# Chilean Wine Towards Sustainability

*Including the supply chain in wine sustainability performance*

Master Thesis by Annabel Bol

Sustainable Development-
International Development

Faculty of Geosciences
Utrecht University

October 2015

Supervisor:
Dr. Femke van Noorloos

Second reader:
Dr. Guus van Westen

# Chilean Wine Towards Sustainability

*Including the supply chain in wine sustainability performance*

Name: Annabel Bol
Student#: 4163788
Email: annabel.bol@hotmail.com
ECTS: 45

March 2015 – October 2015


*Viña Caliterra, Valle Colchagua*
*Santa Cruz, Chile*
*2015*

# *Acknowledgements*

This thesis is the result of an inspiring and educational journey. Simultaneously, it is the final point of the master Sustainable Development, a master filled with idealistic and passionate students and professors motivated to create a more sustainable world. I am grateful for being part of this great learning environment.

First of all I would like to thank my supervisor Dr. Femke van Noorloos, for the constructive and very helpful critique she has given me when asked for.

Furthermore, I would like to thank viña Caliterra, for their interest in this research, collaboration, trusting me and making me feel part of the team. In particular, Mario Oliva, for giving me a more than warm welcome at Caliterra.

I would also like to thank everyone who has provided me with information, in particular my interviewees; without your answers and knowledge this thesis would not have been the same.

Finally, a special thanks to my father Steven Bol, for giving me the wisdom and courage to carry on.
Thank you.

Annabel Bol
October 2015

# *Executive summary*

Globally wineries have different understandings of what constitutes a sustainable wine. Wineries tend to emphasize their *green* or environmental sustainability practices on the vineyard. At the same time wineries put little sustainability focus on their supply chain. Wine cannot be truly sustainable without sustainable supply chain management. Negative sustainability impacts are found both in production and the supply chain. Little is known on how to improve these supply related issues. Scientific research does not focus on this either. These critical supply chain points negatively influence wine sustainability.

Therefore, the main purpose of this research is to include supply chain into the sustainability evaluation of wine, and to explore ways to make a transition towards increased sustainability in the supply chain.

A qualitative case study design has been chosen to explore the paths towards a sustainability transition within the wine supply chain. Within this transition the role of different actors and the potential drivers are discussed. Not the entire supply chain has been evaluated, in this study the focus is on the supplies and suppliers. Three general frameworks have been developed to guide the empirical research: a agricultural supply chain sustainability transition framework, sustainable agricultural supply chain description and corporate sustainability performance.

A evaluation is realized on grape and wine sustainability, being the production itself, for contextual information. Then the research is aimed to make a qualitative judgment on wine's supply chain sustainability. One critical supply was chosen for further research on a sustainability transition within the supply chain. For this one case study of a winery was investigated, located in Chile.

The research shows that wine producers compete on a challenging international wine market. During the last two decades producers have had to take into account a growing variety in wine producers operating from all over the world, since New World producers such as Chile have become relevant competitors. One effect of the financial crisis is that wine consumption is currently lower than wine production. Furthermore wine consumers have become more educated and demand more variety these days.

Within this challenging wine market, it appears that most wineries use sustainability increasingly for marketing purposes to differentiate themselves. The research has shown that this may lead to the inclusion of sustainability practices that work best for marketing in wineries sustainability management without the more difficult or less attractive practices. This is confirmed by the fact that social sustainability is often inferior to environmental sustainability. This may stand in the way of truly effective sustainability management. The case of the investigated winery confirms this development. The clear lack of a proper sustainability master plan of the winery shows itself in many missed chances to improve. Sustainability is now more of an image and is increasingly lacking genuine foundations.

The research has shown that the supply chain has a major impact on sustainability of wine, in both the supplies used and production process of these supplies. The investigated winery does not have sustainable supply chain management in place. The main reason seems to be the winery's failure to acknowledge the value of supply chain inclusion into sustainability to a differentiated product. They do not see the possible premium they may be able to charge, they only see higher costs through new investments. The competitive advantage sustainable supply chain management may bring for wineries does remain a matter of debate. For green vineyard practices this appears to be a lot clearer.

As a consequence, both the supplies the winery purchases and the selected suppliers are not sustainable. Supply purchase is driven by aesthetic needs and costs. Associations and above all communication between supplier and client to raise awareness and discuss options to come to more sustainable decisions in product choices appear to be a key factor in sustainable supplies.

The majority of the suppliers lack clear sustainability management comprising data, goals and strategies.

Sustainability is not a priority. Some suppliers see advantages in sustainability through increased efficiency and cost reduction. Research shows that knowledge and measurements are essential to begin improving sustainability of suppliers and supplies. Pressure from the winery on the supplier appears to positively affect the adoption of sustainability practices. While this is promising, it remains important that suppliers develop an internal sustainability management of their own.

This research identified conventional agrochemical products as one of the most critical points to wine sustainability, both in the application and in the production process. The research found an alternative for this bottleneck in organic wine. Organic grape and wine production, together with an agro-ecological approach, is identified as more sustainable than conventional production. Not only does this work out positive for agrochemical supply impacts, but also the sustainability of grape supply, another critical point, is likely to improve. Furthermore, a transition to organic wine could prove to be positive for other supplies in order to develop a differentiated “green” product. The benefit of wine as a product distinct from others, is that it has an identity and that sustainability can be communicated and leveraged, where there is a key role for marketing. Organic production is not the 'absolute' solution in the sense that it is the only way towards more sustainable wine, there is the piecemeal approach where every phase in the supply chain individually tries to take little steps towards more sustainability, and organic production can go hand in hand with other sustainability certifications to achieve sustainable wine production. In order to achieve a transition to organic wine production a multi stakeholder approach is needed including agrochemical producers, consumer, government and research and development**.**

# *Chapter 1: Introduction*

A high quality wine, derived from grapes on a vineyard surrounded with flora and fauna in harmony with nature. The wine bottle with a stamp of the national wine sustainability certification and the image of a little bird on a branch. This is as sustainable as a wine can get.

Or not? What about the energy used to produce the heavy weight bottle or the environmental unfriendly fertilizers? And what about the socio-economical situation of the external grape suppliers contracted by the winery? Wine cannot be sustainable without a sustainable supply chain management. The problem is that wineries put little focus on their supply chain and little is known on how to improve these supply related issues.

Sustainable supply chain management plays an essential role in sustainable development of institutions and production for two reasons. The supply and suppliers are part of the whole. When the value added, or the supply, is unsustainable this means the product is already x unsustainable before even going into production. Therefore, supply chain sustainability is a fundamental approach in improving sustainability performance (Vermeulen et al, 2006). Furthermore a company must consider its entire supply chain for a more complete understanding of its product impacts (Sutherland et al, 2008).

Challenging is that not each company considers it as its responsibility to sustain business, let alone the supply chain. (Carrol, 2010). As for agricultural supply chains, the global capitalist development led to the rise of the so called “corporate food regime” (McMichael, 2005). In defense of constructing “food security” the corporate food regime is realized through the construction of a world agriculture. The construction of a world agriculture has deepened the unsustainable treatment of natural and social resources. Within this world agriculture, food producers compete internationally in ‘buyer-driven’ markets (Gereffi et al, 2005). This means the consumer could serve as a driver to direct the agricultural companies towards sustainable supply management. However it seems the consumer does not perceive this as an extra value and the benefits of sustainable supply chains may be difficult to promote (Smith, 2007).

The competitive advantage of more sustainable supply chains, is a matter of debate and each company implements a different strategy. The lack of clear evidence of the link between supply chain sustainability and competitive advantage may enhance the need of a interaction with public sector support for sustainable supply chains. It may be emphasized that both actors within and outside the food supply chains need to make changes to make supply chains more sustainable (Smith, 2007 & Vermeulen et al, 2006 & Seuring et al, 2008).

This reality varies for each branch or sector. In this context, more research is needed on wine supply chains and sustainability opportunities for effective management. Moreover, research that brings some insights on comparative advantage of SSCM in the wine branch may enhance this management. Furthermore, it will be interesting to evaluate possible multi-stakeholder cooperation within wine supply chains for increased sustainability.

The main purpose of this research is to include supply chain into the sustainability evaluation of wine, and to explore how to make a transition towards increased sustainability in the supply chain. The research presents a case study of a winery in Chile, for which a qualitative design is chosen to assess its wine's supply chain sustainability. The research aims to make recommendations on possible steps to take and roles to play of different actors to achieve a sustainability transition of the wine supply chain.

The research consists of eight chapters and can broadly be divided in to five parts. The first part provides so called 'background' information. It exists of the first, second and third chapter. The first one providing the introduction to the topic, the second one the analytical framework and operationalization of the research and the third one provides an explanation of the theoretical concepts necessary to understand the thesis.

The second part provides contextual information in order to place the thesis into perspective. It exists of the fourth and fifth chapter. The fourth chapter providing information on the global and Chilean wine market while the fifth chapter links sustainability to grape and wine production. These chapters will provide the answer to research question one.

The third part contains the results of the case study of this research. It exists of chapter six and seven. Chapter six demonstrates the grape and wine production of Caliterra in relation to sustainability practices. Chapter seven will provide a description of the supply chain and the results of the suppliers evaluation of Caliterra. These chapters will provide the answer to research question two.

The fourth part consists of chapter eight, in which a selected bottleneck and best practice will be evaluated more in to depth. This chapter will provide the answer to research question three. Finally the fifth part of this research contains the conclusion, discussion and recommendations of the research.

# *Chapter 2. Analytical Framework and Operationalization*

## 2.1 Introduction

In this chapter the research design is explained. The research objectives and questions are given, as well as the operationalization and framework that aimed for the answers to these questions and the achievement of the objectives. The research is designed in three parts namely: sustainability in grape and wine production, sustainability in the wine supply chain and a transition towards a sustainable agricultural supply chain.

## 2.2 Research Objectives

The research objective can be divided into a scientific and policy objective.

*Scientific objective*
To analyze a wine supply chain sustainability with bottlenecks and best practices, and explore possible sustainability transitions within the agricultural supply chain.

*Policy objective*
To provide an analysis on the sustainability of a wine supply chain with insights and recommendations which address the why and the how of supply chain inclusion in wine sustainability practices.

## 2.3 Research Questions

### *2.3.1 Main Research Question*

In order to attain to the research objective, a research question has been formulated which will serve as the main question for this study.

> *"To what extent is viña Caliterra's wine supply chain sustainable and what kind of sustainability transition within the supply chain will lead to a more sustainable wine?"*

This main research question is divided into three subquestions.

### *2.3.2. Sub Questions*

1. What are the most critical points in the wine supply chain that prevent sustainable wine production?
2. To what extent are the 5 product supply chains of Caliterra sustainable?
3. What sustainability transition would provide a solution?

## 2.4 Research Operationalization

The research conducted is primarily qualitative with an inductive approach as method of reasoning. The research aims to make a qualitative judgment on a wine's supply chain sustainability. The criteria for this evaluation are taken from literature. With these criteria the evaluation of a wine supply chain sustainability is done in a best possible way without quantitative data.
A single case study of one particular winery is used for the empirical part of the research. This choice is made mainly because of the manageability factor in relation to skills, resources and time available. The winery that has been chosen is Viña Caliterra, part of the Group Errazuriz.

The research was realized in seven steps demonstrated in the research framework in table 2.5. Even though this gives a good indication of the sequence of the research, these steps were realized not entirely in chronological order.

First of all, the research has explored the identity of Viña Caliterra. Their grape and wine production was investigated together with related sustainability practices of Caliterra. Also the mission, vision and strategies of Caliterra were discussed during the first visits to the vineyard. Expert interviews with Caliterra and Errazuriz employees were held to obtain this information. For this secondary sources such as websites, articles on Caliterra were also used. Several experts interviews were also useful as they gave their opinion on Caliterra and its past and present sustainability.

Before, during and after this exploration a literature review was held on the relevant sustainability themes of the product wine and the life cycle of wine. Sustainability practices in the international and Chilean wine sector were investigated and the development of these practices among more proactive or passive wineries worldwide. In Chile it became clear that the wine sustainability certification called *Codigo Nacional de Sustentabilidad* (CNS) played a key role in sustainability development of Chilean wineries. The CNS certification of Caliterra was evaluated in order to get more quantitative information on their sustainability and critical points. This analysis did not only include desk research, also semi-structured interviews have been conducted with experts on sustainability management of wineries in Chile. Comparative cases have been investigated through the revision of secondary data and by key stakeholders interviews with other Chilean wineries. Literature review was also held on the international wine market for contextual information.
At the time enough information was gathered on key sustainability themes in wine production, a sustainability framework was developed to evaluate Caliterra's current grape and wine sustainability. For this judgment more interviews were held with Caliterra and Errazuriz representatives and other experts. This was important to get to know Caliterra's choices on sustainability management.

The next step was to explore the supply chain of Caliterra. First a desk research on the supply chain of wine was realized. After obtaining basic information interviews were held with Caliterra and Errazuriz representatives in order to describe as visually demonstrate Caliterra's supply chain. This was challenging because no such scheme existed and the research had collect all components of the supply chain. The description was used to evaluate each supplier of Caliterra according to relevance on total costs and volume of Caliterra, interest for sustainability and the willingness of the supplier to participate. Finally a selection of five suppliers was made for further evaluation. The selection was proposed to Caliterra's managers and they agreed. Interviews with the selected suppliers were scheduled, aiming for a first impression and exploration interview. Several critical and interesting points that derived from the interviews were taken out for further evaluation. A questionnaire (list of points that had to be discussed with the supplier) was developed, for which literature review was used. For each supplier the questionnaire was similar with the exception of some points that needed adaptation. After analysis and development of the questionnaire a more in-depth interview was held with the same or a different supplier, dependent on its expertise. These interviews were necessary evaluate sustainability of the supplier and discover potential bottlenecks.

These interviews were analyzed. Background desk research was done on the supply and industry in general and interviews with experts were held to enhance knowledge on the relations between winery and supplier and critical points for sustainability. With all this info a sustainability evaluation of the five suppliers was held. From the evaluation a relevant bottleneck was selected for further analysis. The outcomes of the evaluation and the selected bottleneck were discussed with Caliterra. On this bottleneck more background desk research was realized and expert interviews were held on both the bottleneck and a potential best practice (agrochemical suppliers and organic production experts). This best practice was further analyzed and feedback was asked from Caliterra on this best practice. Now that all data was collected the research investigated how to achieve a sustainability transition within the wine supply chain, using this best practice as a starting-point.

*Interviews*
For all interviews a semi-structured approach was chosen since this provides the opportunity to ask follow-up questions. Stakeholder surveys and dialogues are known to be useful for highlighting problem areas and/or risks, which was the aim of this research. Besides interviews with Caliterra's suppliers, grape and wine production experts of Caliterra, Errazuriz and other wineries, interviews were held with governmental institutions, research institutions and university representatives for exploratory research. These interviews

were held to obtain more information on the issues but also to explore the roles different actors could play within a transition to a sustainable supply chain. In total 52 interviews were with different stakeholders.

## 2.5 The Research Framework

The research framework visualizes the steps taken into this research in order to answer the research questions.

| 1. Exploration | 2. Desk Research | 3. First evaluation | 4. Supply Chain | 5. In-depth interviews | 6. Bottleneck Selection | 7. Transition |
|---|---|---|---|---|---|---|
| Interviews Caliterra & Errazuriz | Sustainability themes of wine | Development Framework for sustainability evaluation Caliterra | Interviews Caliterra & Errazuriz<br><br>Description supply chain Caliterra | In-depth interviews suppliers | Discuss outcomes with Caliterra | Expert interviews best practice |
| Ins and outs of grape and wine production Caliterra | Caliterra's Codigo Nacional de Sustentabilidad certification | Interviews Caliterra, Errazuriz & experts | Evaluation & selection of auspicious (willing/relevant/important) suppliers | Background desk research supply & interviews experts | Bottleneck selection of evaluation suppliers | Feedback Caliterra |
| Sustainability practices Caliterra | Comparison CNS with other wine sustainability certifications | Sustainability evaluation Caliterra | Interviews selected suppliers & evaluation critical points | Sustainability evaluation suppliers | Desk research bottleneck | Expert interviews governance |
| | International wine market & sustainability developments | Desk research wine supply chain | Design of questionnaire & in-depth interviews | | Expert interviews bottleneck | |

*Table 2.5. Research framework*

## 2.6 Limitations

A limitation to this research is that it provides no quantitative data. Qualitative research is praised because it results in a holistic understanding of complex processes (Desai, 2010). At the same time, it may lack focus and this type of research is filtered by subjective external analysis. In addition, because qualitative data collection is usually small-scale, it has a narrow scope and is open to bias. However, it should not be forgotten that contextual environment is very important in development studies (Desai, 2010). Doing qualitative research one has to take these constraints and strengths into account.

Furthermore the research has used only one case study and has therefore no material to compare with other wine supply chains. Furthermore within this case study only one bottleneck and one best practice have been chosen for further in-depth research on sustainability transitions. In addition this research focused on a selection of five suppliers of the winery and has not investigated the sustainability of the entire supply chain. These limitations are due to the time limit and lack of resources for this research. The research has preferred to look into one case and few suppliers more deeply to provide interesting insights instead of basic research on several cases, more suppliers or the entire supply chain.

The research had to cope with lack of available data on wine supply chain and related sustainability practices. There have been no other similar qualitative studies which has made it hard to design the research and to compare with other case studies. Because of this the research is more a exploratory research. However the lack of similar researches also addresses the value of this research.

Another limitation could be that many interviewees were representatives of commercial organizations. For these organizations it is more difficult to provide hard data and to be transparent. This has complicated the collection of data. Moreover the research was realized in the borders of Chile, Latin America. It is believed the research can be internationally applied but might be geographically biased to a certain extent considering habits and regulations.

## 2.7 Research Location and Period

The research has been conducted in Chile, Latin America. Having contacted several Chilean wineries, the winery Caliterra expressed its profound interest in and support for the research and because of its sustainability strategy this winery became the case study of this research. Viña Caliterra is part of the traditional Errazuriz wine group. The vineyard itself was located in Valle Colchagua, Santa Cruz. The offices of Caliterra and Errazuriz were located in the capital Santiago de Chile. As a consequence, the research took place at both locations. Furthermore the selected suppliers were located mainly in and around Santiago, however sometimes more remote suppliers or plants had to be visited. Other wineries that were interviewed were located either close to Valle Colchagua or in other valleys, located three to four hours from the capital. Other experts were mostly located in Santiago while some had to be visited in the southern regions of the country.

Most interviews were conducted in Spanish and some in English, which have been tape recorded and transcribed.

The research took place in a time period of seven to eight months, from March to October 2015. The research was supposed to start in January however due to complications of the organization this could not be realized. Instead the data collection started mid-March, and had to be finished in the end of July. In August, September and October the data was further analyzed and the thesis was written.

# *Chapter 3. Theoretical Framework: Sustainability Transition in the Agricultural Supply Chain*

## 3.1 Introduction

This chapter will clarify the theoretical concepts used in this research. First, an elaboration of the concept of sustainable development will be given, since this is a fundamental underlying concept throughout this research. Secondly, the concept of agricultural supply chain management and its importance to sustainability will be explained. In the final paragraph will be explored how to realize a sustainable transition in agricultural supply chains.

## 3.2 Sustainable Development

Before operationalization we must decide on a definition of sustainability. Sustainable development is a new and unfamiliar topic with continuing uncertainty about what it means in practice. The sustainability concept is interpreted intuitively but is difficult to express in concrete and operational terms (Kloepffer, 2008). Different approaches to sustainability reflect different world views. These world views do not necessarily compete, they are different fragments of a bigger picture (Levett, 1998). Looking at the neoliberal inclusion of sustainability we can understand what bottlenecks arise in the implementation of sustainable development.

Three critical points of this neoliberal inclusion of sustainable development are:

- the absence of social dimension
- environmental state and pressure variables without any target or limit reflect a rejection of the idea that environmental capacities or limits should constrain policy
- economic output was a satisfactory proxy for quality of life

Somewhat linked to this implementation of sustainable development is the famous definition of sustainable development defined by the Brundtland commission (1989). The majority of scientists seems to agree that sustainable development is based on this definition: “Sustainable development is development that meets the needs of the present without compromising the ability of the future generations to meet their own needs”. Sustainable development consists of three dimensions: the society, the environment and the economy, also mentioned as people, planet and profit. Within this vision of sustainable development, it is believed that social equity, economic growth and environmental maintenance are simultaneously possible, thereby optimizing the ability of the three different dimensions (environment, society, economy). The three dimensions have to be balanced in order to reach sustainable development. Business strategy or policy needs to protect, sustain and enhance the human and natural resources that will be needed in the future (Labuschagne et al, 2003).

This definition of sustainable development can be transformed into a model as seen in figure 3.2a. This model displays a connection the three dimensions of the economy, the civil society and the environment where they are equally important and interdependent on one another.

The fact this sustainability vision aims for a balance between the three dimensions raises the question raises the question as to the different dimensions may act as substitutes for each other. If it is perceived they can then the decline of one type of dimension as long as another type of dimension is increasing sufficiently to compensate for this decline will still be sustainable (weak sustainability). Or the dimensions are perceived as non-substitutable, meaning they contribute to welfare in a unique way that cannot be replicated by another component (strong sustainability) (Ekins, 2003).

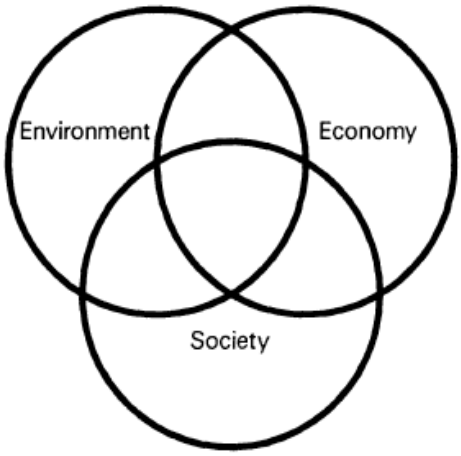



*Figure 3.2a. Conventional "Three Ring Circus" sustainability model (source Levett 1998)*

The Brundtland definition is a widely accepted definition however the meaning of sustainable development and its implementation is continuously debated. Positive is that the old view of development versus environment has definitely disappeared with the arrival of a generally accepted new view in which better environmental and social management is crucial to sustain development (Vermeulen et al, 2006). However is this sufficient?

Levett (1998) argues this is insufficient. He proposes a different vision on sustainable development. According to him the "three-ring-circus" definition does not go sufficiently far because of two reasons. Levett argues that instead of the three spheres being equally important (weak sustainability), the environment as the outer circle should be considered as a precondition for the society and the economy (strong sustainability). He argues that if there was no environment, and thus no life support system, it would be impossible for the economy and the society to exist. The economy should also be considered as a social construct as it functions due to the values the society attaches to it. This is why Levett constructed the Russian Doll Model, shown in figure 3.2b. However it is difficult to put numbers to environmental limits, and even when these are clear its interpretation and application in policy are political and judgmental (Levett, 1998). Nevertheless, the earth has no unlimited capacity and we have to understand these limits and direct policy towards staying in between these limits. Furthermore, quality of life is a subjective issue. These complications increase the attractions of taking a objectively measurable economic indicator as a proxy for well-being, such as the GDP (Levett, 1998). There is a debate on how to modify this GDP. Levett argues that "balance of the three dimensions is an obstacle to its achievement". Development is sustainable if it provides a good quality of life *and* stays within the environmental limits. We have to reconcile the three dimensions in sustainable development. Neither is optional, we must achieve both together. We cannot choose between global warming or use energy for heating of our buildings. Instead we need to figure out how we can do economically good while considering the environmental limits and quality of life. The economy is excluded as an *end* and is instead understood as a *means* to achieve sustainable development.

In this research the "Russian doll" model is chosen. This definition is interpreted in this research as the "possible" approach. It is seen as a more constructive and creative approach. This approach makes sustainability more operational. Even though this kind of sustainable development is not easy to implement, it is the road we need to take to achieve sustainable development. The "three ring circus" is perceived in this research as the "not possible approach". We cannot construct a balance between the three definitions when experience with sustainability in practice shows us that the social and economic dimension are always put higher than the environmental dimension.

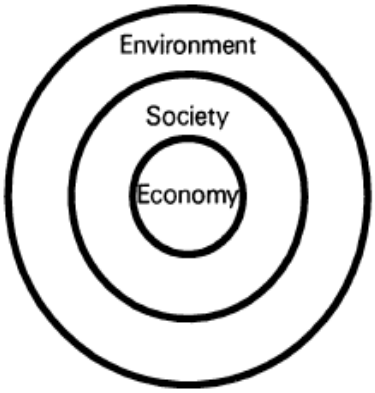



*Figure 3.2b. The "Russian Doll" sustainability model (source Levett 1998)*

## 3.3 Private Sector Perspective on Sustainable Development

In this research the economical dimension is perceived as a means to achieve sustainability. How can the private sector do economically good, while considering the environmental limits and quality of life? Companies need a good economic situation to be able to invest in sustaining their production. According to the "Russian doll" model profit needs to be used (as a means) to invest in sustainability. Scientists address that the company must at all time maintain its own economic health and viability (Hutchins et al, 2008). Unviable companies who do not survive on the long term through their ability to be profitable can make no contribution to the economic systems on a local, national or global level nor will they focus on sustainability practices, for which money but also a long-term perspective is needed. This means economy is perceived not *most* important but nevertheless important for companies to address sustainability or in other words to stay within the environmental limits and increase quality of life.

### *3.3.1 Role Private Sector in Sustainable Development*

The idea that business enterprises have some responsibilities to society beyond making profit has been around for centuries (Carrol, 2010). It evolves around different concepts including; corporate citizenship, corporate social responsibility, business ethics, stakeholder management, sustainability and corporate social performance. What they have in common is that all these concepts are related to key themes of value, balance and accountability of a company. Doing responsible business is not something taken for granted, instead it has been heavily debated, the arguments in this debate are shown in figure 3.3.1. There are proactive companies who feel it is in their responsibility to take on sustainable development. However when a company has a proactive sustainability management and invests in this, while the competition does not, this means the 'proactive' company probably ends up being more expensive and therefore less competitive. This argument is used by the 'passive' companies, who only see responsibility in making profit. These companies abdicate the responsibility of increasing sustainable business to the state or international organizations. The state is able to develop norms for companies to follow, in order to level the playing field of companies. The only problem is that these often combine minimum standards. This research perceives it is the public sector's role to develop mechanisms for what businesses cannot do alone. The private sector should have its own ideas to increase sustainability of the production process and products. If willing, the private sector could make a big difference in sustainability (Vermeulen et al, 2006).

Arguments against and in favor of doing responsible business

Against

1. Business management has one responsibility only and that is to maximize profit of its owners or stakeholders. Responsible business therefore dilutes the business primary purpose
2. If the free market is not able to address social or environmental themes, government legislation should take this place
3. Business is not equipped to handle social activities
4. Business has already enough power, why add social power?
5. Business will make itself less competitive globally

In favor

1. Responsible business is in the business long term interest
2. Responsible business wards off government regulation
3. Business has enough resources and why not let business try
4. Pro-acting is better than reacting
5. The public strongly supports it

*Figure 3.3.1. Arguments against and in favor of doing responsible business (source Carrol, 2010)*

### *3.3.2 Sustainability of a Company*

To address the sustainability of a company we should consider figure 3.3.2. Sustainability requires that corporations maintain the integrity of social and environmental systems while financial resources exit the system. The company is sustainable if financial resources outputs are be bigger than the inputs as well as human and information resources while the physical substances remain within environmental limits.

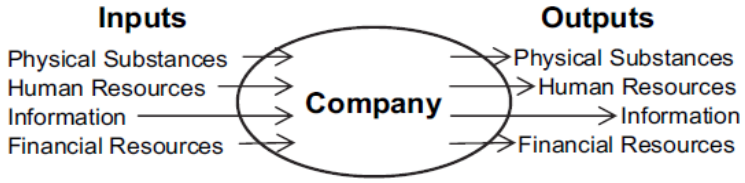



*Figure 3.3.2a. Primary flows of a corporation (Hutchins et al, 2008)*

What social, environmental and economical aspects are important for the sustainability performance of industries? UN and national governments have been driving sustainable development so most frameworks focus on national and regional levels. Some include a institutional dimension. Less work has been done on sustainability performance assessment practices. Most frameworks that assess business sustainability mainly integrate environmental sustainability. Social sustainability is currently undervalued and not well defined but increasingly receives attention (Hutchins et al, 2008). The economic pillar is common practice of businesses. Also frameworks mainly address the product level (LCA), less on entire organization (Labuschagne et al, 2003). The Global Reporting Initiative (GRI) is according to this research the only recognized international initiative that focuses on reporting the sustainability of the entire organization. Labuschagne et al (2003) propose a comprehensive framework of sustainability criteria that can be used to assess the sustainability of overall company sustainability. The framework is based on a variety of published approaches and guidelines. This framework is shown in figure 3.3.2b.

Sustainable supply chains depend on the sustainability of each company. In the next paragraph we will evaluate why supply chains are important for sustainability and how to manage supply chains.

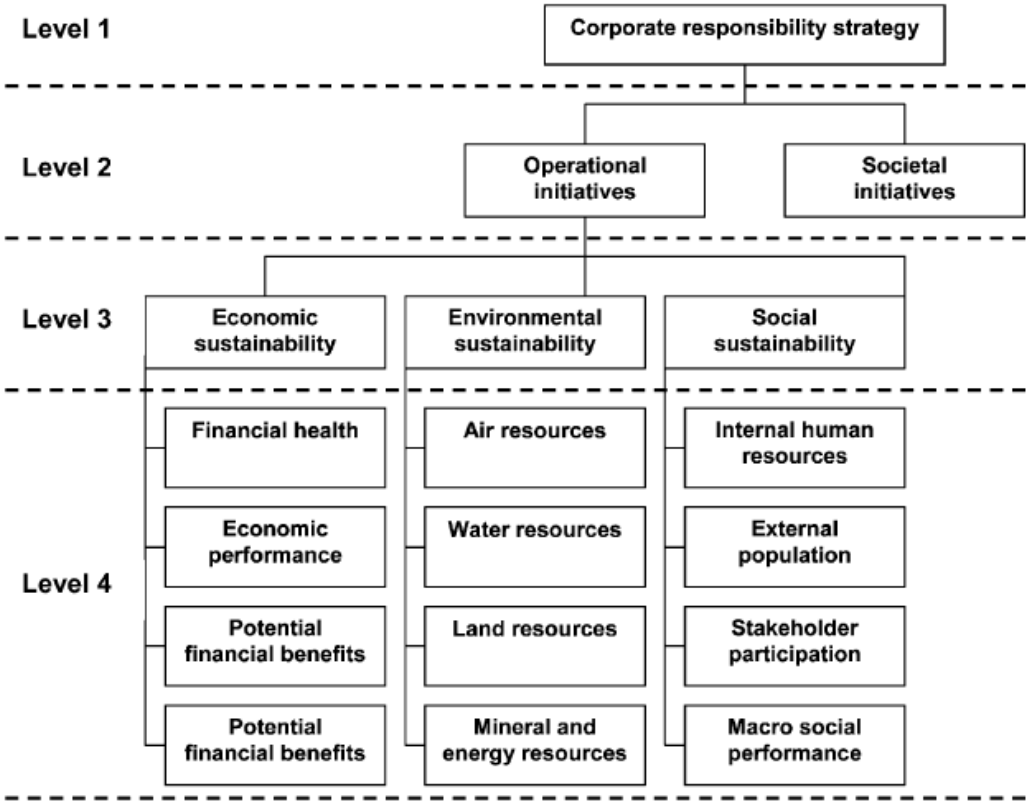



*Figure 3.3.2b. Criteria sustainability performance of industries (source Labuschagne et al, 2003)*

## 3.4 Agricultural Supply Chain Management

### *3.4.1 Supply Chains*

Individual businesses no longer compete as sole autonomous entitles, but rather as supply chains (Gereffi et al, 2005). One of the most significant changes in modern supply chains is that these are highly globalized and therefore more complex.

3.4.1.1 What is a Supply Chain?

Every company is by nature in some way involved in supply chain relationships with other companies (Lambert, 1998). However, the supply chain is not a chain of businesses of one-to-one, business-to-business relationships, but a network of multiple business relationships. Each node in the network adds value. The network begins with raw materials and ends with a finished product, and includes suppliers, manufacturing centers, distribution centers and retail outlets (Sutherland et al, 2008).

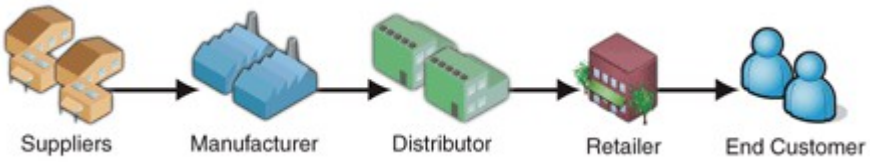



*Figure 3.4.1.1. A general Supply Chain*

3.4.1.2 What is Supply Chain Management?

The management of multiple relations across the supply chain is referred to as supply chain management (SCM). The core of SCM is the integration and coordination of business processes and strategies from

beginning to end of the supply chain in order to satisfy the final consumers of the supply chain. SCM offers the opportunity to capture the synergy of company integration and management. The chosen definition in this research is: "SCM is the integration of key business processes from end user through original suppliers that provides products, services and information that add value for customers and other stakeholders" (Lambert, 1998).

Due to globalization there is a growing complexity of supply chains. SCM increasingly focuses on core competencies of suppliers, the effect is an increase of organizations in the chain, and with this increase in complexity a reduced enterprise control.

Buyer-seller relationships have transformed in recent years. Firms are moving away from conflicting relationships toward stronger relationships with fewer suppliers. In these long-term relationships a company may ask a supplier to not only manufacture but also design components of the final product. In addition to price, many other measures are now being used to select suppliers: quality, delivery and service. We are now at a point where the company must not only select their direct suppliers, but also consider the entire supply chain or network to meet the demands of a global market (Sutherland et al, 2008).

Each company sees itself as the focal company and perceives the network structure differently. The key element to manage a supply chain is to understand the network structure (Lambert, 1998). Due to the economic nature of the supply chain, the management of the supply chain usually focuses upon economic efficiency or economic performance (Hanfield and Nicols, 1999).

3.4.1.3 Research on Supply Chain Management

Lambert emphasizes the need for research for successful SCM practice (Lambert, 1998). According to him, a top priority should be research to develop a normative model that can guide managers in the effort to develop and manage their supply chain. Seuring et al (2008) explains that since the 90's research on sustainable supply chain management has grown. He addresses research that has distinguished between 'greening the supply process', where e.g. criteria for supplier selection are identified, and 'product based green supply', aiming to green the product itself, where frequently life-cycle assessment based criteria are taken into account. Particular contributions have investigated the use of environmental management systems and how sustainability issues might be integrated into supply (chain) management (Seuring et al, 2008). Scientists however argue that there has been less attention to social sustainability in supply chains (Hutchins et al, 2008).

There is a difference between traditional and current interests and decisions in SCM (Seuring et al, 2008). Research and debates address that there has been increasing sustainability attention in SCM. Some attention has been devoted to evaluating sustainability of supply chains, but as discussed this has largely emphasized environmental sustainability. There is currently a discussion of how to incorporate the social dimension of sustainability into business decision making. It is rather difficult to operationalize indicators of social sustainability into suppliers and further efforts are needed (Sutherland et al, 2008).

3.4.1.4 Why is Supply Chain Management Important for Sustainability?

As discussed it is crucial to make sustainability operational, use it to guide decisions. SCM plays very important role in sustainable development of institutions and production for two reasons. The supply chain adds value to the final product. The value added can be sustainable or not sustainable. Therefore, the sustainability of the final product is dependent on the sustainability of the supply chain and the suppliers. The supply and suppliers are part of the whole. When the value added, or the supply, is unsustainable this means the product is already x unsustainable before even going into production. Choices in sustainability must be made in the supply chain. Furthermore a company must consider its entire supply chain for a more complete understanding of impacts (Sutherland et al, 2008). According to Vermeulen and Ras, "greening of product chains may be expected to be the most fundamental approach in improving environmental performance of commodities " (Vermeulen et al, 2006).

### *3.4.2 Food Supply Chains*

In most of the world, we have long been dependent on a mixture of local production and imported conserved foods. More recently, manufacture foods have become an important part of many people's diets, and many of the world's foods are now traded internationally as commodities, through the removal of trade barriers, relatively inexpensive transport and technical advances in food conservation (Smith, 2007). Food producers compete internationally in 'buyer-driven' markets (Gereffi et al, 2005). According to McMichael (2005) the global capitalist development led to the rise of the so called "corporate food regime". He argues that in defense of constructing "food security" the corporate food regime is realized through the construction of a world agriculture. The construction of a world agriculture has deepened the instrumental use, misuse, and abandonment of natural and social resources. Global displacement of peasant cultures of provision by dumping, the supermarket revolution, and conversion of land for agro-exports have led to political and social movements towards more local food supplies, or "food sovereignty" have emerged in some parts of the world (McMichael, 2005).

This global food regime complicates the management of food supply chains and their social and environmental sustainability. As shown in table, we can distinguish 4 types of food supply chain: *local, conserved, manufactured and commodity.* Each chain brings different challenges for SCM.

*Local food supply chains* are generally perceived as relatively sustainable because they are simple chains, without having to cross a high transportation distance.
In *conserved food supply chains*, food products are stored and traded outside the local area. Different technologies have enabled food conservation.
In *manufactured food supply chains*, food usually contain ingredients from different origins and production systems. The number of transactions in such a chain is high. These chains deal with complicated dynamic s which may limit traceability, information flow and influence along the chain.
In *commodity food supply chains*, foods are bought and sold to standard specifications worldwide and often bulked for low costs and ease of transport and storage. These chains have a very difficult traceability and a lack of knowledge and influence. These are usually simple conserved foods where prices depend on market mechanisms. Moreover production often exceeds demand. This means prices are low and unstable (Smith, 2007).

In this research a international applicable description of sustainable food chains is used to evaluate sustainability for food supply chains. This description is from the UK Sustainable Development Commission (SDC; DEFRA 2002).

1. Produce safe, healthy products in response to market demands and ensure that all consumers have access to nutritious food and to accurate information about food products.
2. Support the viability and diversity of rural and urban economies and communities.
3. Enable viable livelihoods to be made from sustainable land management, both through the market and through payments for public benefits.
4. Respect and operate within the biological limits of natural resources (especially soil, water and biodiversity).
5. Achieve consistently high standards of environmental performance by reducing energy consumption, using renewable energy wherever possible.
6. Ensure a safe and hygienic working environment and high social welfare and training for all employees involved in the food chain.
7. Achieve consistently high standards of animal health and welfare.
8. Sustain the resource available for growing food and supplying other public benefits over time, except where alternative land uses are

These eight descriptions will be taken into account when evaluating sustainability of food supply chains. In the next paragraph we will evaluate how a transition can be developed to change food supply chains into sustainable food supply chains.

### *3.4.3 Sustainability Transition in the Agricultural Supply Chain*

The aim of this paragraph is to develop a framework of the routes to a sustainability transition in the agricultural supply chain. Literature revision on this theme has helped to identify the most important roles, drivers and barriers to succeed such a transition. The points were taken over from Smith's analysis on sustainable food supply chains (2007). The majority of these points were confirmed by other scientists and several points from other studies have been added. This collection of points have formed the framework.

The roles of different actors needed in order to achieve such a transition will be discussed. Also the drivers and barriers that support or withhold producers from the transition to a more sustainable agricultural production and supply chain will be analyzed.

3.4.3.1 Agricultural producer

Food producers, are perceived in this framework as the 'focal company' in the supply chain (Seuring et al, 2007). A bottleneck in achieving supply chain sustainability that scientists address is that producers lack internal capabilities to reduce negative impact of their suppliers (Seuring et al, 2008). Therefore in literature on supply chain sustainability it is emphasized that both the focal company and the suppliers possess a clear sustainability management with goals, plans and strategies of sustainability on their own production and their supply chain (Zelbst et al, 2012 & Darnell, 2008). To develop such a management it is believed the producer needs a proactive attitude. This kind of management is called in literature Environmental Management Systems (EMS) (Zelbst et al, 2012). An EMS leads to a sustainability plan or policy of the company, creating quantifiable goals to systematically improve business sustainability performance. These EMS should include supply chain management as well (Darnell, 2008). According to Vermeulen and Ras, “greening of product chains (….) can easily be extended to the social dimension of sustainability as well, taking into account fair prices, stable employment and stable partnership relations with global suppliers”, these dimensions should also form part of the management (Vermeulen et al, 2006). Another bottleneck scientists mention is that producers, in enhancing their own sustainability through standards, may experience difficulties in the great diversity of certifications and its costs. For this a clear management could also help.

Whenever sustainable supply chain management (SSCM) is new for a company, Vermeulen and Ras (2006) argue that the company should adopt a more pragmatic approach which includes the identification of bottlenecks within the supply chain and cooperation with trusted partners. When this is achieved, Vermeulen and Ras argue the company should aim for a more comprehensive approach. The sustainability management of the producer should be linked to the management of the suppliers, so that the supply chain as a whole works towards the same goals. Others address that sustainability should be an intrinsic part of a supply chain relationship (Smith, 2007).

When a producer has developed such a management, how will sustainability be increased within the supply chain? Scientists state that one of the principal challenges associated with supply chain decision-making is selecting suppliers that follow the same guidelines with respect to sustainability as the enterprise. Most organizations rarely restrict their purchasing decisions to suppliers (at any level) with certain environmental and/or social criteria (Sutherland et al, 2008 & Seuring et al, 2008). In recent years however, some organizations have started to rely on their supply chains to improve their business performance and create value for their end customers. Increasingly firms who aim to minimize their environmental impacts during production process understand that their ability to do so depends to a great deal on their management of increasingly complex supplier relationships (Vermeulen et al, 2006).

When suppliers are selected it seems successful cooperation is the key. As mentioned, scientists explain it might be wise and effective to cooperate first with trusted partners, aiming at implementation of identified improvements on the input side and output side. Moreover, in order to improve sustainability in its supply chain the producer must have a deeper understanding of the chain. This can be achieved through several methods, including LCA. Furthermore scientists address the importance of an overarching communication among supply chain members. Seuring and Müller (2008) have even argued that this is one of the key issues differentiating sustainable supply chain management.

What scientists also address is that sustainable supply chain management can increase competitiveness for all members, since producers and suppliers will all be improving their capabilities and knowledge with the new management which will lead to a stronger chain as a whole (Vermeulen et al, 2006).

3.4.3.2 Transition Framework Producer

*In order to develop a sustainable agricultural supply chain the agricultural producer:*

- Implements a Systematic Sustainable Management, including the supply chain
- Develops clear objectives for sustainability excellence
- Analyzes how to reduce negative impacts
- Analyzes the economics of sustainability improvements
- Implements sustainability improvements within own production facilities

- Selects suppliers on sustainability criteria
- Unifies sustainability management with suppliers network
- Engages in inter-firm cooperation
- Develops systems of control
- Audits and monitors suppliers on sustainability

- Accesses government-sponsored schemes designed to encourage sustainability
- Promotes the advantage of sustainability practices of all shackles of the chain to gain access to more lucrative markets

- Gains increasing knowledge on supply chain sustainability by: 1. analyzing the life cycle of the product and identifying environmental and social bottlenecks and 2. pursuing good communication with suppliers

3.4.3.3 Other Actors in the Transition

Following the roles of different actors needed in order to achieve a sustainability transition within the agricultural supply chain are discussed. The actors that are perceived as relevant for this research are: *Processing and manufacturing suppliers, Consumers, Civil society and NGO's, the Government* and *Research institutions.* Retailers and distributors are not taken into account.

Scientists emphasize that both actors within and outside the food supply chains need to make changes to make supply chains more sustainable (Smith, 2007 & Vermeulen et al, 2006 & Seuring et al, 2008). Most important, scientists address that cooperation among food manufacturers, retailers, NGO's, governmental and farmers' organizations is vital in order to raise standards for some supply chains and to enable farmers to adopt more sustainable agricultural practices (Smith, 2007 & Vermeulen et al, 2006 & Seuring et al, 2008). Multi-stakeholder initiatives involving governments, farmers, academics and NGO's as well as food businesses have even more potential for driving improvements by engaging in dialogue and action to achieve changes more ambitious than they could. Public/Private/NGO partnerships are essential to 'raise the baseline' for commodity supply chains (Seuring et al, 2008). Furthermore each actor can contribute to the transition of agricultural supply chain sustainability.

Private sector dominates management and technical skills, diffusion and distribution competence. Civil society organizations provide on-the-ground know-how, development expertise, people skills and original low-cost solutions. The public sector possesses information, skilled staff, authority to mobilize resources and the power to create the institutional structures and incentives. Government policies in the field of green products (eco-labelling, pricing, standards, voluntary agreements etc.) extended producer responsibility, waste management and recycling policies prove to be supportive for SSCM (Vermeulen et al, 2006). NGO's often understand local social and environmental themes, offer participatory approaches and enhance trust. Research institutions help increase the knowledge and effectiveness of practices.

Due to increasing pressures by the end of the supply chain and the consumers, the reach of responsible

business now often extends to supply chain partners including suppliers, customers, and logistics providers (Maloni et al, 2006). The necessary role of processing and manufacturing suppliers within the transition has many points in common with agricultural producers. The suppliers need a similar sustainability management with a proactive attitude, not only following regulations or international pressure (Seuring et al, 2008). Since scientists address agricultural producers should unify sustainability management with their suppliers, this is also true for the suppliers itself. Scientists emphasize they should focus mainly on eco-efficiency, reduced pollution, improved worker welfare on own sites (Smith, 2007).

3.4.3.4 Transition Framework

**Processing and Manufacturing suppliers**

*In order to develop a sustainable agricultural supply chain the processing and manufacturing suppliers:*

- Implement a Systematic Sustainable Management, including the supply chain
- Develop clear objectives for sustainability excellence
- Analyze how to reduce negative impacts: focus on eco-efficiency, reduced pollution, improved worker welfare on own sites
- Analyze the economics of sustainability improvements
- Implement sustainability improvements within own production facilities

- Work with immediate suppliers (co-packers, processors) to improve supply chain sustainability, as joint 'competitive' programs to mutual benefit
- Cooperate with producers/clients
- Unify sustainability management with suppliers network
- Communicate negative impacts of their product and production process to their clients

- Investigate sustainability of own production process and organization
- Understand the sustainability issues associated with supplies and develop programs and partnerships to address these
- Identify benefits of sustainable product and production alternative

**Consumers**

*In order to develop a sustainable agricultural supply chain the consumers:*

- Value local food supply chains
- Value support for sustainability as part of brand, manufacturer or retailer quality and reputation
- Value assurance and higher level sustainability standards
- Demand sustainable final performance

**Civil society and NGO's**

*In order to develop a sustainable agricultural supply chain civil society and NGO's:*

- Contribute to legitimizing supply chain sustainability to consumer and general public with their critical attitude
- Highlight issues and problem areas
- Share expertise and insights in order to support improvements
- Demand sustainable final performance

- **Governments**

*In order to develop a sustainable agricultural supply chain governments:*

- Implement food purchase criteria to combine price, quality and sustainability aspects.
- Implement regulations, support, tax and advice to encourage the development of more socially, environmentally and financially sustainable food supply systems
- Provide national and international support for more sustainable production systems and trade
- Address the importance of EMS and provide pressure to adopt EMS
- Set standards that companies can use as guidelines (eco-labelling, pricing, standards, voluntary

agreements etc.)

- **Research and Development**

*In order to develop a sustainable agricultural supply chain research and development institutions:*

- Provide deeper understandings of sustainability issues linked to farming and food.
- Develop technologies to improve, for example tracking, tracing, waste management, eco-efficiency, participative working
- Provide deeper understanding of competitive advantage SSCM
- Provide deeper understanding of sustainability transition within food supply chains

### 3.4.4 Drivers and Barriers

3.4.4.1 Drivers and Barriers

Smith (2007) has developed summarized, bases in part on *Paths to Sustainability in Supply Chain Management* of the Nordic Partnership in 2004, the factors affecting food business investment in more sustainable supply chains. This overview is given in figure 3.4.4.1 and is useful in addressing to what extent producers or suppliers are capable of improving the sustainability of their supply chain and what needs to be changed in order to support this transition.

| | supporting investment | counteracting investment |
|---|---|---|
| resources | Resources available for strategic work | Works to tight margins or in highly competitive environment. |
| vision | Long-term business vision | No time or energy for strategy, lack of motivation |
| culture | Culture of involvement in (local) communities and support for local and national priorities<br>High standards of social and environmental care within the business and with employees<br>Knowledge of issues (e.g. eco-efficiency, waste management,agronomy, biodiversity) and<br>Their management, based on in-house expertise or strong relationships with external experts | No long-term business vision<br>Considers that responsibility to communities and national priorities is confined to paying taxes and obeying the law |
| products | High-quality products, trusted brands, high brand reputation<br>Value of differentiated products | Short-lived product lines or products, perhaps subject to rapid changes in fashion |
| pressure | High-quality products, trusted brands, high brand reputation<br>Customer requirements for supply chain management to deliver evironmental performance of suppliers | Media exposure has negligible effect on consumers or employees<br>No pressure for change from consumers |
| supply chain | Risk of media exposureowing to social or environmental performance on suppliers<br>Long-term relationships and interdependency with suppliers<br>Good understanding of own supply chains | Complicated, dynamic supply chains or multiple ingredients for manufactured foods<br>Buy entirely on cost rather than value<br>Does not value stable supplies or long-term relationships with suppliers |

*Figure 3.4.4.1. Factors affecting food business investment in more sustainable supply chains (source Smith 2007).*

3.4.4.2 Competitive Advantage

Another factor that could support investment of food business in more sustainable supply chains is the concept of competitive advantage. There exist several strategic imperatives that may yield competitive advantage such as customer focus, efficiency, quality and responsiveness. According to Zelbst et al (2012) the most recent one is environmental sustainability. In this context, competitive advantage deals with the

question of whether is it useful or even profitable for companies to invest in sustainable production and improve sustainability within the supply chain. If sustaining a supply chain would provide advantage over competitors this would sound as an appealing business case to all producers. However, competitive advantage of sustaining the supply chain is a matter of debate.

According to some businesses sustaining the supply chain may lead to environmental benefits *and* economic benefits (Nordic report, 2012). They use the argument that SSCM leads to increasing efficiency of the production process by diminishing energy or material use, for example reduction, recycling and use of reusable packaging systems, which limit these costs. Another argument in favor is that demand for transparency and sustainability of consumer increases the attractiveness of SSCM whenever this is communicated to the consumers. Creating consumer value from sustainable procurement can make good business sense while supporting the development of more sustainable food supply chains. Furthermore, scientists state that social and environmental performance in the supply chain could serve as quality attributes (Smith, 2007). This would mean that aside from sustainable products the consumer would also buy a high quality product. These higher-level standards are 'competitive' and used to create consumer value by supporting claims for superior products and brands, often in niche markets. Scientists emphasize that the best chances for competitive advantage at the supply chain level lie at the niche markets.

A business can also have a internal drive to sustain its supply chain through CSR while competitors catch up with legislation. This could serve as a imperative for long-term survival. Eventually producers who do not develop an internal business case will find themselves forced to commit to parts of the sustainability agenda by their customers, external campaigns or new governmental regulations. This internal drive is not necessarily positive. Companies may aim to avoid scandals caused by non-sustainability, highly polluting production processes or miserable labour quality.

There are also counter arguments. Mainstream businesses state that these "possible" advantages are insufficient to justify the higher supply chain costs and reduced flexibility inherent in a smaller, more-sustainable supply base (Smith, 2007). Some argue the benefits of sustainable supply chains are difficult to promote. The value of niche markets is very dependent on the relationship with the "green" or conscious consumers and it is believed this market in not yet optimal. Niche products do not always lead to a higher price, and when it does it is unclear whether this higher price makes up for all investments.

The competitive advantage of more sustainable supply chains, either in niche markets or to support more mainstream brands, is therefore a matter for debate and each company implements a different strategy. Possible advantages could be: *reduced costs because of increasing efficiency, long-term survival, creating consumer value* and *the value of niche markets*. However there seems to be no clear evidence in favor or against and this probably also depends on the branch and the country or market.

The lack of clear evidence of the link between supply chain sustainability and competitive advantage enhances the need of a interaction with public sector support for sustainable supply chains. Also research institutions could provide a deeper understanding of this link.

## 3.5 Conclusion

Sustainability is still highly debated. This research has chosen the "Russian doll" sustainability model, this means for the private sector that the economy is not *most* important but nevertheless important for companies to stay within the environmental limits and increase quality of life. This research perceives it is the public sector's role to develop mechanisms for what businesses cannot do alone. The private sector should have their own ideas to increase sustainability of their production process and products. If willing, the private sector could make a big difference in sustainability, even more when it includes sustainable supply chain management.

This global food regime complicates the management of food supply chains and their social and environmental sustainability. Multi-stakeholder initiatives involving governments, farmers, academics and NGO's as well as food businesses are necessary in sustaining supply chains. The competitive advantage

sustainable supply chain management may bring for food companies is a matter of debate. The lack of clear evidence of the link between supply chain sustainability and competitive advantage enhances the need of a interaction with public sector support for sustainable supply chains. Also research institutions could provide deeper understanding of competitive advantage.

Chapter 4 will reveal developments on the global and Chilean wine market, which will serve as a contextual overview for chapter 5 that will elaborate on sustainability and wine including its dependency on the sustainability of the supply chain and the suppliers.

# *Chapter 4: Global Wine Market and the Chilean Wine Sector*

## 4.1 Introduction

This chapter will provide an overview on the global wine market and discuss the developments this market is experiencing. The challenges and opportunities of this market will be discussed. Finally we will zoom in at the Chilean wine sector and evaluate how this player has gained an increasingly important role on the global market.

## 4.2 Global Wine Market

### *4.2.1 Global Wine Production*

Wine production plays a big role in the agricultural industry around the world. Research done by the International organization of Vine and Wine (OIV) shows that in 2014 the world surface area planted with vineyard was 7573 millions of hectares (OIV statistical report, 2015). These vineyards are able to produce a total of 736,7 millions of quintals (100kg). However in 2014 the OIV calculated an estimated 5% of grape loss. This means the total of produced grape available in 2014 was 699 millions of quintals.

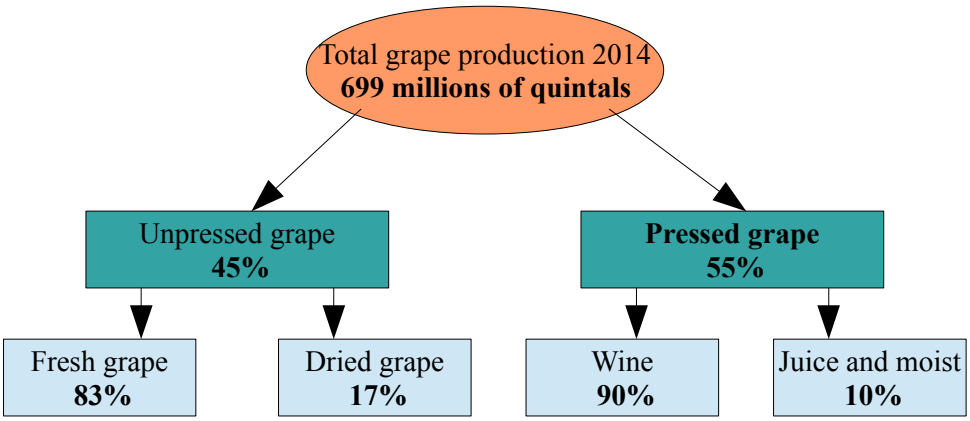



*Figure 4.2.1. Total grape production 2014*

Aside shown in figure 4.2.1, of this grape production, the total of unpressed grape was 45%. Of this unpressed grape the production destined for consumption of fresh grape reached 83%. The remaining 17% was used for production of dried grape. The other 55% of the grape production was used for the production of wine (90%) and of juice and moist (10%). While the global area under vine decreases, grape production has been increasing since 2000 with an annual growth rate of +1,1%. This is partly due to an increase in yields but also to the more favorable climate conditions as well as to a partial redistribution of the vineyard. In general, vineyard surface in European countries is decreasing or remains steady (OIV world market, 2015). In 2015, 5 countries represented almost 50% of global vineyards namely; Spain, China, France, Italy and Turkey. Not surprisingly is that 41% of total grape is produced in Europe. At the same time vineyards outside Europe appeared to grow slightly between 2013 and 2014, mainly in China and South America (OIV, world market 2015).

In 2014, 270 millions of hectoliters of wine was produced (OIV statistical report, 2015). The total wine production decreased in 2014 with 21 mhl (millions of hectoliters) compared to 2013, but is still a fairly high average. In 2014, France is by far the biggest wine producer, followed by Italy, Spain, USA and Argentina (OIV statistical report, 2015).

### *4.2.2 Global Wine Consumption*

Wine consumption was still marked by the effects of the economic and financial crisis of 2008, which has impeded the return to the growth of global consumption observed between 2000 and 2007. Wine consumption decreased in 2014 with 3 mhl compared to 2013, to reach 240 mhl. Compared with 2007 wine consumption of 252 mhl this is a low number. Besides lasting effects of the financial crisis, wine consumption is currently lower than wine production. This creates a challenging market for wine producers. The biggest wine consumer is USA followed by France, Italy, Germany, China. Traditional wine consumer countries recorded a reduction in their share in global market (France lost 4% and Italy 3% of their global market share). Growing consuming markets are USA and Asia (OIV world market, 2015).
World wine trade increased in 2014 with 2,5% in terms of volume, in terms of value it remained the same as 2013. The bottled export is still dominant in volume, despite the further growth in bulk exports (OIV world market, 2015).

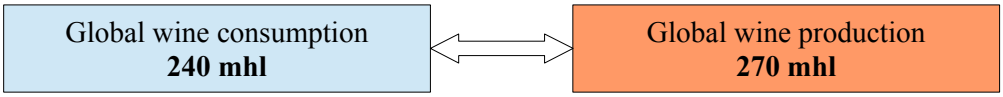



*Figure 4.2.2. Global wine consumption versus production, 2014*

### *4.2.3 Old and New Producers*

The international wine market is famous for its competitiveness, growing and changing continuously with a constant need for innovation of products and marketing strategies (Bisson et al, 2002). During the last two decades, producers have had to take into account a growing variety in wine producers operating from all over the world. Historically Europeans have dominated the wine sector. Because of this, Old World wine producers (those within Europe) relied on their centuries of tradition and were thus unprepared for the rapid invasion of their global markets from New World producers; South Africa, Australia, New Zealand, South America and North America (Flint, 2009 & Vergara, 2001). These last twenty years, the New World is increasing its wine production and has become a serious competitor on the export market. The current high level of competition has been driven by several factors including a growth in demand and changing regulations, which granted opportunities (Flint, 2009 & Vergara, 2001).

As discussed, since the crisis in 2008 the number and variety of global wine producers increased whereas global consumption of wine has decreased. Besides its decrease, consumer behavior has also changed. Wine consumers have become more educated and demand higher variety these days (Flint, 2009). This means preferences arise for several products. The countries and producers that can best adapt to these market changes will have most success. The relative cheaper wine from these New World countries do favor their market share (Flint, 2009).

## 4.3 Chilean Wine Sector

### *4.3.1 The Wine Industry in Chile*

Nearly one third of Chile's continental area is covered by agricultural area. The extensive climatic and soil diversity of the country enables a large variety of productive sectors, among which fruit-growing, timber and wood pulp production, dairy and meat livestock and viticulture stand out, among others (Conicyt, 2007). Chilean agriculture is also one of the most open to international trade of the world (Odepa,2015).

Chile belongs to the New World wine producers. For many years, Chilean wineries have conducted the country's to export expansion and have set the base for Chile's image as a provider of quality agricultural products, thus opening a path for the export of other Chilean agricultural products (Conicyt, 2007). Chile is currently the 5$^{th}$ biggest wine exporter on the world and ranked 9$^{th}$ on world's wine producers (OIV statistical report, 2015). Surprisingly twenty years ago Chile was very distant to this position and the scale of their wine production has changed drastically.

### *4.3.2 History and Development*

Chilean wineries did not all of a sudden start producing, instead it was a gradual transition. The arrival of the first Spanish conquerors lead to the construction of vineyards in the regions that were seen as a paradise with ideal grape growing conditions. The Chilean soil was free of phylloxera[1] and the climate granted an ideal growing season and ripening of the fruit (Wines of Chile, 2015).

Later in the seventies, when the Neoliberal Development model was implemented, the economy of Chile opened itself to global trade, and consequently the law limiting vitivinicultural development was dismantled. In 1974, the traditional wine activity changed remarkably: cultivation surfaces were amplified, new vinification technologies were introduced and foreign capital was incorporated, which increased immensely during the second half of the nineties under leadership of Miguel Torres (Muñoz, 2007). This famous Spanish wine maker arrived in Chile and started making wines in the Curicó Region. With his arrival, a new cycle of wine making began in Chile. He demonstrated new technologies to the wineries, such as stainless steel tanks and French oak barrels (Muñoz, 2007). Till that time the equipment and the wineries of Chilean vineyards were very ancient. Torres' example was rapidly taken over by Chilean wineries and consequently new vineyards were planted (Wines of Chile, 2015).

Aside from these important productive transformations, the systems for water resource use also improved and grapes of major interest to international commercial trade were cultivated (Muñoz, 2005). A Chilean wine expert explains that education on wine making also increased when rich wine makers traveled to European or North American countries to gain experience. Consequently, they imported many French rootstocks to plant in Chile (Wines of Chile, 2015).

At the beginning of the 80's however, the Chilean wine sector suffered from a serious crisis. This sectoral downfall can be explained by the explosive production increase of previous years, a progressive reduction of domestic consumption, and the general economic crisis of 1982 (Vergara, 2001). Other elements that made the crisis even worse were the elimination of the support programs for the small producers of the governmental agency Corfo (La Corporación de Fomento de la Producción) and the decision of the government to liberate prices. Still, the crisis together with the new regulatory frame stimulated a radical change in the behavior of the wineries. Production at the time was focused mainly on the national market and exportations barely reached 9 million dollars (Vergara, 2001). The big restructuring implied that many small and medium vineyards disappeared together with several cooperatives. The big national companies understood they had to sell their wines on the international market. The new strategy meant high quality wine had to be produced that was attractive for the European and American consumers. Modifying the product also meant changing the production process including vinification, elaboration and the packaging for which the discussed modernization and investments were needed (Vergara, 2001 & Muñoz, 2005).

Nowadays, the most influential and largest Chilean wine companies are gigantic vineyards such as Viña Concha y Toro (the big leader on the Chilean wine market), Viña San Pedro and Viña Santa Rita. During the wine sector's transition, they took over many small and medium vineyards. Considering that these vineyards usually continue to produce their own brands this has led to a complex network. Different from neighboring country Bolivia where agriculture is dominated by small scale farming, Chile has become a grape and wine producer of large scale with a demanding wine industry.

1 A pest that destroyed European vineyards in the nineteenth century.

| Year | Surface of vines for wine making (hectares) | Total of wine for consumption (thousands of liters) |
|---|---|---|
| 1995 | 54.393 | 316.737 |
| 1996 | 56.004 | 382.369 |
| 1997 | 63.550 | 430.758 |
| 1998 | 75.388 | 526.550 |
| 1999 | 85.357 | 428.015 |
| 2000 | 103.876 | 641.937 |
| 2001 | 106.971 | 545.179 |
| 2002 | 108.569 | 562.323 |
| 2003 | 110.097 | 668.222 |
| 2004 | 112.056 | 630.074 |
| 2005 | 114.448 | 789.441 |
| 2006 | 116.796 | 844.878 |
| 2007 | 117.559 | 872.746 |
| 2008 | 104.717 | 868.297 |
| 2009 | 111.525 | 1.009.292 |
| 2010 | 116.831 | 884.413 |
| 2011 | 125.946 | 1.046.381 |
| 2012 | 128.638 | 1.255.371 |
| 2013 | 130.362 | 1.282.095 |

*Table 4.3.2a. Vineyard surface and wine production in Chile (SAG & Odepa, 2013)*

| Region | Vinification property |
|---|---|
| De Atacama | 11 |
| De Coquimbo | 195 |
| De Valparaiso | 247 |
| Del L.G.B O'Higgins | 1.779 |
| Del Maule | 3.676 |
| Del Bio Bio | 3.619 |
| De La Araucania | 4 |
| De Los Lagos | 4 |
| Metropolitana de Santiago | 465 |
| Total | 10.000 |

*Table 4.3.2b. Chilean grape growing regions (SAG & Odepa, 2013)*

### *4.3.3 Production Scale*

Since the restructuring of the wine sector in Chile, the sector has widely expanded. The surface of vineyards for wine making purposes has doubled between 1996 and 2000 to a 100.000 hectares. As shown in table 4.3.2a, these plantations have been expanding each year, only in 2008 the surface decreased with 11%, possibly due to the global crisis. In 2013 the surface of vineyards for wine making purposes reached a 130.363 hectares. The total surface in 2012 was 128.638 hectares which means an increase of 3.5% (SAG & Odepa, 2013).

These plantations are localized between the regions of Atacama in the north and Los Lagos in the south, including the Metropolitan region of Santiago. The division of the 10.000 properties that make up for the total of planted vineyards amongst the nine grape growing regions is shown in table 4.3.2b.

Of all planted vineyards for wine making purposes 74,1% are red varieties and 25,9% are white varieties, represented mainly by the grapes Cabernet Sauvignon, Merlot, Carmeneré y Sauvignon Blanc and Chardonnay (SAG & Odepa, 2013). Remarkable is that grape variety Carmenere has grown from zero in 1990 to over 10.000 hectares in 2013. Carmenere is Chile's own signature grape, this red varietal disappeared from European vineyards in the mid-19th century and was rediscovered on Chile's Merlot vines a hundred years later (Wines of Chile, 2015). The twelve most planted varieties in Chile are indicated in figure 4.3.4.

Chile's total grape production in 2013 was 33.616 thousands of quintals, of which grapes for wine making purposes are the big majority. The forecast of 2014 was a lower production of 27.907 thousands of quintals. This decrease can be explained by the fact 2013 production was optimal (OIV statistical report, 2015).

Wine production in 2013 was also a record production, of 12,8 mhl, an shown in table 4.3.2a. The estimated wine production of 2014 is also lower than 2013, namely 10,5 mhl meaning a decrease of 18% (OIV statistical report, 2015). Despite this decrease Chile will still be ranked 9th on the worlds list of wine producers (OIV statistical report, 2015).

### *4.3.4 Consumption*

Chile's domestic wine consumption experienced no significant developments between 2013-2014. The average per capita has increased slowly from 13 liters in 1994 to a little over 17 liters in 2013. Beer consumption has increased 65 percent over the last 10 years, surpassing 40 liters per capita. Chile has the lowest per capita wine consumption of all major wine producing and exporting countries. Chile's per capita wine consumption compares to 55 liters consumed in France and 40 liters in Argentina (USDA Fas, 2014).

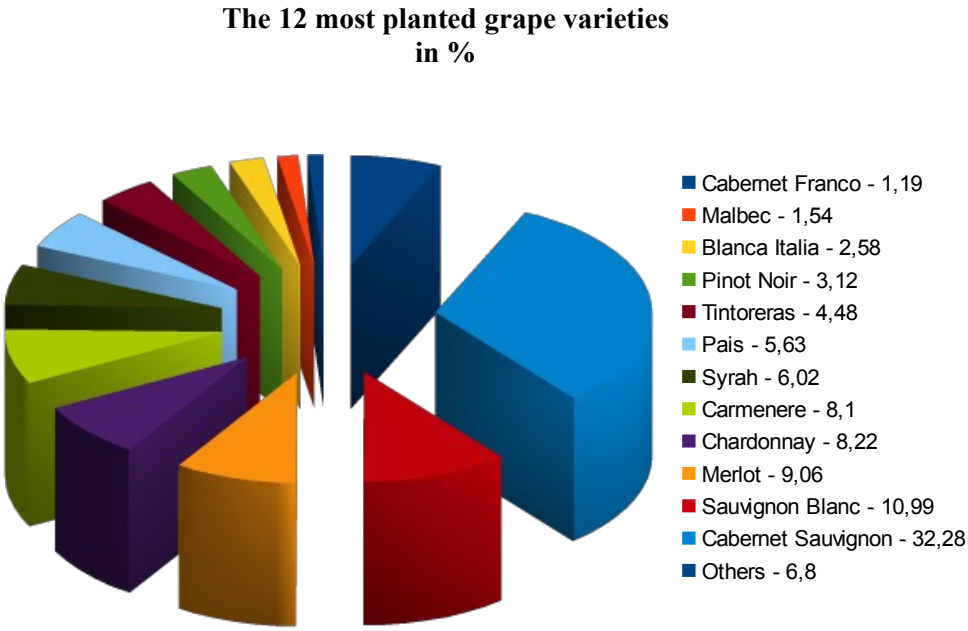



*Figure 4.3.4. The twelve most planted grape varieties in Chile (Sag, 2013)*

### *4.3.5 Export*

In the year 2002, the organization Wines of Chile was founded in order to strengthen the image of Chile and stimulate the sale of fine wines overseas. The association now reunites 95 percent of the industry and currently, there are more than 70 Chilean wineries exporting. Over 60% of Chile's total annual production is exported, supplying more than 150 countries (USDA, FAS 2014).

The wine market seems favorable for Chile. Chilean wine exports increased mainly in volume and fell slightly in value during 2013 when compared to the previous year. Higher prices were acquired only for sparkling wine in 2013. The export volume of bulk wine increased with 40% in 2013, which made the value of bulk wine increase 17% in 2013. Constant improvements in quality and a good price/quality relationship have helped to maintain or enhance exports levels. Chile traditionally exports both bottled and bulk wine. A large number of wineries are making a big effort to increase premium-bottled wine exports (USDA, FAS 2014 & Odepa, 2015).

The United States is currently Chile's number one wine export market, the UK takes second place. Exports of bottled wine to Spain increased 85 percent in 2013 which made Spain the third largest wine export market in volume. Other important markets include Germany, Denmark, Canada, and Holland (USDA, FAS 2014). The Chilean wine industry increases its focus on the Asian markets (USDA, FAS 2014).

In 2014 export in volume of Chile decreased with 9.0% however decline in Value is less. This is probably due to the low of grape and wine production in 2014 as discussed (OIV world market, 2015). In 2014 Chile

was still one of the 5 largest exporters of wine, making up 8% of total exports with 8 millions of hectoliters of wine. Chile is the largest wine exporter from the New World countries (OIV statistical report, 2015).

### *4.3.6 Policy*

Wine production and exports are regulated and certified by the Agriculture and Livestock Service (SAG) of the Ministry of Agriculture. SAG administers the export certificates that indicate the wine's origin and quality. The government provides no direct subsidies to support wine production or subsidize exports (USDA, FAS 2014). Chile does have a successful marketing campaign called "taste of Chile" that encompasses wine. "Wines of Chile" which is co funded by both of the wine producers associations, Vinos de Chile and Chilevid, is the main Chilean wine promoter. The government contributes 15% of the total amount, through its export promotion agency called ProChile (ProChile, 2015). Wines of Chile used most of its budget for promotional activities in Canada, England, Germany and the United States. The marketing builds on the natural beauty of Chile and the quality of the products. Another promotional program is the annual "Wine Show and Tasting" which consists of seminars and wine tasting. ProChile contributes with logistics and market information and the wineries pay the costs. With this strategy the Chilean wine industry is promoting wines in markets like Russia, Netherlands, Denmark, Sweden, Czech Republic, Brazil, Mexico, Venezuela, Taiwan and Hong Kong (USDA, FAS 2014 & ProChile, 2015).

## 4.4 Conclusion

Possibly due to the lasting effects of the financial crisis, wine consumption is currently lower than wine production. This creates a challenging market for wine producers. Moreover, during the last two decades producers have had to take into account a growing variety in wine producers operating from all over the world. The New World is increasing its wine production and has become a serious competitor on the export market.

Besides a decrease in wine consumption, consumer behavior has also changed. Wine consumers have become more educated and demand higher variety these days. In this competitive environment, the relative cheaper wines from these New World countries do favor their market share.

Chile, a new world producer, is currently the 5$^{th}$ biggest wine exporter on the world and ranked 9$^{th}$ on world's wine producers. Chile has a low domestic market for wine and its producers are therefore almost entirely focused on exportation. Constant improvements in quality and a good price/quality relationship have helped to maintain or enhance exports levels. Chile has become a grape and wine producer of large scale with a demanding wine industry, and is still growing.
In the next chapter, the sustainability of wine production in general and of Chilean wine will be discussed.

# *Chapter 5: Sustainability and Wine*

## 5.1 Introduction

Sustainability has become a very important topic for the competitiveness and innovation of wineries. First of all we have to understand what are the fundamental sustainability issues of grape and wine production. Then, how and why wineries include sustainability in their business strategy will be discussed. Moreover, sustainability inclusion of Chilean wineries and their national sustainability certification will be reviewed.

## 5.2 Sustainability and Wine

### *5.2.1 The Life Cycle of Wine*

Most research to sustainability issues in wine production is done by Life Cycle Assessments (LCA). A LCA is a method that analyses environmental sustainability of a product including the whole life cycle, from cradle-to-grave, to recognize and avoid possible trade-offs. A LCA is also a functional unit for comparative studies (Kloepffer, 2008). A LCA includes production, manufacturing, distribution, retail and waste management processes. The particular life cycle of wine, divided into an agricultural and industrial phase is shown in figure 1. A Hot Spot is an area of the product life cycle that has significant potential impact on a given environmental aspect and is identified and generally agreed upon by experts. The idea behind identifying hot spots is to understand where it is most necessary to implement improvements. It only provides relative context within the product life cycle and does not imply a comparison to other products (Kloepffer, 2008).

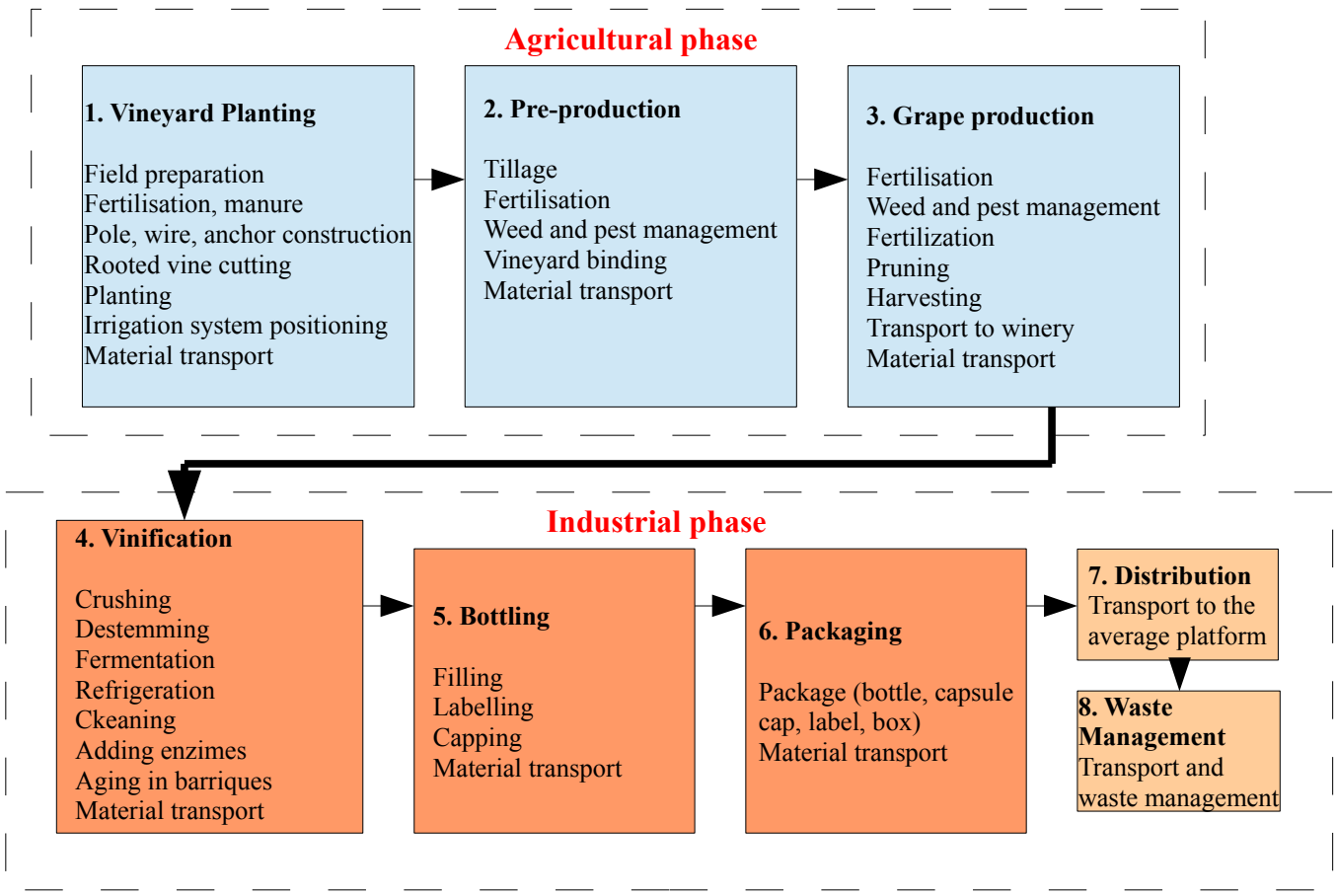



*Figure 5.2.1. Life Cycle of Wine*

This research has examined the most critical sustainability issues or hot spots through studies of sustainability research organizations. Research institute Fundación Chile has been approached who together with the Australian Edge Environment realized a study to critical sustainability issues in the environmental life cycle of wine. Through this study both organizations have developed a Sustainability Measurement and Reporting Standard (SMRS) report in 2011, indicating the main sustainability issues in the life cycle of wine. The report was developed as part a Product Sustainability Assessment program for Walmart Chile and its data is derived from life cycle inventories, databases and other scientific studies (Fundación Chile et al, 2011). Since a LCA indicates environmental sustainability, this study does not include social sustainability.

Research conducted by The Sustainability Consortium (TSC), a global organization with a great diversity of stakeholders dedicated to improving the sustainability of consumer products, has also been revised (TSC, 2015). Their research addresses sustainability issues throughout a wine's supply chain and life cycle.

The results of both studies solely concern conventional wine.

### *5.2.2 Study one: Fundación Chile-Edge Environment*

The results of the Sustainability Measurement and Reporting Standard (SMRS) report for wine of the organizations Fundación Chile and Edge Environment indicate that there are a few key processes and life-cycle stages that are the dominant contributors to greenhouse gas (GHG) emissions, energy demand and water consumption during the wine life-cycle.

*GHG Emissions*
The main impacts in terms of GHG emissions typically occur in the viticultural stage (41-52%), primarily from use of fertilizers and mechanical irrigation. The report addresses that the type of fertilizers/pesticides/herbicides is not only important for on side emissions through application, also pesticide and herbicide production are a key indicator for GHG emissions in the wine life cycle. The second most GHG-emitting life-cycle stage is packaging production contributing 27-31% of GHG emissions. Production of glass bottles constitute 95% of the GHG impacts at the packaging stage. Impacts on energy use from labels, corks and transport of packaging material to the wine-bottling site are small

*Energy Demand*
The main impacts in terms of non-renewable energy consumption occur in the viticultural stage (33-47%), primarily from production of fertilizers/pesticides/herbicides and mechanical irrigation (dependent on the type of irrigation system, energy source and efficiency of the pumps).

The report addresses that of non-renewable energy consumption in this agricultural stage of the wine life-cycle:

- production of fertilizers/pesticides/herbicides covers 56-83%,
- mechanical irrigation covers between 7-38%, and
- transport of fertilizer and staff contributes around 10% or less.

The second most energy-consuming life-cycle stage is packaging production (29-34% ). Production of glass bottles makes up over 95% of the energy consumed in the packaging stage. Impacts on energy use from labels, corks an transport of packaging material to the wine-bottling site are small.

*Water Consumption*
The amount of water used for mechanical irrigation appears to be the only relevant water consumption issue over the life-cycle of wine. Relative small amounts of water are used unless for irrigation.

In summary, according to this report the largest opportunities for sustainable wine production include:
*1. type and application of fertilizer(s) and pesticides/herbicides in grape cultivation*
*2. water and energy efficiency providing irrigation in grape cultivation*
*3. type (e.g. glass, cardboard box with aluminum bag, PET) and production (e.g. source of energy, recycled content etc) of packaging material.*

### *5.2.3 Study two: the Sustainability Consortium*

Research of The Sustainability Consortium identified the following eight issues, in random sequence, as most important sustainability issues in wine production (TSC, 2015). For each point is indicated if it is production (vineyard and winery) or supply related.

*1. Fertilizer and Nutrients (production)*
Improper management and use of fertilizers can lead to local water pollution and release greenhouse gases during production.

*2. Land and Soil (production)*
Improper soil management can remove nutrients, release greenhouse gases, and cause soil loss, while clearing land for agriculture can lead to deforestation.

*3. Pesticides (production)*
Improper use of pesticides can impact workers and nearby ecosystems and communities

*4. Grape Supply (supply)*
Lack of transparency of grape suppliers can lead to unwanted negative environmental and social impacts.

*5. Climate and Energy (supply and production)*
Farming and final product manufacturing require significant amounts of energy. The burning of fossil fuels to produce this energy, as well as the production and use of fertilizers, result in greenhouse gas emissions.

*6. Packaging (supply)*
Under-packaging and over-packaging can both lead to increased environmental impacts, by material use and energy resources.

*7. Water (supply and production)*
Farming and final product manufacturing can use a significant amount of water and contribute to freshwater depletion, which is problematic in water-stressed regions.

*8. Workers ( grape supply and production)*
Farm workers, especially women and migrants, may face unfair pay, discrimination, and limited freedoms. They may also be exposed to chemicals, dust, or other hazards.

Seven out of eight points are linked to the proper winery's production process in the vineyard and wine making process. Five out of eight points are linked to suppliers production and products. Point 8 is the only one in this study including social sustainability. It is possible that in this point the researchers only aimed for the workers on the farm of the wine company, however the grape suppliers of this company would need the same labour. For enhanced sustainability this point should therefore be expanded to the grape suppliers.

### *5.2.4 Main Sustainability Issues Wine*

Both analyzed studies include critical points of: production and application of agrochemicals, type and production of packaging material, and water and energy efficiency of irrigation on the vineyard. Study two demonstrates more critical points in both production and supply.

In summary main sustainability issues in the grape production are: environmental negative impacts of application of fertilizers/pesticides/herbicides, improper soil management, water and energy consumption for mechanical irrigation practices, situation for employees. These issues are believed to be equally important for grape suppliers.

In summary main sustainability issues in the supply chain are: GHG emissions and energy demand due to production of fertilizers/pesticides/herbicides, GHG emissions and energy demand due to production of wine

packaging. Remarkable is the energy consumption of glass bottle production. Energy consumption of packaging and production of fertilizers/pesticides/herbicides, which is related to the supply chain, are worst for sustainability of entire life cycle. Water management may also need to be included.

Water and energy consumption in the vinification process results not to be a hot spot for wine sustainability in these studies, nor is waste management or distribution.

Study two includes one critical social sustainability issue. Other studies and literature that have been revised mainly include environmental hot spots of wine production. This would either mean there are no social sustainability hot spots or simply less research has been done on the theme. Therefore this research has conducted exploratory interviews with wine experts to identify critical social sustainability issues in wine production. These interviews indicated critical social issues to be: 1. the condition of workers on the farm and the winery, especially the temporary workers, and 2. the condition of the (small-scale) grape suppliers. Social sustainability can also be expanded to the workers of wine suppliers.

As this analysis shows, the main sustainability issues deal both with the grape and wine production process and the supply chain. We could state that both are equally important to revise when evaluating a wine's sustainability.

## 5.3 Sustainability in the Global Wine Sector

### *5.3.1 Responsible Wine Production*

Sustainability issues in agriculture in general have received a lot of media and public attention. The wine industry has been ´the target of complaints from local communities due to its use of pesticides and herbicides, fertilizers, scarce water resources, and packaging materials´ (Pullman et al, 2010). In this context, similar to other agricultural sectors, sustainability practices are gaining importance both on the wine consumption and production side.

There seems to be no doubt about the sustainability engagement of the wine industry (Santini, 2013). The OIV points out in its five year strategic plan for 2015-2019 that “the sector needs to respond to the environmental, climate, social and technological challenges such as: sustainable production and climate change” (OIV, 2014). Also the FIVS, the worldwide organization promoting the alcohol and beverage industry, has provided the wine industry of a framework called the Global Wine Producers Environmental Sustainability Principles (GWPESP) to promote 'a coordinated, efficient and results-driven approach for the international wine industry’s environmental sustainability efforts'. The framework offers strategies to guide those in the industry in integrating sustainability principles. 'The GWPESP initiative recognizes that the wine industry is entirely dependent on natural resources, solar energy, suitable climate, clean water, healthy soils, and must successfully integrate these elements in an ecologically sound manner. The protection and the enhancement of these natural assets through sustainable practices are an imperative' (FIVS, 2015). These initiatives show that the wine sector feels or should feel a certain responsibility to produce more sustainable.

### *5.3.2 Sustainability Certifications*

Another indication of the wine industry addressing this responsibility is found in the rise of sustainability certifications internationally. In various countries the wine industry is collaborating in national programs aimed to enhance sustainable growth amongst all vineyards. Examples of these programs are the *Sustainable Australia Winegrowing Program,* the *Sustainable Winegrowing New Zealand,* the *Integrated Wine Production of South Africa* and the *Californian Sustainable Winegrowing Alliance* of the United States. The vineyards within these programs earn a certification or stamp after evaluation on sustainability standards.

In these certifications or codes many of the discussed environmental sustainability hot spots of wine are included; soil management, efficient application of agrochemicals, efficient use of water and energy in production process and more. A important new aspect in wine sustainability is the Carbon Footprint analysis (Olmos, 2008). Product Carbon Footprints are a subset of LCA that focus only on the climate change or the

global warming potential impact category. A product carbon footprint, reported in CO2-equivalents, is a measure of greenhouse gas (GHG) emissions (carbon dioxide, methane, nitrous oxide, fluorinated gases) over a product's life cycle (CSWA, 2013).Wineries are pressured internationally by manufacturers and retailers to reduce carbon hot spots (Olmos, 2008). Because of the increasing importance of carbon footprints for wineries, practices such as vineyard and winery electricity efficiency but also light glass bottles and distribution of packaged wine are increasingly evaluated by wineries.

So far, sustainability seems to merely focus on environmental practices. Increasingly though, both wine producers and consumers are looking beyond environmental practices to a broader concept of overall sustainability (Pullman et al, 2010). Social sustainability is also included in the sustainability certifications. Social and environmental practices can also interact; a concern for employee welfare is linked to the reduction of toxic spray applications and other potentially damaging environmental practices. Aside from employee related issues (workplace opportunity, human resource policies, quality of life, governance, and democratic processes) some certifications include community engagement to some extent.

### *5.3.3 Sustainability Drivers*

This rising fascination for wine sustainability is furthermore affirmed by the expansion of academic literature, new academic journals and scientific communities. In addition, the wine sector has displayed an preoccupation in sustainability in general; people in the wine industry question the performance of sustainable practices and explore possible advantages of sustainability (Santini, 2013).

Wineries explore the advantages, that might arise from sustainability, in terms of marketing, corporate image positive feedbacks or cost savings (Santini, 2013). Interesting and promising is that within the process towards sustainability, wineries have found improvement opportunities in their internal processes. They are for example experiencing cost savings through more efficient energy or water use (Olmos, 2008). One important outcome in a qualitative research performed by Pullman, Maloni and Dillard, is that wine quality is believed by wine producers to be enhanced through environmental sustainability practices, which could stimulate premium pricing (Pullman et al, 2010). Other wineries are mainly driven by their sustainability philosophy and ethical motives inspiring top management and entrepreneurs.

There are also drivers that take place in the firm's external environment. It appears there is an important role played by industry associations in creating "sustainable awareness" among grape growers and wineries. Also a great willingness of institutions and organizations is perceived in providing long term financial support to sustainability programs and training activities (Abraham et al, 2014). Other wineries may wish to avoid regulatory fines and market pressures. Consumers' involvement in sustainability could also reshape wineries' interest toward this issue (Hudgey, 2005 & Flint, 2009).

Led by the government, the New Zealand wine industry aims to be the first in the world to be 100% sustainable (Flint, 2009). In New Zealand it is currently hard to sell wine when a vineyard does not possess a sustainability certification (Abraham et al, 2014). The country is globally known for its rich ecological heritage and was one of the first countries to address the interdependence between economic and environmental systems as well as establish voluntary sustainability initiatives within businesses. The argument is that it is more robust in the longer term to rely on market pressures for implementation rather than mandates through regulations (Flint, 2009). This logic appears to be working within the wine industry in New Zealand as many producers are implementing environmental management systems (EMS) as a means of differentiation, such as ISO 14001 certifications. Firms in the wine supply chain believe these EMS serve as a marketing tool and are becoming more important in order to compete in the industry. Some even believed that their EMS, and inherently sustainability practices, enabled product differentiation and their business experienced a competitive edge (Hudgey, 2005 & Flint, 2009).

According to this analysis, drivers for sustaining wine production can be summarized by: ethical considerations, differentiation, improved quality and efficiency, consumer and institutional involvement,and corporate image. Through these drivers, environmental concerns have progressively found a diffusion among wineries and have become strongly related to corporate image. Nowadays, both in Old and New World

countries, a winery that does not have any information on sustainability indicators is generally perceived as irresponsible (Abraham et al, 2014).

### *5.3.4 Sustainability or Green Marketing?*

As discussed, the "sustainability" concept can be understood in many ways and there is no indisputable sustainable behaviour. When it comes to sustainability, wine companies can choose among various alternatives: it is not only a matter of being green or not, but they can also choose among a multitude of "shades of green". Some wineries tend to heavily highlight the few sustainable practices introduced, simply because it is good for business. The question rises if sustainability in wineries may be too much related to corporate image.

Surprisingly all sustainability certifications belong to New World countries. A reason for this may be because the more traditional Old World wineries pay less attention to sustainability. It seems as if sustainability has become a important business strategy for the more modern and new wineries who need a attractive corporate image.

Moreover, the importance of corporate image could be confirmed by the fact social sustainability overall appears to receive less attention in wine sustainability strategy or research. It seems social sustainability is more difficult to sell and has less drivers that pressure wineries. Furthermore sustainability mainly considers environmental sustainability in the production process of grape and wine. The entire life cycle or supply chain is not or less taken into account, only to a certain extent in the carbon footprint analysis.

## 5.4 Sustainable Wine Chile

### *5.4.1 Sustainable Wine Chile*

In Chile, the wine industry is one of the most advanced in sustainability policy. Representatives of governmental institutions Odepa (La Oficina de Estudios y Políticas Agrarias), FIA (Fundación para la Innovación Agraria) and Corfo (La Corporación de Fomento de la Producción) explain that the wine industry needs least support with the implementation of sustainability practices and it is the only sector that has a certification regulating sustainability. This code is called the Codigo Nacional de Sustentabilidad (National Sustainability Code, CNS). Sustainability in the Chilean wine sector is characterized by this code . The CNS is sponsored and developed by Wines of Chile, the private organization representing the Chilean wine industry. The CNS is a voluntary instrument orientated to incorporate sustainable practices in wineries based on three complementary areas: green (vineyard), red (process) and orange (social). In figure 5.4.2, the different themes within the three areas are demonstrated. The code consists of a series of points that wineries have to attain. There are obligatory points for obtaining the certification and other points that receive a approbation percentage. The CNS is applicable to all sorts of wine companies, regardless the production scale (Sustentavid, 2015).

The objective of the CNS is to guide the Chilean wine sector towards a sustainable wine production based on a high social, environmental and quality standard. The certification is a transparent and independent process realized by certification companies. What is finally certified is the sustainable management of the company, not the end product. When the winery achieves a sufficient score the winery obtains the right to use the stamp *Certified Sustainable Wine of Chile.* The requirements of the CNS increase each year, as well as the score a winery has to obtain to renew its certification (Sustentavid, 2015). In 2015 a basic economic dimension is taken in for the first time. According to a representative of Wines of Chile, the comprehension of sustainability varies a lot within the vitivinicultural sector. She argues it is essential to educate vineyards on a comprehensive definition of sustainability and to head into one direction. She adds that 'the social part is most difficult, because often sustainability is only related with

environmental changes and vineyards need more conviction from us in the social part. Especially for the smaller vineyards it is hard to include, it is even more difficult to convince them because of the inherent costs'.

### *5.4.2 CNS, Sustainable Production?*

Government institutions such as Odepa and Corfo applaud the initiative. A representative of Wines of Chile explains that Corfo is financing the CNS a 50%. The CNS seems to be a success. In 2015, 52 vineyards obtained the certification of the CNS. Also the CNS increasingly earns acknowledgment internationally. However, opinions are divided on this certification.

The CNS is regarded by most vineyards and public institutions as positive given that the certification unites Chilean vineyards towards a sustainability goal and raises awareness amongst vineyards on sustainability. As a consequence the CNS increases sustainability in the Chilean wine sector. Furthermore the certification includes both environmental and social sustainability, and increasingly the management of grape suppliers.

The CNS is regarded as negative because the certification wouldn't be build on good foundations and isn't sufficiently critical. A representative of Agroecologia, an organization that grants companies technical assistance on organic projects, argues that it is a bad copy of the Californian wine sustainability code. He states *'the code is only selling an image. They may represent sustainability but sustainability can be anything. It is more of a green bath.'*

It is believed the CNS has been developed mainly for reasons considering exportation of Chilean wine which would increase through constructing a sustainable or green image of Chilean vineyards. It furthermore appears that the direction of the CNS doesn't exist of sustainability experts (Estándar de Cumplimiento, 2014).

The main critique is that when developing an evaluation this cannot exist of a simple checklist without any participation of the producer. This is necessary because the context of each vineyard is very different in factors such as price, climate, and technical development. The CNS lacks regional and sociocultural context. A representative of viña Santa Rita, agrees that the code does not always apply very well on Chile's reality.

This certification, as well as other international certifications, mainly addresses environmental sustainability of the vineyard and winery production process. While the marketing manager of viña Caliterra argues that even though small changes are made, the biggest deficit of sustainability lies in labour conditions of Chilean vineyards. Moreover, the CNS does not include suppliers into sustainability, except for a small percentage of grape suppliers. A sustainability representative of viña Concha y Toro adds, *'the requirements for grape suppliers in the code are mainly environmentally focused, not so much socially.'*

Besides the importance of social sustainability of the company and its grape suppliers, the CNS should include requirements on other suppliers. The representative of Wines of Chile communicates that the direction is currently looking at inclusion of suppliers in sustainability. She adds that no other wine certification in the world includes its suppliers, so there is no comparison possible which makes it harder to design such requirements. She explains that mainly for smaller vineyards it is a lot to ask to include sustainability management of suppliers in the code.

Nevertheless it appears that when it comes to sustainability, the majority of Chilean vineyards follows the requirements of the code. Some vineyards do engage with more demanding practices. A representative of Fair Trade states that only two or three vineyards are certified with Fair Trade. There are various organic and some biodynamic producing vineyards, such as Cono Sur or Lapostolle. Certain vineyards, such as Emiliana, purchase supplies with some sustainability requirements such as FSC certified corks (sustainability report Emiliana, 2014). It seems no vineyard requires sustainability of their suppliers, except for Concha y Toro who is demanding CSR practices of several suppliers (sustainability report Concha y Toro, 2014).

| Orange Area | Green Area | Red Area |
|---|---|---|
| *Social. Applies to the company, including their land, offices and facilities* | *Vineyard. Includes their own fields and long-term suppliers* | *Process. Considers the winery, bottling plant and other facilities related with wine production* |
|  |  |  |
| Ethics<br>Environment<br>Labor Quality<br>Community<br>Marketing y Consumer Compromise | Erosion, Soil and Nutrition Management<br>Weed Management,<br>Plagues and Disease Management and agrochemicals application<br>Energy and Fuel use<br>Water Source protection<br>Weight and Strength Management<br>Biodiversity<br>Pre Plantation Management | Energy savings<br>Water Management<br>Prevention of contamination<br>Waste Reduction and Recycling<br>Winery location |

*Figure 5.4.2. Standards Codigo Nacional de Sustentabilidad. (Estándar de Cumplimiento, version 2014)*

So far this demand is limited to ethical policy or carbon footprint measurements. A representative of Fundación Chile explains that recently several vineyards started to lighten their bottles, such as Santa Rita (sustainability report Santa Rita, 2014).

## 5.5 Conclusion

Globally there appears to exist a general recognition of the intrinsic benefits of sustainable wine production. Increasingly sustainability practices are implemented on the vineyard, community and winery. Even though it is still not certain how sustainability improves corporate performance, many wineries seem to increasingly believe that sustainability engagement works beneficial for their sales. However it appears that most vineyards use sustainability increasingly for marketing purposes. This may stand in the way of real effective sustainability management. Also it may lead to the fact that the sustainability practices/issues that work best for marketing are included in the wineries sustainability management and more difficult or less attractive issues are not.

The Chilean wine sector represented by its national sustainability certification should raise the sustainability baselines. Grape and wine producing regions in Chile are very diverse, the code should not be generalized and merely include the bigger vineyards. The code should pay extra attention to social sustainability and include supply and suppliers sustainability.

Sustainability research on wine is dominated by life cycle analysis. Little research has been done on the sustainability of the supplies needed for wine and its suppliers. This is remarkable given the fact the supply part has a big impact on sustainability of wine, as could be seen in the main sustainability issues. The main critical sustainability issues; linked to GHG emissions, energy and water use, concern both the grape and wine production process and the supplies needed for wine.

Little is known on how to improve these supply related issues and wineries put little sustainability focus on their supply chain. This research will be one of the first to realize a sustainability evaluation of a wine supply chain. For time's sake, transport, distribution, manufacturing or consumer side of wine production have not been included. Such an evaluation is interesting because sustainable supply chain management could have great impact on the total wine sustainability.

First, in chapter 6 we will explore Caliterra's sustainability on grape and wine production in order to get to know the company and their choices on sustainability. Then in chapter 7 we will zoom in on Caliterra's supply chain.

# *Chapter 6. Case study: Vineyard Caliterra*

## 6.1 Introduction

In this chapter viña Caliterra is introduced. The characteristics of the vineyard are demonstrated and the sustainability practices related to the grape and wine production of Caliterra are discussed. This will provide a good impression of the choices the management of Caliterra makes which will serve as a preparation for the suppliers evaluation in the following chapter. Caliterra's sustainability performance is evaluated more in detail, through a framework of environmental and social indicators, in appendix III.

## 6.2 Identity Caliterra

### *6.2.1 Identity Caliterra*

Viña Caliterra's name is the result of a fusion of the words “quality” (calidad) and “land” (tierra). Caliterra was established as a vineyard in 1996, part of a project between the north American wine expert Robert Mondavi and Viña Errazuriz. The idea was to elaborate high quality wines under a environmental friendly production, preserving natural resources for future generations. Today the vineyard is part of the Errazuriz group, a traditional winery founded in 1870.

Besides the Errazuriz vineyards the group now includes the three vineyards Caliterra, Seña and Arboleda (also named Las Vertientes). The winery is dedicated to the production, commercialization and exportation of fine wines. In 2010 Errazuriz had a surface of 1.284 hectares divided in seventeen properties.

#### *6.2.1.1 Valle Colchagua*

Chile has a privileged geography for the growing of vines. However it seems no region has been distinguished as a producer of world-class wines as the Colchagua Valley, located 180 km south of Santiago the VI O’Higgins Region. The valley is characterized by its geography, its great diversity of soils (clay, sand, decomposed granite) and Mediterranean climate (592 mm of rain per year), where cool nights and gentle breezes from the coast of Pacific and the Andes, make this region an ideal location for the production of high quality red varieties. The wine region has earned much appreciation for its full-bodied premium quality red varieties Cabernet, Carménère, Syrah, and Malbec, and its wines regularly appear high on the world’s lists of leading wines. The majority of the wineries are concentrated in the center of the valley, although new plantations climb hillsides and explore the western frontier toward the sea. The valley was named “World’s Best Wine Region 2005” by Wine Enthusiast (Wines of Chile, website).

The founders of Caliterra encountered potential in the Colchagua Valley, where Viña Caliterra is located on 200 km south of Santiago and 60 km from the coast at 150 meters above sea level. They constructed the vineyard in a isolated sub valley protected and privileged by its nature. The vineyards were first planted in 1997, with 210 ha (518.5 acres) of Merlot, Carmenere, Cabernet Sauvignon and Syrah and smaller lots of Malbec. Today the vineyard embarks 1.085 hectares, of which 276 planted hectares which the company keeps increasing, and approximately 75% of virgin land covered by native forest. Hillside plantings have been introduced to reap more of the estate’s potential. The great diversity of its soil, location and climate offer unique conditions for the creation of 'perfectly ripe, intense, concentrated and balanced wines' (Website Caliterra). As a consequence, Caliterra solely posses high quality wines on their list, topping with Cenit, *where the sun reaches its zenith,* their icon wine. This wine is a combination of the finest grapes of the land. Beside Cenit, the vineyard offers two premium wines: the first being *Edición Limitada* and the second *Tributo.* Caliterra has a modern *Reserva* line and in 2015 Viña Caliterra presented their new wine *DSTNTO*, a young and fresh red wine, with an intense red color who's elaboration method is a renewed ancestral technique of carbonic maturation, putting the vineyard in their own words at 'the vanguard of wine innovation in Chile'. Caliterra's wines are graded highly in diverse well known rankings.
Caliterra's grape production for the white wines are derived from the Curicó, Maipo and Casablanca Valleys.

The winery of Caliterra is located at the Caliterra vineyard, where red wine is produced. The winery even processes wine of the other vineyards of Errazuriz, 50% of total. When the wines are finished, the packaging process takes place in a Errazuriz fabric in Panquehue.

### *6.2.2 Production and Sale*

Despite the discussed global wine crisis, Caliterra is increasing their wine production (increasing hectares) and sale, indicated in table 6.2.2. The expectation for 2015 is that Caliterra will sell at least 226.683 boxes of wine. One box of wine contains 12 bottles. This means an estimation of 2.720.196 sold bottles. In 2014 222.727 boxes have been sold. This indicates an increase of 3965 boxes or 47.580 bottles between 2014 and 2015. The general price for a box is in 2015 42,4 dollars and was in 2014 around 41,9 dollars. Due to the price and sale increase, in 2015 296.099 more dollars will be earned. In general, 90% of the Caliterra's wine are exported outside Chile, only 10% is consumed in Chile. 80% of the sale is red wine and 20% is white wine. As an indication, 5,4 % of the sale is the Cenit wine.

| **Real sale 2014** | | | **Estimated sale 2015** | | |
|---|---|---|---|---|---|
| Boxes | Sale USD | Price USD | Boxes | Sale USD | Price USD |
| 222.727 | 9.323.425 | 41,9 | 226.683 | 9.619.524 | 42,4 |

*Table 6.2.2. Wine sale 2014 and 2015 Caliterra*

Even though the vineyard is very attractive with a lot of flora and fauna, horses and alpacas walking freely on the vineyard and a high and diverse bird population, Caliterra does not include tourism on their vineyard. Once in a while a tour for stakeholders is organized on the vineyard. As the head wine maker explains, Caliterra prefers to focus fully on good quality grape and wine than to engage in tourism.

### *6.2.3 Mission*

Caliterra is a growing wine company with a mission to produce wines with a close link to the territory, in harmony with the environment. The slogan stated on the bottles is: *unique details in perfect harmony.* On the website is written: 'Our sustainable approach to crafting wines gives great value to high standards of environmental quality, protecting the health of the consumer and our workers, respecting the environment (flora and fauna), working strongly united to the community and preserving the natural landscape for future generations'. The website is overflowing with sustainability. Sustainability practices are also described and videos of these practices are offered to demonstrate the sustainability of the vineyard is. Arrival on the vineyard validates this vision. The vineyard is very green with little construction, and isolated with a lot of preserved flora and fauna. Besides the slogan, the Caliterra wine bottle label is decorated with a little bird on a branch, indicating the flora and fauna. Caliterra appears to have achieved the primary goal of the founders to elaborate high quality wines under a environmental friendly production.

As discussed in previous chapters, there is quite some pressure on the wine sector for a sustainable and above all 'green' production. Wine companies can also exploit a 'green' image and use it to their advantage. Besides, as the representative of Vinos de Chile explained; 'the comprehension of sustainability varies a lot within the vitivinicultural sector'. One must therefore be careful in judging to what extent sustainability is valid.

## 6.3 The Sustainable Development of viña Caliterra: Vineyard and Winery

### *6.3.1 The Sustainable Development of viña Caliterra*

From the start, Caliterra has embraced a philosophy of sustainability and consequently image, wine production while taking care of the environment and the community. This philosophy has persevered in time. At the beginning of this research and during the first visits to the vineyard, Caliterra's managers have been promoting its sustainable character. According to Caliterra sustainability not only contributes to the environment which makes it possible to develop a good wine, but also offers commercial benefits on the long term for the company. Caliterra also considers sustainability contributing to higher efficiency of the operations, protection of the vineyards reputation, social stability, lowering health risk for their employees, legal completion and contribution to regional development. These are benefits not solely related to Caliterra as a company, but also to the environment and community.

Caliterra defines sustainability similar to the discussed Brundtland report: “Sustainable development is development that meets the needs of the present without compromising the ability of the future generations to meet their own needs” This is the vision where the three dimensions need to be in balance. Caliterra explains that sustainable development for the vineyard means moving from development based on quantitative terms and economic growth, to a more qualitative development with strong links between economic, social and environmental aspects, in a democratic and participative frame full of opportunities to advance simultaneously within the three dimensions. The advance of one dimension will not imply the deterioration of the other. This is the general accepted definition, not the “possible” and constructive approach preferred in the theoretical framework.

Through this philosophy Caliterra has become the Chilean pioneer vineyard in the development of sustainable practices. It was Caliterra who through sharing their protocol of innovative practices formed the base of what is now the Codigo Nacional de Sustentabilidad for the Chilean wine industry. As discussed, this code includes the concepts of precision agriculture and sustainable management of the vineyards, environmental quality, nature preservation, labor quality and community inclusion. It will be interesting to see how Caliterra's sustainability has evolved. Is Caliterra still a pioneer? How has their sustainability developed since the implementation of the CNS?

The senior grape production manager is very proud that Caliterra was proclaimed the first sustainable vineyard of Chile and according to him, Caliterra still lives up to it. In 2013, Caliterra started a project to control plagues in their vineyards -of rabbits and rodents principally- by conservation and repopulation of predatory birds like eagles, falcons, owls and kestrels, who today are in real danger of extinction because of hunting, lack of food and contamination. Concretely, the program exists of constructing nest boxes or shelters of recycled material for all the birds, strengthening their presence on the land and its repopulation in a natural form, with the goal of transforming them into natural predators of the rabbit and rodent plagues. This bird project has won Caliterra a lot of international propaganda, with many journalists and interviews. It is a good example of their sustainability philosophy, mainly found in their practices on the vineyard. Marketing manager of Caliterra argues that 'when clients speak of Caliterra they speak of sustainability'. Green practices such as the birds project together with their certification of the CNS characterize Caliterra's sustainability and its appeal to clients.

### *6.3.2 Codigo Nacional de Sustentabilidad*

After having a principal role in the design of the CNS, Caliterra is now one of the 52 vineyards with a certification (appendix I). Caliterra reached a high score, as indicated in table 6.3.2. The score is divided into three areas; orange (social), green (vineyard) and red (process). Since Caliterra is part of the Errazuriz group, the orange area was scored for the Errazuriz group as a whole. This is where Caliterra scored lowest of all three areas. In the green area Caliterra had the highest score of all Errazuriz vineyards (82,5%). The red area was evaluated for the wineries of Caliterra and of El Descanso, Caliterra also scored highest here with 82,5% where el Descanso came close with 78% (Codigo Nacional de Sustentabilidad, 2013).

Although a vineyard with a sufficient score obtains the certification, critical points that prevent vineyards from reaching a 100% score are pointed out in the evaluation, so that these can be improved before the next round of certification. For Caliterra in the green area the main critical point was the use of toxic agrochemicals and the lack of rotation of herbicides. The majority of critical points were found in the red

| Caliterra Score Codigo Nacional de Sustentabilidad, 2013 | | |
|---|---|---|
| **Green Area** | 515/624 points | 82,5 % |
| **Red Area** | 312/378 points | 82,5% |
| **Orange Area** | 444/592 points | 75% |

*Table 6.3.2. Caliterra Score, Codigo Nacional de Sustentabilidad 2013*

(winery) area. Here the main critical point was the lack of sustainable energy and water management, in particular the lack of roofs and walls at the cubes. In the orange area, evaluated for the Errazuriz group as a whole, there were many critical points, specially on the diffusion of the Ethical code and the CNS within the company, the workers and community. However, within the orange area Viña Caliterra did come out as most developed of the group (Codigo Nacional de Sustentabilidad, 2013).

At the time of research Caliterra was preparing the second certification in 2015. The second certification is considered more difficult because of higher requirements, a vineyard needs to reach a 75% to retain the certification instead of the original 60%. With scores over 80% Caliterra would easily reach this if they would just carry on. So, according to the CNS, Caliterra's sustainability is more than good. When asked how Caliterra evaluates their current sustainability, the head grape producer said he evaluates the sustainability according to the CNS. However not everyone agreed with this nor evaluated vineyards sustainability only by the CNS. The supply and marketing managers explained sustainability of Caliterra is now mainly marketing. *'Caliterra without sustainability image will fail to exist. It has been exploited. Maybe Caliterra's mistake was to declare itself sustainable 18 years ago and it didn't work out. Sustainability is a long term process. Even though the birds are beautiful, they need to have an impact.'* Some sustainability practices have disappeared. The development of the children's Traditional Music School (folklore group) ceased to exist but is still promoted on the website. This together with expert doubts and a controversial CNS raises the question: Has Caliterra's sustainability decreased and is the image more beautiful than reality?

## 6.4 Sustainability Evaluation Caliterra Vineyard and Winery

The sustainability evaluation of this research (appendix III) addresses that indicators that are weakest in sustainability are on water and energy management, and agrochemical product use. Aside from a very efficient irrigation system, water optimization is not taken into account. Of energy use no sustainability management exists, except for some checks and adaptations related to high energy costs. Recently Caliterra started measuring their water and energy use but what is missing are both process measurements in order to be able to specify where to cut energy or water use and to implement clear reduction and optimization goals. In agrochemical products use especially weed, plague and disease management are weak in sustainability. Caliterra uses +/-60% of green (low environmental impact) labeled chemical products. The rest is blue (medium environmental impact) or yellow (high environmental impact). Though not the majority, high toxic products are still used and here goals on the quantity of application are absent. Caliterra has no quantified knowledge on the effect of realized sustainable practices (such as biological corridors) or on the reduction of production costs (application of pesticides).

What all indicators share in general is the lack of relevant data, plans, goals and strategies of Caliterra for increasing sustainability. Master plans can direct indicators onto sustainability. Without goals to work towards, sustainability cannot be expected to improve. Even less when a company has no quantified knowledge or data on an indicator, as is often the case with Caliterra. *If you don't have tangible results, how*

*can you steer efforts and communicate successes then?*

Since the CNS evaluation Caliterra has not improved. At least not through a strategy or action plan and outcomes. Caliterra is not sure how to meet the new and increasing requirements. For this a plan must be designed. Caliterra has not yet created an improvement plan.

This leaves Caliterra in a situation where sustainability intentionality is good but its implementation is not. The clear lack of a proper master plan shows itself in many missed chances to improve. Sustainability is now mainly image build and increasingly lacking real foundations.

When Caliterra co-developed the CNS they were pioneers in green production in Chile. Now they seem to be scoring on average levels and just following the indications of the CNS, not putting in a lot of extra efforts to set even better standards. Main sustainability practices are green viticulturist practices on the field. And some less integrated themes for workers, community and winery. As for its sustainability policy Caliterra should implement an environmental management system (EMS): a collection of internal policies, assessments, plans and implementation actions affecting the entire organization and its relationships with the natural environment. It should include "creating quantifiable goals to reduce environmental impacts, providing resources and training workers; checking implementation progress through systematic auditing to ensure that goals are being reached; correcting deviations from goal attainment and undergoing management review" (Darnell, 2008).

Now Caliterra's sustainability is depending on the good will of the managers. The head grape producer evaluated Caliterra's sustainability according to their score in the CNS. The head wine maker is a bit more skeptical and believes they miss a complete rationalization of chemical products use and 'rationalizing the use of inputs is very important, Chileans are overprotective'. According to him the solution lies in practices such as biological corridors, which are in fact agro-ecological. 'rationalizing the use of inputs is very important, Chileans are overprotective'. He also sees the future of sustainability mainly in reducing the use of herbicides, which is critical. He explains 'when Caliterra designed the CNS no use of herbicides was meant to be a requirement but nationally this was too complicated.' He recognizes that Caliterra wants to go further in sustainability but that has to go hand in hand with costs. An example for this is the organic production fiasco. Since 2013 Caliterra has stopped purchasing organic products. These products were used for 50 hectares of organic grape, due to a commercial request. However, Caliterra's organic wine line failed mainly because they produced organically only on a part of the hectares and these plots where not isolated geographically. Furthermore Caliterra focused mostly on the use of organic products which are more expensive than conventional products, and less on achieving natural balance on their vineyard, hard to reach when organic plots function next to conventional plots. So, Caliterra needed to sell the organic wine they produced at a higher price to be profitable, but on the marketplace they did not achieve this. With disappointing harvests and high production costs, after two years of trying the costs outweighed the benefits of their organic wine line. Also Caliterra's head wine maker is critical on the sustainability of organic production. Organic wine production as a solution to over usage of agrochemicals will be further discussed in chapter 8.

Caliterra is part of the Errazuriz wine group, this means they need approval for investments in sustainability. This relation turns out both beneficial and harmful for Caliterra's sustainability; 'being part of the Errazuriz group is really good for Caliterra (medium-big vineyard to one of the biggest groups in volume), because it gives you more negotiation power with suppliers etc. But the down side is we are the little brother of Errazuriz, less investments, more convincing'. To frustration of Caliterra's management, this has prevented the company from installing a roof above the fermentation cubes, which without the roof is a energy gulping area due to high temperatures changes. The head wine maker is considering carbon footprint measurement and investment in clean energy sources. 'The energy theme is very little developed in Chile but is growing'. 'The roof we will never obtain. But we can improve our energy source'.

Caliterra has no sustainability criteria for the selection of agricultural and wine making inputs and service,. On corporate level, suppliers are simply evaluated by price, quality and service. What this means for Caliterra's supply chain will be discussed in chapter 7.

## 6.5 Conclusion

Caliterra has a good sustainability intentionality and philosophy, the company even believes sustainability can lead to market and cost reducing benefits. On the vineyard many sustainable agro-ecological practices are implemented and the company is certified with the Chilean wine sustainability certification. However, in practice Caliterra sustainability is not optimal. The main reason for this stems from the lack of relevant data, plans, goals and strategies of Caliterra for increasing sustainability. The clear lack of a proper master plan shows itself in many missed chances to improve. Sustainability is now mainly image build and increasingly lacking real foundations.

# *Chapter 7: Caliterra Supply Chain*

## 7.1 Introduction

From grape producing and wine making sustainability practices of Caliterra we will now move to the inputs needed to form the final product, wine. First, an overview of Caliterra's wine's supply chain will be given. Thereafter the sustainability evaluation of Caliterra's suppliers is elaborated, indicating also Caliterra's supply choices. Finally, challenges and opportunities for sustaining Caliterra's supply chain will be discussed.

## 7.2 The Wine Supply Chain

During each step of a wine's life cycle, both in the agricultural and the industrial phase, various inputs and services are needed. Little is written about the wine supply chain, most scientists do not add a description or analysis of the inputs to a wine life cycle or they simply write in general about a wine supply chain. Neither Caliterra nor Errazuriz have a supply chain scheme. However, it is advisable for companies to have such a scheme in order to obtain a good visual overview and insights in the quality and quantity of the used supplies and services. For this purpose, a wine supply chain has been designed with separate supply information of both Caliterra and Errazuriz, as presented in figure 7.2.

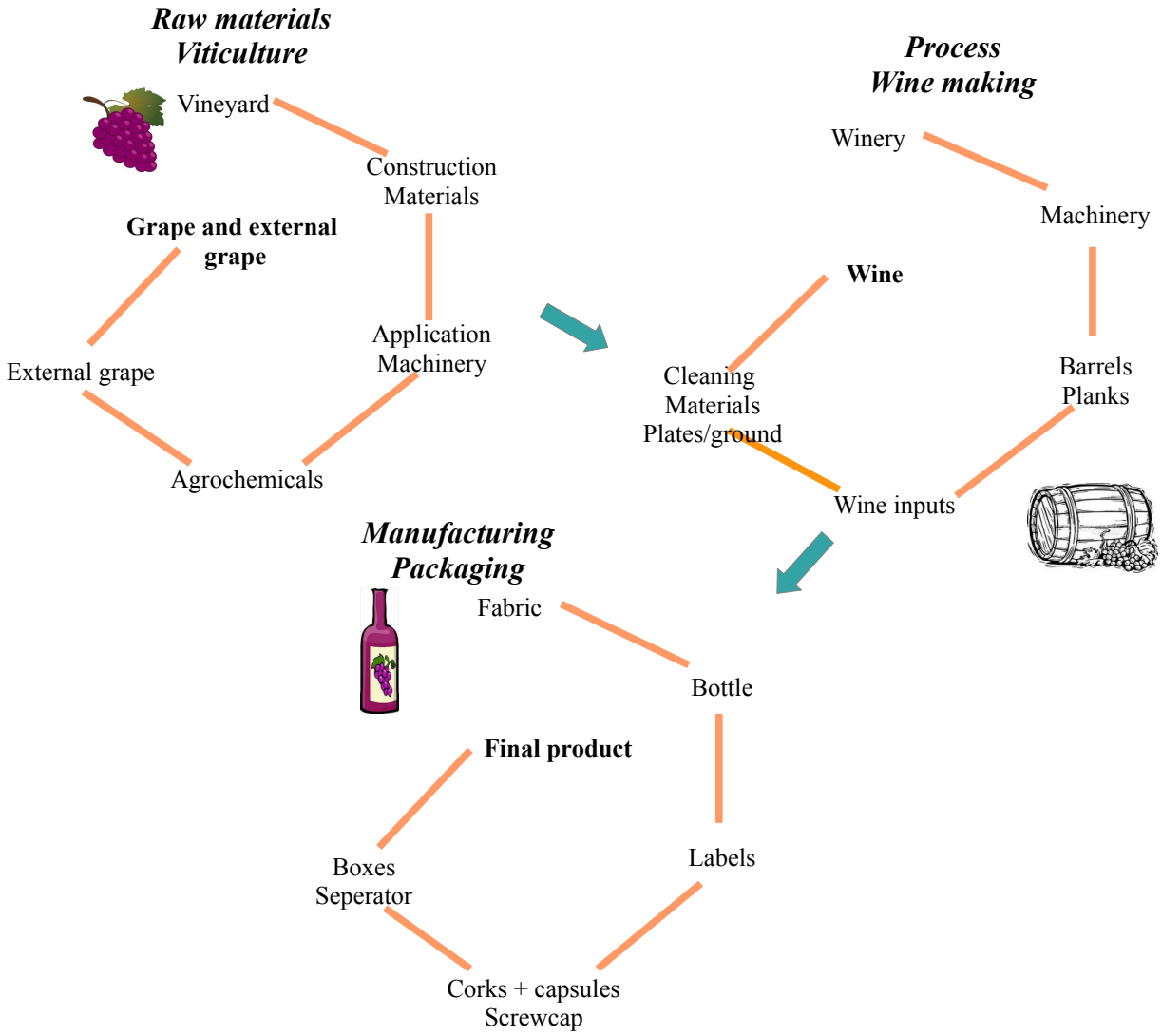



*Figure 7.2. Supply chain wine: from the vineyard to the bottle in the box*

This research focuses on the principal inputs in the chain, meaning those where most resources go to. These inputs are divided into three stages of production: viticultural, vinicultural and packaging stage. The viticultural stage aimed to produce grape as a raw material includes inputs for vineyard planting, pre-production and grape production processes. The vinicultural stage includes all inputs needed for the maturation of the wine. Finally the packaging stage includes the preparation of the product for transport. Wine trade (transport, distribution) and retail (consumer, sales) are not included in the chain.

Figure 1 provides a simplified overview of the supply chain, several supplies and services are missing. In the viticultural process some missing inputs are; *manure, hooks, security gloves and work suits, scissors, plastic bags (which are attached to the root of the plant)*. Machinery of the grape production consist mainly of application and harvest machines, tractors, often rented. There are service suppliers; of gas and water, reparation and maintenance, or labor. Also there are distributors of the agrochemical products.

Equipment used during the vinicultural process are amongst others; *a sheller, cubes, tanks, refrigerator, pumps, humidity machines*. Important wine inputs are; *acid, yeast, filter ground, filter plates, clarifiers, powders, disinfectants* and *enzymes.* These inputs are also newly purchased each year in high quantities. An important aspect is the cleaning of the winery together with maintenance services and laboratory labor.

The packaging process can be realized by the wine company itself or by other fabricators. Equipment needed for this process are label, bottling and packaging machines. Supplies are; *bottle, label, cork, screw cap, capsules, boxes* and *separators*. Services are for labor, maintenance and training.

## 7.3 Purchase of Viticultural, Vinicultural and Packaging Supplies

Currently Caliterra evaluates suppliers in terms of quality, price and service; not in terms of sustainable conditions. According to the ethical code, Caliterra has an agreement sending suppliers social law certificates, however they have not been meeting this agreement. Management of the supply chain and chosen supplies are essential for a sustainable production.

This chapter will evaluate the sustainability of the supply chain of Caliterra. The evaluation aims to provide more knowledge on Caliterra's supply chain through this knowledge make sustainable changes. For this evaluation a selection of suppliers has been made for further research and sustainability evaluation. Caliterra has both local, national and international suppliers. The selection of suppliers and inherently supplies was made according to the relevance, the annual cost rate, of the supply in comparison to the chain. The bigger the supplier and supply, the more interesting for sustainability research since possible changes may have a higher positive impact in the chain than products that are less renewed or used. This is also more interesting for Caliterra itself, to get to know and evaluate sustainability of big and important supplies. Besides relevance, the goal was to evaluate suppliers from more than one stage of the chain.

During the analysis the lack of ready available and transparency of data became clear. As a consequence not all data of Caliterra necessary for this research could be collected. Some data was only available of the Errazuriz group. Furthermore, the separation of vineyards and cerrals for red and white wine production complicated the search for complete supply data of Caliterra. Not only was data not readily available, also both Calitera and Errazuriz were not willing to share costs and volumes on all supplies. Because of the lack of clear documentation, and therefore the difficulty of demonstrating the full supply picture of Caliterra in volumes and costs, in this analysis data is used to evaluate proportions. These proportions aim to demonstrate the relevance of a particular supply in the total picture. The data on viticultural and vinicultural inputs belong to Caliterra and the data on packaging inputs to Errazuriz. It is indicated when data includes only red wine or both white and red wine production.

### *7.3.1 Viticultural supply*

Even though Caliterra's vineyard supplies and services are known, no data could be found on their supply volume and costs. Besides these supplies are often not renewed annually. The supplies discussed here are agrochemicals and grape. Agrochemicals products are more significant to sustainability than the use of scissors. Besides agrochemical products are purchased in high quantities annually. In table 7.3.1 the

proportion of each agrochemical product type is demonstrated.

A high quantity of resources must be spend annually on agrochemicals; more than 80.000 euros per year on different products with a high variation rate, as shown in table 7.3.1. This variation has been discussed in the previous chapter.

| **Group – Year** | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| Acaricides | 4,20 | 8 | 11,6 | 8,4 | 3,8 | 3,3 | 6,5 |
| Fungicides | 62 | 49,7 | 68,7 | 47,3 | 37,6 | 40,7 | 38,7 |
| Herbicides | 6,9 | 6,7 | 5,5 | 2,5 | 2,4 | 2,7 | 11,1 |
| Insecticides | 8,3 | 8,9 | 5 | 9,8 | 9,6 | 12,3 | 13,3 |
| Others | 1,7 | 2 | 0,2 | 0,8 | 0,2 | 0,3 | 0 |
| Nematicides | 4,5 | 1,7 | 0 | 0 | 0 | 0 | 0 |
| Fertilizers | 12,4 | 23 | 9 | 31,2 | 46,4 | 40,7 | 30,4 |
| Total | 100% | 100% | 100% | 100% | 100% | 100% | 100% |
| Hectares | 240,60 | 242,20 | 254,90 | 271,40 | 269,30 | 265,27 | 269,30 |

*Table 7.3.1. Supply division agricultural products Caliterra in %, Valle Colchagua.*

The sustainability of Caliterra's grape has been evaluated in chapter 5. However, Caliterra is highly dependent on external grape production, which accounts for 54% of total grape use. When the price of one kilo grape is set on 1 dollar, Caliterra spends an estimated 2.5 million euros on external grape each year.

| **Wine Inputs** | **Requirement Caliterra (kg)** |
|---|---|
| Tartaric acid | 2400 |
| Clarifier | 150 |
| Anhydride sulphur | 1200 |
| Metabisulphite potassium | 100 |
| Acid soda | 3600 |
| Peracetic acid | 1400 |
| Enzymes | 40 |
| Yeast | 265 |
| Hydration nutrients | 40 |
| Fermentation nutrients | 1485 |
| Other pilot inputs | 60 |
| Total | 10.740 |

*Table 7.3.2. Red wine inputs*
*Viña Caliterra, 2015*

### *7.3.2 Vinicultural supply*

*In table 7.3.2 the wine inputs for Caliterra's red wine are shown. Caliterra needed more than ten thousand kilos of wine inputs in 2015. Tartaric and soda are clearly the two main inputs, however costs of these products are unclear. Caliterra has 13 suppliers that provide them these products namely; Vinicas, Vinotec, Lallemand, Partner, Sasa, AEB, Blumos, Dimerco, Navarro, Engel, Enartis, Oliverogar, and Insuvit. Barrels*
Barrels are used by Caliterra for about 6 years. More or less after the third year of use, the barrels lose the features of the flavors they add to the wine. These barrels still continue to be a good reservoir for wine maturation because the porosity of the wood allows little amounts of oxygen to enter that evolve the wine and soften it. In 2015 Caliterra spend a total of 130.628 euros on 182 new barrels. Barrels are quite expensive, from 600 to 1200 euros per barrel. In 2015 Caliterra purchased 11 different types of French oak barrels from a variation of providers for maturation of their red wines.

According to the wine manager of Caliterra the French oak woods are very sustainable, implementing the principle of tree planting whenever a tree is cut for production. However barrels are chosen by Caliterra solely for wine quality. None of the barrels are fabricated in Chile, all are imported. The wine manager of Caliterra explains they are forced to do this since Chile does not produce barrels. Chilean barrels with a sustainable management would be a more sustainable option for Chilean wine makers, due to transportation emissions.

### *7.3.3 Packaging supply*

Packaging supply is divided into several big (important) and small (less important) supplies. Data of Viña Errazuriz in table 7.3.3 also give an indication for a wine company in general. Addressing supplies on their volume, or quantity received, gives other results than on value, or cost of supply. Here preference is given to cost relevance, because it is believed to be of more importance to a company and more significant in supply analysis.

| Packaging inputs | Volume % | Value % |
|---|---|---|
| Bottles | 22,17% | 43,17% |
| Cardboard Box | 2,98% | 9,09% |
| Wooden Box | 0,04% | 3,38% |
| Capsules | 4,6% | 3,23% |
| Back labels | 22,67% | 4,4% |
| Front labels | 22,83% | 11,06% |
| Corks and screwcaps | 21,64% | 23,04% |
| Separators | 3,07% | 2,63% |
| Total | 100% | 100% |

*Table 7.3.3. Proportion packaging inputs Viña Errazuriz S.A, 2014*

*Bottles*. Data in table 7.7.3 shows that particularly bottles are highly important in the supply chain, making up a 43,17 % of total costs spend on packaging by Errazuriz.

*Boxes*. A wine company chooses between wooden and cardboard boxes. Table 7.3.3 shows a higher volume of cardboard boxes of Errazuriz. This is true for most wine companies because wooden boxes are more expensive and mainly used for premium wines. Caliterra uses wooden boxes for its wine Cenit. Separators

are only a small detail in this analysis.

*Corks vs. screwcaps.* Even though Table 7.3.3 includes data of Errazuriz, it is known is that two bottles of Caliterra use cork. These corks are imported from Portugal. The other four bottles use screwcap. As Errazuriz' packaging supply manager argues, clients increasingly ask for bottles with screwcap, today about 70% of the market.

The capsules are only used when the bottle is corked. All bottles of Caliterra with cork use complex capsules. Except for the Cenit premium wines which use tin capsules. This still means 99% complex capsules and 1% tin for Cenit, which accounts only for a small amount of 500 boxes of Caliterra's total production.

*Labels.* A wine company purchases both back and front labels: together these make up a relatively high cost rate for Errazuriz namely 15,5 %.

In figure 7.3.3 the discussed data of the viticultural, vinicultural and packaging supplies is demonstrated visually. This gives an overview of the proportions and relevance of the principal supplies. Also the number of suppliers Caliterra uses per supply is shown. Several costs remain unknown and the external grape cost is a premise.

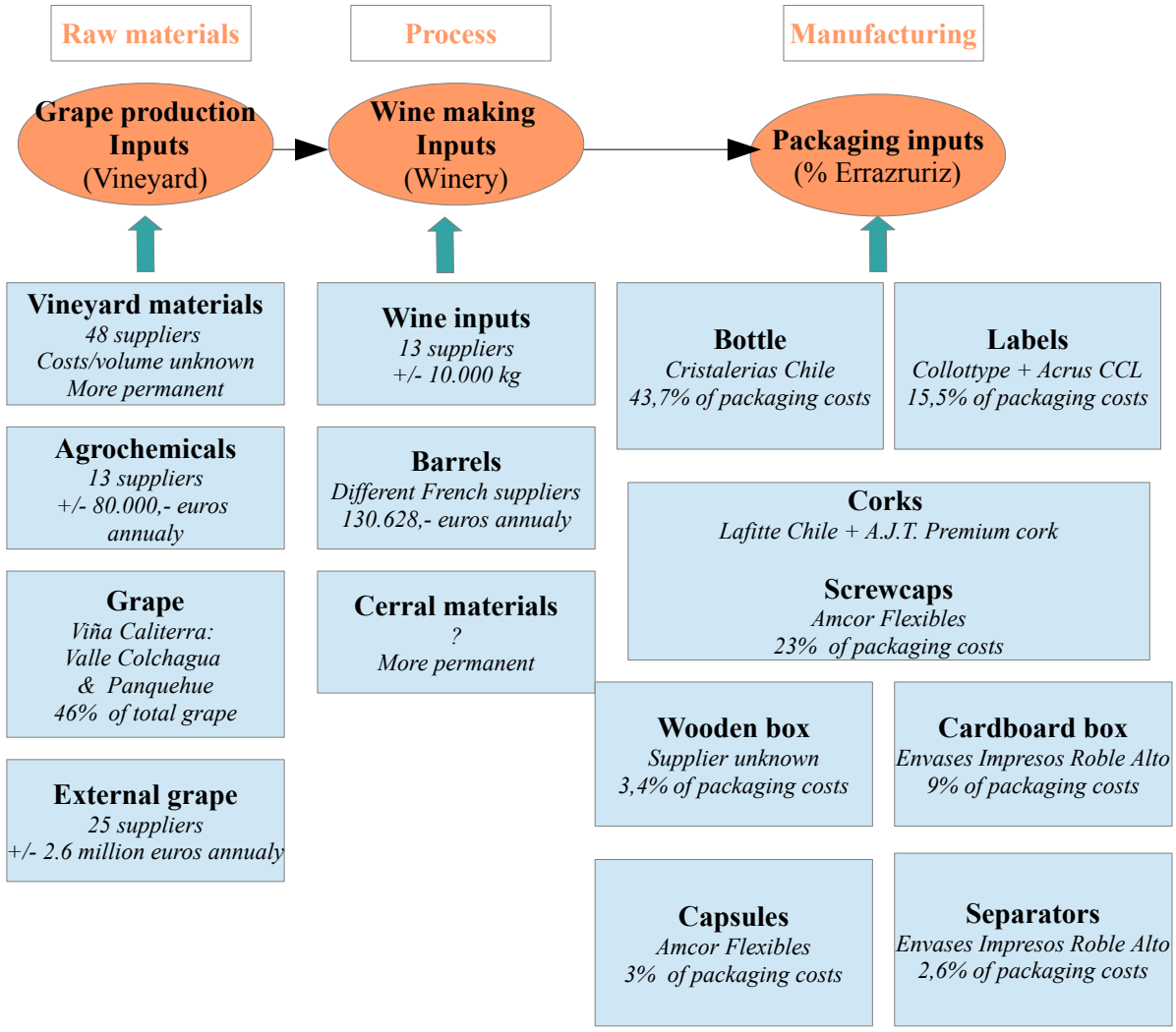



*Figure 7.3.3. Supply chain Caliterra with annual cost rate*

Which suppliers are most relevant when looking at costs? *External grape, Agrochemicals, Barrels, Bottle, Corks/screwcaps* and *Labels*. Also the wine input volume is not ignorable. However not all relevant suppliers are interesting for sustainability research. Inputs with a high cost rate, such as barrels or corks, are all imported from international suppliers which complicates a sustainability evaluation of the supplier. This research has therefore chosen to evaluate relevant supplies with Chilean suppliers. Apart from the high volume needed, wine inputs are perceived as less relevant for further sustainability research compared to agrochemical inputs. Interviews with experts clearified that the wine inputs appear to have a lower negative sustainability impact than agrochemicals, therefore they are not used as a focus point in sustainability practices. Furthermore because of a time limitation agrochemicals were given preference in this research.

### *7.3.4 Supply sustainability evaluation*

After exploratory analysis to supply relevance and their research opportunities, this analysis has indicated five inputs of Caliterra for a supply sustainability evaluation.

- Agrochemical products

Agrochemicals are essential for wine sustainability, not only the application but also the type of product and its production process. Because of this together with the high amount of resources necessary and high dependency of vineyards on these products, it provides an interesting supply for more profound research. Caliterra has 13 different agrochemical suppliers of which 1 Chilean supplier has been chosen for further evaluation. Another international supplier has also been evaluated for comparison. Both suppliers were chosen because they sell more than one product to Caliterra.

- External grape

Due to Caliterra's dependency on external grape and its high cost rate, external grape is perceived as interesting for more profound sustainability research. To evaluate Caliterra's external grape sustainability, 4 suppliers with different characteristics will be evaluated.

- Bottle

Due to the fact it is the most expensive supply and because there has been lots of sustainability progress in bottle production, this supply is therefore chosen as one of the 5 evaluated supplies. The single supplier of Caliterra has been chosen for evaluation.

- Cardboard box

Wooden boxes are less sustainable than cardboard since more raw material is necessary for production. Furthermore wooden boxes are probably difficult to change because they are used for premium wines. Therefore cardboard boxes are chosen for a more profound sustainability evaluation. Cardboard boxes also constitute a higher percentage of total supply value. Caliterra has only one cardboard box supplier who will be evaluated.

- Label

Labels are perhaps less relevant for Caliterra than corks, the latter being the second most expensive supply. Caliterra's corks however are imported. As a consequence, label supply will be evaluated on sustainability. For this one label supplier has been chosen, producing two out of three labels of Caliterra. Caliterra's second label supplier has also been interviewed for comparison.

In the next chapter these five suppliers will be evaluated on sustainability performance. Evaluation will consist of a production analysis and a business analysis. Also an overview is given of current sustainability choices of Caliterra in the supply chain.

## 7.4 Suppliers Evaluation

A list of ten indicators is set up to include all important aspects suppliers specifically should focus on in order to provide sustainable supply. The list is indicated in table 7.4. The majority of these indicators can be applied to each supplier thus allowing for comparison. The indicators have been chosen for the following reasons:

- Other sustainability certifications address the importance of a clear sustainability policy and strategy with prevention, reduction goals and action plans. This can improve sustainability more effectively.
- Measurement allows for evaluation of progress in sustainability.
- Environmental and social sustainability both need to be addressed for an integral evaluation.
- The difference between product and production sustainability, both need to be addressed to evaluate both suppliers business and product sustainability.
- Caliterra's suppliers are also dependent on their own suppliers and supplies, therefore this aspect needs to be included in the evaluation.

The score is divided into 1 to 4, defined as:

1 = insufficient focus;

2 = insufficient focus, but in development;

3 = good focus, but still need for improvement;

4 = good focus.

This way of scoring is believed to be effective to evaluate what the supplier is doing well and what else is needed.

| |
|---|
| **Clear and transparent sustainability policy** |
| **Sustainability strategy with prevention, reduction goals and action plan** |
| **Environmental sustainability (Waste, energy and water management)** |
| **Production efficiency** |
| **Product recycling rate** |
| **Impacts measurement and knowledge** |
| **Sustainable product solutions** |
| **Social sustainability focus** |
| **Strong relationship with clients and awareness raising strategy** |
| **Help improve sustainability own suppliers and supplies** |

*Table 7.4. Indicators to evaluate supplier sustainability*

The sequence of the evaluations are as follows:

1. bottle
2. agrochemicals
3. label
4. box
5. grape suppliers

## 7.5 Supplier 1: Wine Bottle – Cristalerias Chile

### *7.5.1 Product Analysis: Wine Bottle*

Glass is the most neutral and natural of packaging materials[2]. Opinions on glass as a packaging material are not just positive. The three usual negatives that people mention are that glass is heavier than other materials (which means higher energy use for transport, higher Co2 emissions), glass breaks and uses a lot of energy to produce. The second most energy-consuming stage in the life cycle of wine is packaging production (29-46%). Production of glass bottles makes up over 95% of the energy consumed in the packaging stage. Impacts from labels, corks and transport of packaging material to the wine-bottling site are negligible (Fundación Chile, 2011). In the glass business, energy is the most important component of the footprint. The principal sources of energy consumption are the melting processes of primary material (fossil fuel and electric energy) and glass products formation (electric energy).

Today, the wine industry can choose from a range of packaging solutions, be it glass, liquid cartons, aluminum, PET or bag-in-box. However, glass bottles currently dominate, making up 97% of the market (Wrap, 2015). This is mainly due to the fact that wine is emotion, as a consequence consumers prefer to buy wine in a glass bottle. However, as discussed, glass bottles are unsustainable on several levels. At the same time glass bottles can be produced more sustainable. Research highlights that there are clear environmental wins by considering carefully the impact of the chosen material - in particular, through the light weighting of existing bottles (whatever the material) and the level of recycled content (Wrap, 2015).

*7.5.1.1 Recycled Content*

Glass is a 100% recyclable and can be recycled endlessly without loss in quality or purity. If we use recycled glass we can diminish the use of raw materials (sand, soda ash, limestone and "cullet) by a maximum of 95%. Glass is recognized as being widely recycled, nonetheless global and national recycling rates are not ideal yet and this collection rate complicates the optimization of recycled content in a bottle. In North America the Glass Packaging Institute (GPI) announced in 2008 that its member companies were committed to achieving the goal of using at least 50% recycled glass in the manufacture of new glass bottles by 2013. They did not reach this goal, by 2013 only 34% of glass was recycled (GPI, 2014). This indicates the complexity of increasing the collection rate of glass[3].

Manufacturers experience environmental and commercial benefits from recycling for it reduces emissions and consumption of raw materials, extends the life of plant equipment and saves energy. Energy usage drops about 2 to 3.5% for every 10% of recycled glass used in the manufacturing process (GPI, 2015). Along with reducing the consumption of natural resources, using recycled glass in the manufacturing process reduces carbon dioxide emissions released into the atmosphere as a by product. Some raw materials used to make glass (limestone and soda ash) contain carbon. When these are melted the carbon reacts with oxygen to produce CO2. This is a on/off emission which means when glass is re-melted no additional CO2 is released

2 Neutral, because its non-reactive and safe to use over and over again. Natural, because glass is made from sand, soda ash, limestone and "cullet," the industry term for furnace-ready scrap glass. The only material used in greater volumes than cullet is sand. These materials are mixed, or "batched," heated to a temperature of about 1,565 degrees Celsius and molded into the desired shape.

3 Currently, green glass has the highest recycled content, so the average impact of green would be lower than that of the other glass colors.

into the atmosphere. For every 10% of recycled glass used in the manufacturing process, the resulting greenhouse gas emissions are reduced by 6 to 10% (GPI, 2015). The use of recycled glass also lessens the volume of waste send to landfills.

In summary, it is important that the recycled content of glass is high. And that global recycling rates rise. Recycled content of bottles produced in Chile depend on recycling rates in Chile. The estimated recycling rate of glass in Chile in 2010 was 54% (Ministerio del Medio Ambiente, 2014). Both public and private sector should aim to increase this percentage through recycling campaigns and support of community recycling developments.

*7.5.1.2 Less is more*

Globally glass bottles have been reduced in weight by more than 50% between 1970 and 2000 (GPI, 2015). Wine bottles of 750 ml today vary in weight from less than 400 grams up to 700 grams. The original high weight of wine bottles can be explained by two reasons. The first explanation is pure luxury charisma, a heavier bottle implies higher wine quality. Wine industry trades on a premium image and there are bottles that weigh more than a kilo, but this link of weight-quality is changing towards a less is more perception. Furthermore, research has found that the height rather than the weight of the bottle plays a big part in consumers' attitudes to wine value (Wrap, 2015). Secondly, previously glass production technology did not allow factories to have a homogeneous distribution. In order to make sure no bottle would break they needed to be produced thicker and therefore heavier. Now with modern manufacturing processes[4] bottles can be produced with a much more even glass distribution, to allow thinner bottles to be strong. (Cristalerias & Wrap, 2015).

Today bottles are becoming lighter than light. Not only technology but also demand has pushed into this direction. Wine companies have become more environmentally aware and choose lighter bottles to reduce the carbon footprint of their wine life cycle. This is then of course used in marketing and attracts clients and consumers. Bottles can be manufactured lighter still. But some wineries are less keen to engage because they worry about the risk of bottles breaking during transport which would mean losses for the company. Furthermore certain markets or international norms indicate the bottle needs to resist a specified impact, as is the case in Canada. Cristalerias explains the breaking risk has to do with the design of the bottle as well, for instance beer bottles resist more and break less in general. Nonetheless, even modest reductions in bottle weight can deliver major material savings.

Light weighting of packaging, in particular of glass wine bottles, has been going on for many years now in line with progress in production and process control technology. Nevertheless, the wine sector is reconsidering whether glass is the only appropriate material for wine bottles. As a lighter packaging option, PET has obvious benefits – at 54g a PET bottle weighs around 90% less than the average weight of a glass wine bottle. This would imply lower pressure on the environment at many levels. However PET bottles might not be a solution for wine because PET lets oxygen and Co2 through which makes the wine become sour (Consumentenbond, 2011). The bag-in-box, a plastic bag in a cardboard box with a little tap, has a significantly lower environmental pressure than a glass bottle even if its comes from thousands of kilometers further away (Consumentenbond, 2011). In countries such as Scandinavia and France the number of bag-in-box wines in the supermarkets are increasing. Glass companies recognize that these days their competition does not come from another glass company but from the producers of plastic containers as a substitute for glass instead. Besides shifting to light bottles, wine companies try to abandon the emotion of glass wine bottles and consider the economic and environmental benefits of other packaging materials. Especially large importers can pressure their suppliers to adjust their packaging.

4'Narrow Neck Press and Blow' process

*7.5.1.3 Characteristics of Caliterra bottles*

Caliterra so far only opts for glass wine bottles. As shown in table 7.5.1.3 six different glass bottle models are being used, all containing 750 ml of wine. Five bottles are qualified by the manufacturer as light bottles ranging between 580 and 425 grams. The sixth bottle is a conventional bottle of 730 grams. This is some 40% heavier and it is used for Cenit, Caliterra's premium wine. The calculated average height of Caliterra's bottles is 298,5 mm. The average width is 81 mm. Two bottles are qualified as eco glass, the manufacturer defines this as their light weight product lines, with Ecoglass 2.0 being lighter still. However both ecoglass and non-ecoglass are around 425 grams. The really light ecoglass bottles of 750 ml weigh 360 grams, but as yet Caliterra does not purchase these.

| Bottle Model | Light/not light | Heigh (mm) | Width (mm) | Cont (ml) | Weight (gr) | Color |
|---|---|---|---|---|---|---|
| Burdeo Colchagua Cork P40 | Not light | 303 | 84,4 | 750 | 730 | Ambar |
| Burdeo Screwcap P28 LW | Light | 302 | 75,3 | 750 | 425 | Green |
| Borgoña Screwcap P28 LW | Light | 297 | 83,1 | 750 | 425 | Green dry leaf |
| Burdeos Conica Baja P30 **Ecoglass** | Light | 298 | 80,3 | 750 | 455 | Green |
| Borgoña Casablanca Screw cap P30 VHS | Light | 289 | 88 | 750 | 580 | Green dry leaf |
| Burdeos Blanca P28 screw cap **Ecoglass** | Light | 302 | 75,3 | 750 | 425 | White |

*Table 7.5.1.3. Bottle types Caliterra*

## *7.5.2 Business Analysis: Cristalerias Chile*

Cristalerias Chile is the supplier of wine bottles for Caliterra. It is the largest glass supplier in Chile and serves more than 70% of the Chilean market with Concha y Toro being their biggest client. Cristalerias started its business in 1904. Today they sell different types of glass containers to more than 360 national and international clients, in various sectors. Their main factory is located in Padre Hurtado, and has the capacity to produce 300.000 tons of glass containers with four ovens and eleven IS formation machines. In 2007 the factory in Llay Llay was opened, the most modern glass factory in Latin America, which has the capacity to produce 200.000 tons of glass containers with two ovens and 6 IS formation machines.

Cristalerias forms part of and collaborates with the world's largest glass producer Owens Illinois Inc, Ohio, United States. This American company holds some 75% of the glass market. Cristalerias gets technical assistance in order to develop, among other things, sustainability themes (Sustainability report, 2014).

*7.5.2.1 Sustainability Policy*

Cristalerias approach to sustainability is the three dimensional policy: social, economic and environmental. They aim to: 1. sustain the business, 2. achieve client satisfaction and 3. recognize responsibility towards community-environment. The company has matured in sustainability. In 2011 they started *Plan Cristalchile Sustentable*. In the same year they realized a Carbon Footprint Life Cycle measurement in order to get to know the impacts of glass production. They developed a sustainability report and in the 2014 sustainability ranking of Prohumana they earned a 15$^{th}$ place. The report is especially focused on social sustainability and lacks info on water and waste management. They have a transparent and well developed Ethics Management. The company is involved in community projects and offers broad benefits programs for their workers. They

have a well developed supplier management and evaluation, aimed at creating sustainable relations with suppliers which includes both environmental and social aspects (Sustainability report, 2014). Cristalerias Chile is the first Latin American glass packaging company with ISO 50001 (Energy Management System) certification. This allows them to have more correct measurements and data to work with. In 2013 they received the *Sello de Eficiencia Energética* by the Chilean Ministry of Energy. Also they received ISO 22000 (quality and innocuous policy) certification. Cristalerias emphasizes that each glass manufacturer uses a different strategy. They say glass companies generally do not look beyond their own business line nor do they have an open mind towards other technologies. Cristalerias invests in and incorporates systems from different businesses.

Despite a well developed sustainability management, Cristalerias mainly operates by a long term economic vision. The sustainability definition given by the interviewed engineering manager was: *'Assure growth in time, pass on a strong company to the next generation, and always become stronger'.*

*7.5.2.2 Sustainability Practices*
As discussed, sustainability issues in the glass sector are linked to:

- Energy efficiency
- Incorporation of technologies that reduce negative environmental impact
- Increasing recycling rates of glass
- Product innovation

Cristalerias embraces these issues through their five strategic environmental points (Sustainability report, 2014).

- Energy Efficiency

One important observation during the interviews and from the sustainability report was that Cristalerias has been very focused on the implementation of efficiency or reduction measures within their production process, before regulations demanded this. They put themselves at the vanguard of technology so they do not have to worry about control systems. This turns out to be very beneficial for the company because in their own words 'this way we go only forwards'. Especially the strategy of energy efficiency[5] with huge investments eventually increases the profit rate. Aside from cost reduction this has an inherent impact on lowering carbon footprint and being green/sustainable.

Cristalerias strategic plan for 2020 is to diminish energy use by 40%. For each new construction, renovation or expansion project in the factories, the environmental and especially the energy efficiency variable is considered. Examples 2013: remodulation of Oven B and a feasibility study on heath recovery. There is an energy committee that develops indicators and reduction strategies. The equipment designs are generally very efficient. They implement new technologies and improve existing ones. Faster machines finally result in a better quality and higher productivity. But in the end, as the engineering manager puts it, the energy goals are realized by the people who work with the equipment. Therefore they focus on training of personnel and external partners on energy consumption.

- Technologies that Reduce Negative Environmental Impact

Aside from CO2, the emissions of sulfur dioxide (SO2) and oxides of nitrogen (Nox) are generated as waste during the Cristalerias production process. In many cases Cristalerias implemented measures to reduce negative environmental impact, such as Nox reduction towers, before regulations demanded them. This way they meet emission goals established by the environment authority. Another example: implementation of Oven F in Llay Llay factory, less contaminating and destined to produce Ecoglass bottles. Training workers in maintenance of machines and general maintenance to avoid contamination. On the down side there is little transparency on the effectiveness of strategies and on reduction rates.

5 In Chile energy costs are extremely high, energy costs increased with 50% compared to 1990. These high rates trigger companies to pursue optimal energy efficiency, in particular the glass business where energy use is very high.

- Recycling

Glass produced by Cristalerias consists of 30% recycled glass and 70% new glass. As discussed, the recycling challenge is to increase the relatively low recycling rate (54%) of glass in Chile. In 2013 Cristalerias installed a recycling committee that looked into how to increase the rate of recycled glass. 10.000 tons of glass are recycled yearly by their recycling campaigns together with NGO Coaniquem and in the Llay Llay community. But more effort and collaboration with other actors will be needed.

- Product Innovation: Light bottles

In 2008 Cristalerias created the Ecoglass family; lighter bottles. In 2013 Ecoglass 2.0 bottles were introduced. These bottles are 5% lighter than previous Ecoglass, however this division between Ecoglass 1 and 2 is not specified on the website's product list. The lightest eco glass bottles of 750 ml Cristalerias offer weigh 360 grams. Lighter bottles are sold cheaper, but production is more complicated and efficiency rate is lower. They also extended this product line to the to beer sector and sparkling wines. The main reason they created this line is because of wine clients wanting to enter certain international markets with bottle weight restrictions. Aside from developing lighter bottles a glass manufacturer could also look a bit further to sustainable options such as refillable bottles.

Wine clients stand out because they generally have a lot of volume. Clients usually do not embrace product innovations easily. Although Cristalerias can make bottles even lighter but some clients still tend to prefer their bottles heavy. Image is important. Because of flexible demands a glass company needs good relations with the client. Now, Cristalerias and clients have a good commercial and product development relation. They do offer sustainable products but they lack associations with the client to stimulate the comprehension and demand for these products. They seem to be waiting for the client to take initiative. As a logic consequence, clients know little of Cristalerias strategies and innovations within the factory.

| **Positive aspects** | **Negative aspects** |
|---|---|
| Very proactive and long-term business vision | Costs before sustainability<br>More transparency on data needed |
| Detailed sustainability report<br>Well developed social sustainability | Lack of data and action on water and waste management |
| Good knowledge and measurements | Insufficient transparency sustainability strategy and improvements<br>Lack of documentation |
| Recycling committee | More effort needed in collaboration with other actors |
| Focus on sustainable product solutions | Insufficient client awareness raising on product solutions |
| Person in charge of environmental performance | |
| Engagement in clients sustainability initiatives | |
| Glass recycled content | Percentage could be higher |

*Table 7.5.2.2. Positive and negative aspects of sustainability policy Cristalerias Chile*

On the other hand, wine companies such as Concha y Toro do visit suppliers, including Cristalerias, to evaluate sustainability themes and propose actions. Each client has a vision that Cristalerias respects, Cristalerias hand over their information, everything is documented, but Cristalerias do follow their own

vision. The clients helped Cristalerias with some aspects but less with others. They consider some aspects like no child labor or no environmental fines very hard to demonstrate.

*7.5.2.3 Hot Spots: more important positive and negative aspects of their sustainability policy*
In table 7.5.2.2 the discussed sustainability aspects of Cristalerias Chile are ordered according to their positive or negative influence on sustainability. Even though the future of wine packaging maybe not be in glass bottles as it is the most unsustainable way of packaging, whenever glass bottles are used at least firms should focus on light and recycled bottles. Energy efficiency is important. Cristalerias Chile includes these three aspects rather well. They have a well developed sustainability policy. On the down side, they lack water and waste aspects into their environmental sustainability, are not sufficiently transparent on their strategies and reduction rates, need to enhance their glass recycled content and could aim for higher awareness of their clients on sustainable product solutions.

The negative aspects are explained by the fact that sustainability is no priority for Cristalerias. Cost reduction, particularly through energy efficiency, is more important to the company. Waste and water management is therefore of inferior sustainability compared to energy management. The recycling rate is not optimal because of Chile's relatively low recycling rate of glass. This is partly out of the company's reach. Unfortunately Cristalerias does not consider it their responsibility to influence the client's choice. Company and clients have a mere commercial relation.

This analysis leads to the following sustainability score for Cristalerias Chile.

| | |
|---|---|
| **Clear and transparent sustainability policy** | 4 |
| **Sustainability strategy with prevention, reduction goals and action plan** | 3 |
| **Environmental sustainability (Waste, energy and water management)** | 3 |
| **Production efficiency** | 4 |
| **Product recycling rate** | 3 |
| **Impacts measurement and knowledge** | 4 |
| **Sustainable product solutions** | 3 |
| **Social sustainability focus** | 4 |
| **Strong relationship with clients and awareness raising strategy** | 1 |
| **Help improve sustainability own suppliers and supplies** | 3 |

*Table 7.5.2.3. Evaluation sustainability Cristalerias Chile*

## 7.6 Supplier 2: Agrochemicals - Anasac

### *7.6.1 Product Analysis: Agrochemicals*

*7.6.1.1 Product Choice*

The conventional or traditional synthetic products are offered by the agrochemical companies in four different colors, indicated on the product label[6], from low toxicology to high toxicology: green, blue, yellow and red. Red products are practically not used anymore and have been eliminated by the majority of agrochemical companies. There are also biological[7] and natural (organic) products. These together with green products are found less effective than more toxic products and generally need more applications to achieve the same effect. This is challenging, most Eco-toxicological friendly products are less effective and more expensive to use. And agrochemical companies, aside from changing and developing, of course still want to sell their products and assure an effective treatment for their client.

*7.6.1.2 Vineyards Product Use*

Grape is one of the biggest sectors for agrochemical companies active in Chile, especially table grape, the principal export product of Chile. Grape also requires high technical management. In table 7.6.1.2 the products vineyards use are divided by agrochemical companies into five sections: *nutrition, insecticides, herbicides, growth regulators, fungicides.* As Caliterra's head grape grower indicates, 'the amount and type of agricultural inputs depend on the period of the year. Everything is applied preventively, except for the occasional plagues'. These products all have their own purpose during ten different production stages: *recess - begin of sprouting -sprouting – pre-flowering - begin of flowering - full flowering – closing - coloring of the grape - pre-harvest and post-harvest.*

| | |
|---|---|
| Fungicides | to solve fungi problems: botrytis, mildew and mycetes |
| Growth regulators | to stimulate and uniform sprouting |
| Herbicides | to eliminate different types of weed. All herbicides are green products |
| Insecticides | to kill insects: Chilean false red mite, brown soft scale, grape mealybug, grapevine moth |
| Nutrition | to stimulate defenses of the plant, increase reserves, improve the soil etc |

*Table 7.6.1.2. Function of crop protection products.*

Whenever a harvest year begins, agrochemical advisors and vineyards will sit around the table and discuss the treatment program. Agrochemical companies advise on both correct and effective product use. The manager of the development and technical department of Anasac explains that the color (toxicity) of the products is not used as a criteria. 'Effectiveness and cost is what make clients buy a product, not the toxicological level. Some companies take the environmental criteria into account, but most do not'. Agrochemical companies usually do not only discuss costs and effectiveness, also a general profile of the product is given, for example the environmental impact of a product.

According to agrochemical companies it is impossible for a vineyard to only use green products. Olivia explains that especially in plague protection you certainly need more toxicological products. Of course any decent vineyard tries to privilege green products to minimize environmental impacts, but today the most

6 Since products are synthetic and sometimes dangerous there is a lot of information to be found on the label. The type of active ingredient, toxicological level, pre harvest interval (for example a product can be applied up to 15 days before the yield), user instructions and warnings are also indicated on the label.

7 Microscopic biological agents or products derived from microorganisms

important argument to choose for less toxic products is the quantity of detectable active ingredients at the yield, in the end product. Vineyards do want and need to demonstrate to their clients and buyers that their treatment program is at a toxicological minimum, which has to do with marketing as well.

Agrochemical companies put a lot of effort in technical assistance to the client. This technical assistance is focused on correct product application, avoiding product spill, secure management of the equipment and the storage cerral. Rotation practices to avoid product resistance are being promoted. Moreover they support clients on the management of residues, residues a chemical product leaves behind in the product from the moment of the application.

The manager of the development and technical department of Anasac explains that 'usually clients do not put much emphasis on application, therefore we insist they apply it well, to gauge the equipment, maintain them well but in practice little is done.' Vineyards mainly use a dusting technique for application of the products, where they leave drops of chemical substance on the plant's leafs, very effective. Its important to do product applications according to humidity and temperature, not calender wise as vineyards used to do, and also localized applications in order to not exceed. However sometimes they have to apply product on the entire vineyard, after a rain for example. The marketing manager of Bayer furthermore explains that farmers need to get used to new less toxical products. They want immediate effect, such as with the traditional technology. Todays products are very selective and a more integral vision is needed. This way the agrochemical company acts in a way of educating the client.

Aside from technical assistance, the relationship between client and agrochemical company is mainly commercial and aimed at assuring their client will have an effective treatment and is satisfied with their service. However to assure sustainable agriculture, it is also their responsibility to push the client into the right direction of : 1. product choice, 2. product use and 3. sustainable innovations. Agrochemical companies have power because of their clients' high dependency on agrochemical products. As for product use it seems agrochemical companies already offer good support by technical assistance. This is a good thing but not enough. There are clients who are not very keen to start using less toxic products because that would mean a more expensive and less efficient program. So aside from clients who are pressured by international market requirements, clients are not necessarily buying most sustainable products. Agrochemical companies can do more to promote higher use of green and biological products, by raising awareness and perhaps even lower prices or discounts. They should look at the vineyard as a whole: cultural practices, IPM, natural enemies.
Also they should promote sustainable innovations such as Phytobac of Bayer on the vineyard.

To judge sustainability of agrochemicals there are two impacts one needs to take into account. Not only the application or use of agrochemicals but also the production process, which uses a lot of energy. Research by Fundación Chile and Edge Environment show that the production of inorganic fertilizers and pesticides/herbicides accounts for 48-72%% of energy use in the wine life cycle . This production is also key parameter for GHG emissions over the wine life cycle, depending on type and production of the chemical and the quantity (Fundación Chile et al, 2011). So it is essential that agrochemical companies aim for energy use efficiency and reduction within their production process.

*7.6.1.3 Characteristics of Caliterra Agrochemicals*

As discussed in the previous chapter, the use of agrochemicals depends greatly on climatic circumstances, so product use can vary a lot. In 2015 Caliterra bought fertilizers and agrochemicals for some 80.000 euros in total. In table 7.6.1.3 the percentage of this sum per product section is indicated.

In 2014 Caliterra purchased 51 different products from 13 different suppliers: Agroq del Maule, Adama, Anasac, Arysta, Bayer, Basf, Chemie, Compo, Dupont, Dow, Nutrafeed, MYV, Syngenta and Quimetal. Some of these suppliers are agrochemical companies and others are just distributors. Each company has a different product range. Two of their biggest suppliers that develop their products have been interviewed; Anasac and Bayer. Of Anasac Caliterra bought eight different products, of Bayer six different products. The agrochemical companies sell their products to distributors which sell and deliver them to the clients.

| | |
|---|---|
| Fertilizers (growth regulators and nutrition) | 30% |
| Insecticides (acaricides make up for 7%, these are substances that can destroy mites and are included here) | 20% |
| Herbicides | 11% |
| Fungicides | 39% |

*Table 7.6.1.3. Division agrochemicals (in value)*

Product decisions are made on corporate level, by Errazuriz. There are several meetings between suppliers and Errazuriz in order to learn about new developments in the market. Then each year product purchase is decided on quality, price and availability, however some products are always being used. For some premium wines they do not check price, only the quality of the product. Others are generic products, which are bought in high volume and all vineyards use exactly the same product. Those products are part of the formula of Errazuriz. This is beneficial for Errazuriz because it can buy for a lower prices, getting discounts for total volume. For the specific vineyards it is less beneficial as it reduces freedom of choice. Besides those joint products, each vineyard can choose several products on its own.

The packaging format is not taken into account in this decision. No matter how much packaging is used, when the price is convenient the product will still be bought. The purchasing manager has never seen agrochemical products with unnecessary packaging. Products sometimes do have special packaging but that is because of security reasons, implemented by the entire industry.

A important observation is that the supply department buys exactly what is needed or they buy with partial dispatches, so that it expires the next season. 'But no stock, when the vendimia ends, the idea is that the cerral must be empty'. This way products do not lose quality and products usually cannot be used the next year. Due to the expiration date of the products, product use follows the FIFO method - first in, first out. Sometimes, because of grape loss, products remain unused. When this happens Errazuriz sends the products back to the suppliers, and the suppliers return the money. This is not a formality, this depends on the relation between client and supplier. Errazuriz always tries to return products when leftover and it usually works. Only occasional plagues will require the purchase of extra products.

As for the type of products, Caliterra uses conventional products, both green, blue and yellow labeled products, as discussed in chapter 4. In 2014 they used 62,7% of green products, 21,5% of blue products and 15,6% of yellow products. Caliterra purchase neither organic nor biologic products.

### *7.6.2 Business Analysis: Anasac/Bayer*

Two different agrochemical companies have been interviewed. Their characteristics are shown in table 3. Being part of a global enterprise Bayer Chile has more investment possibilities, applies innovations from abroad and both the direction of the holding and their product innovations are perceived as more trustworthy by clients, and Bayer has more power because of the molecules development.

| Anasac | Bayer |
|---|---|
| Chilean enterprise. 2 production plants in Chile and Argentina. Anasac's main market is Latin America. The firm also intends and expects to grow on the export market. In Chile they work with a great variety of distributors throughout 11 regions. | Global enterprise. Bayer AG, Leverkusen, Germany, acts as a strategic management holding company. It defines the values, goals and strategies of the entire group. The subgroups independently manage their business operations in line with preset objectives. |
| Agriculture and livestock. Production: plant protection products, seeds, vegetative nutrition, biopesticides, | Health, crop and material science. Bayer CropScience is one of the world's leading research-intensive companies in |

| | |
|---|---|
| veterinary, salmon farming. For agricultural and non-agricultural use. | the agricultural industry, offering a broad range of innovative chemical and biological products for improving plant health, along with high-value seeds. It also provides extensive customer service to support modern, sustainable agriculture. A further focus is on non-agricultural applications. |
| Anasac does not develop active ingredients, imported from China by an intermediate party. Anasac has to wait for patents to resolve. | Bayer develops active ingredients which they then transfer to chemical products. |

*Table 7.6.2. Characteristics Anasac and Bayer.*

Bayer possesses a very well developed sustainability report for the entire holding, however without specific sustainability information for Chile (Sustainability report Bayer, 2014). Therefore the business sustainability evaluation is focused on Anasac while specific points of Bayer Chile serve as a comparison.

*7.6.2 1 Sustainability Policy*

Anasac is little transparent on their sustainability vision, policy and practices. They have no sustainability report. Anasac lacks a clear sustainability management for the production process. At the production level Anasac seems uninterested in sustainability practices. The production manager has no knowledge of the main environmental impacts of the production process. No environmental measurements are realized at the factory.This may also be due to the fact Anasac experiences no demand from the market for a more sustainable production process. International pressure only drives them to achieve lower resistance, less toxicological products and provide training on sustainable use of products. As the production manager explains: 'Sustainability has not been a priority for Anasac. Our priorities are: quality, process security and costs.' According to him this does not mean they do not have any sustainability practices going on.

- Water Optimization

No high quantity of water is used during the production process. Anasac uses water for cleaning but they also use a lot of solvents. Also they use water in the formulation tanks. Because of this small relevance water management is not a focus for Anasac.

At the factory they have a re-utilization system of domestic water use through bio-degradation. This water is then used for irrigation around the factory. Not for consumption because the manager explains more process would then be necessary. Anasac could also use this water for other purposes. Also more recycling of water of production activities could be pursued. They could also reduce the amount of waste water and minimize emissions into waste water. Anasac could to set up a water measurement system and subsequently establish a water efficiency target.

- Social Sustainability

Social sustainability recently received a renewed focus. For their workers Anasac has a training program, various benefits, a contract, a syndicate and sufficient security elements for the workers inside the factory. There is a well developed and broad Ethics Policy[8] that workers have to sign. Anasac furthermore has ISO 9001 certification and the responsible conduct certification which includes clients, suppliers, workers and the community. This is perceived as a basic labor quality. More sustainability certifications could be engaged with and more data on improvements and evaluation of the staff itself. The firm will continue to increase benefits and training for their workers. On the other hand, the firm aims to automatize the plant more, this could mean less labor is needed.

Anasac has no social management on Chinese companies with which they buy active ingredients. Anasac buys on price and characteristics, no other questions asked. This is highly critical for sustainability. Less inputs are bought locally, there Anasac claims to have more information. Their suppliers are member of a

8 Transparency in activities, Maintain work relationships under an ethical and integral base, Demand all workers meet their function, Promote and respect the law completion, Work with dedication, perfection and be aware of the policy and values of Anasac

guild association of chemical producers, with certain standards and responsible conduct certification.

The issues analyzed previously are important for sustainability, however the principal sustainability issues for agrochemical companies are:

- Environmental impact of emissions and waste
- Energy use
- Sustainable product development
- Clients product choice (toxicology vs. efficiency) and application

- Environmental Impact: direct and indirect air emissions.

The manager explains Anasac has always been preoccupied with minimizing air emissions. Their Chilean factory is situated outside of Santiago in a special area for dangerous factories. There is always a negative impact of Co2, Nox, and Sox emissions and particulates. These emissions are caused mainly by the generation and consumption of energy. Anasac attached filters in the system to catch particles and to capture spilling, in order to no affect the soil. They do not have a drainage system, to avoid pollution in environment and domestic network with dangerous waste. Anasac has no clear measurement of these emissions. They will need these data to develop a good reduction strategy. Bayer on the other hand does measure and reduce these emissions (Sustainability report Bayer, 2014).

- Hazardous and Non-dangerous Waste

It is not possible to recycle their dangerous waste, dangerous waste is destroyed. Anasac's main focus lies on the elimination and reduction of dangerous waste, because of the high costs of processing the waste. All not dangerous waste is dropped separately in special entities and is recycled. Plastic is sometimes used by waste companies for fuel. The production manager showed the recycling center for their workers which is little used because a lack of culture. Anasac could provide a better training for their workers on this topic. Also they could develop waste measurement and reduction goals.
Anasac has no strategy to avoid unnecessary packaging of their product formats. The packaging depends on the client and the use of the product. A lot of plastic wrapping is used but it seems like no agrochemical manufacturer focuses on this aspect of sustainability. Bayer explains they have uniform packaging. They have plans to reduce plastic packaging but nothing specific.

Anasac, unlike Bayer, has not expressed interest in the challenge of how to increase recovery rates of rigid containers in Chile from 25% to 70%. This percentage has to increase and Anasac may well support this as a agrochemical producer.

- Energy Use

Even though we identified the use of energy within the production process of agrochemicals as highly critical within the wine life cycle, Anasac has no energy measurement, no energy reduction goals and uses no renewable energy resources. The only energy item they mentioned are the plans to change the lighting in the office to Halogen lighting, not led because this is considered too expensive. These plans also exist outside the factory and in the production area, which consume most light. This lack of energy management is highly unsustainable. To become more sustainable Anasac needs to measure energy use, develop a energy efficiency target and invest in renewable energy.

- Clients Product Choice (toxicological vs. efficiency) and Application

Anasac has two main sustainability focus points towards their clients; support and improve their resistance strategies: rotation, moderation, alternation; and develop the capabilities of the client though providing technical assistance on product application, crop production processes and secure product use. Also they raise awareness on safe management of the equipment and the storage cerral.

Unlike Bayer, Anasac is not active in promoting sustainability innovations for clients. Bayer developed

projects such as Phytobac (responsible treatment of chemical wastewater to increase surface water quality), Magis (project for vineyards to manage their resources more sustainably), Agrovida (application training) and a plague warning system. These services they provide for free with a commercial interest that drives them.

- Sustainable Product Development

Anasac invests highly on product development. International pressures on these issues have made product development processes much more demanding. Anasac does not sell red labeled products anymore. Most manufacturers stopped selling these, this is a international trend. Anasac does sell both biologic and organic products. In the years to come Anasac will increase investment in product innovation, towards products with less remaining residues and lower toxic levels.

The firm does not influence a sustainable product choice by the client: marketing aims to sell all products, has no preference for the green or organic ones. In presenting a product, Anasac specifies the environmental impact of the product, so not only do they discuss the efficiency also the general profile of the product. The toxicological level of a product is not specified on the plant protection program of Anasac because it is not a decision criterion for the client.

*7.6.2.2 Hot Spots: more important positive and negative aspects of their sustainability policy*

Anasac is a step behind in sustainability perspective from international firms such as Bayer. These firms are more pressured towards sustainability by their holding. The good thing is Anasac follows international focus on product development and the firm has plans to further invest in lower eco-toxicology of products. Moreover they provide their clients with good technical assistance, also to reduce resistance to pesticides and remaining residues in the client's products. This increases sustainable agriculture. The relationship between client and agrochemical producer is essential to promote sustainable product choice. Anasac does not take advantage of this opportunity to further improve sustainable agriculture through more natural products. The positive remark is that they stopped offering their clients red labeled products.

| **Positive aspects** | **Negative aspects** |
|---|---|
| Ethics Policy | No sustainability strategy<br>No intention to engage with sustainability |
| | No transparency sustainability strategy |
| Product innovation<br>Safety production process | No measurements (energy, emissions, water. waste) |
| Partial recycling of waste water<br>Minimize air emissions | No targets (optimization) |
| Good technical assistance client | Insufficient client awareness raising |
| | No idea of suppliers sustainability |
| Elimination red products<br>Offer biological and organic products | No promotion natural products |

*Table 7.6.2.2a. Positive and negative aspects sustainability policy of Anasac*

Moreover Anasac has no basic evaluation of their production sustainability. A firm cannot evaluate and improve its sustainability without sustainability definition, management nor measurement. To improve their sustainability, Anasac needs to make a priority of sustainability, this should not be 4$^{th}$ ranked issue for a

agrochemical firm given the huge impact of both the use and the production of agrochemicals in a wine life cycle. In table 7.6.2.2a the sustainability policy of Anasac is divided into positive and negative aspects for a better overview.

The negative aspects are explained by the fact that sustainability is no priority for Anasac. Investments that could go to sustainable development go to product development, products with a lower eco-toxicological rate. There is no client awareness raising because the companies do not want to influence the client's product choice. They prefer a purely commercial relationship. Also Anasac has no knowledge on their current unsustainability. Without information there will be no action.

In the indicators list in table 7.6.2.2b the topic production recycling rate is not applicable for agrochemical firms. Sustainable product solutions is modified into Sustainable product development. An extra topic has been included called Technical assistance clients against evolution resistance and trace of residues.

| | |
|---|---|
| **Clear and transparent sustainability policy** | **1** |
| **Sustainability strategy with prevention, reduction goals and action plan** | **1** |
| **Environmental sustainability (Waste, energy and water management)** | **1** |
| **Production efficiency** | **1** |
| **Impacts measurement and knowledge** | **1** |
| **Sustainable product development** | **3** |
| **Social sustainability focus** | **3** |
| **Strong relationship with clients and awareness raising strategy** | **1** |
| **Technical assistance clients against resistance and residues** | **3** |
| **Help improve sustainability own suppliers and supplies** | **1** |

*Table 7.6.2.2b. Evaluation sustainability Anasac*

## 7.7 Supplier 3: Wine Label – Collotype

### *7.7 1 Product Analysis: Wine Label*

A product label is mainly used for identification, differentiating your product from the others. There is a huge diversity of labels in the food, beverage, wines and spirits industry. Determined by the effects required, the nature of the labeled product and the application method. Factors like surface smoothness, opacity, stiffness, porosity, water absorbency, wet strength, grain direction, degree of curl and costs need to be considered.

This analysis will focus on three main types within the food and wine industry. .

1. Glue applied label
2. Self-adhesive label
3. Shrink sleeve label

The application of glue applied paper labels was one of the earliest methods of labeling, and is very simple;

information is directly printed on regular paper. Even today, in spite of rapid growth of self-adhesive labels and other technologies, glue applied labels are still the main method of volume labeling bottles and cans with paper. These labels are often also varnished, coated or lacquered to provide surface protection.

Self-adhesive labels are more diverse than any other method of labeling, using paper and board, films, synthetic paper, foils and laminates, with a whole range of surface treatments and top coating. Although they are more expensive that wet-glue labels, they are simple, clean and more easy to apply with different systems. Its market share grows in the wine and spirits market. Self-adhesive will increasingly take over the market.

Shrink-sleeve label films tend to have higher costs. Relatively thick materials are used, the bottle is completely covered by the sleeve and the sleeve has to be converted into a tube after being printed. Raw materials are expensive, printing is expensive, gravure costs. But the technology is delivering good quality, high added value in decoration and for light weighted glass bottles the strength of the shrink-sleeve compensates for the glass' lower strength. The sleeve label market is growing, it is dynamic and a great opportunity in package decoration. But there are challenges with cradle to cradle recovery.

Each type of label is printed by different technologies available. These labels have different production processes which influence sustainability.

*7.7.1.2 Production Process and Materials*

In figure 7.7.1.2 the Co2 emission per ton of product is indicated for the three different labels. The emission has been calculated for the factory of Collotype Labels in Chile, but is used here as exemplary for the industry. The emission is divided into inputs, production and the distribution. The total emission and the distribution of this emission over these three steps vary per label due to different production processes of the labels and the primary materials used.

- 1. Glue applied Label

This label is produced in 4 production steps : "Printing", "Layering and Relief", "Varnishing and cutting" and "Packaging". During each of the steps emissions are present due to electricity use of the machines, as well as for transport and waste disposal of the non valued residues. The process produces a relatively high Co2 emission of 6,4 ton per ton of product. Specially the production process stands out, it contributes 37,6% of the emission. The inputs, 61,6% of total emission, are indicated in figure 7.7.1.2: foil, a more expensive and luxurious glue applied label substrate and is made of a thin aluminum foil, is often used as well as varnish, paper spreads and liquid paint. No adhesives are used. The labels are packaged into cardboard boxes. Also plastic bags, plastic film, pallets and corners are used.

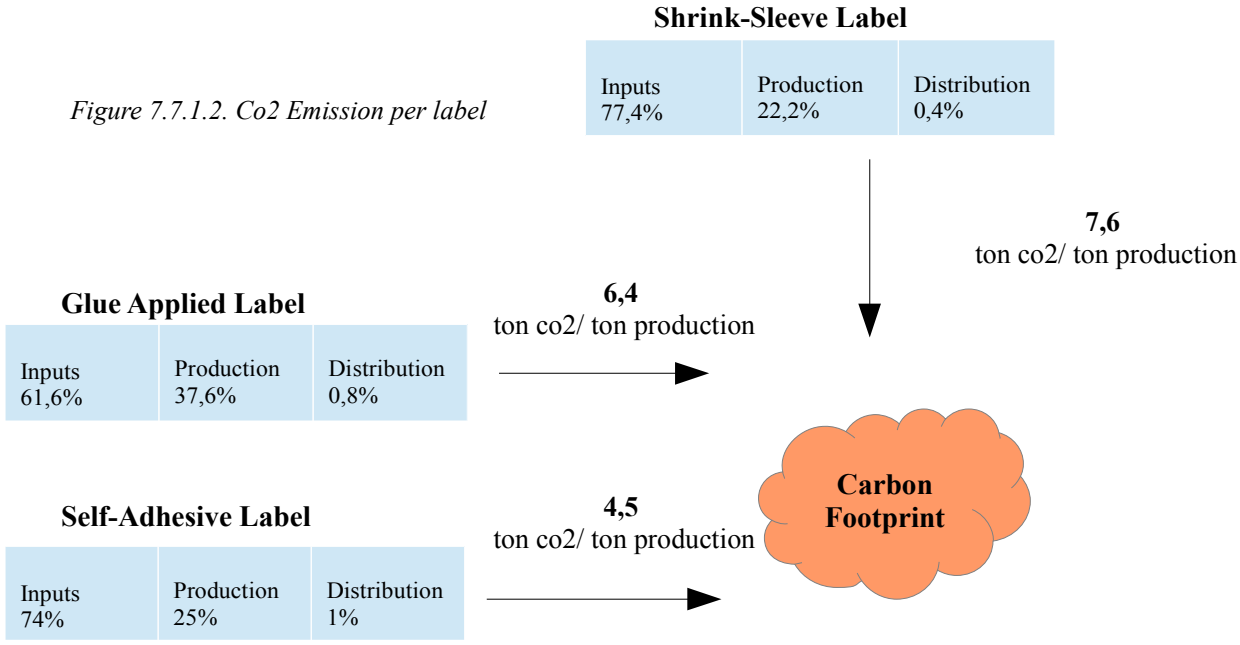



*Figure 7.7.1.2. Co2 Emission per label*

| Process | Material/input |
|---|---|
| **Printing** | Paper spreads<br>Liquid paint |
| **Layering and relief** | Foil |
| **Varnishing and cutting** | Varnish |
| **Packaging** | Box |

*Table 7.7.1.2a. Material inputs Glue applied label*

- 2. Self-adhesive label

As shown in figure 7.7.1.2 the self-adhesive label with 4,5 ton per ton product has the lowest Co2 emission of the three labels. The inputs claim a higher part of this total emission compared to the glue applied label, namely 74%, however the production process emission share is significantly lower with 25%. The production process of this label, is simple and easy with only three production steps: "Printing", "Revision and Packaging". During the printing process foil and/or varnish is applied and cuts are made. This process is realized by only one machine.

| Process | Material/input |
|---|---|
| **Printing (and finishing)** | Polypropylene<br>Polyethylene<br>Paper<br>Ink<br>Foil<br>Varnish<br>Cardboard cone |
| **Revision and Packaging** | Cardboard cone<br>Box |

*Table 7.7.1.2b. Material inputs Self-adhesive label*

The environmentally unfriendly part lies in the adhesives that are used: polypropylene and polyethylene. The labels with adhesive cannot be recycled. During the revision process, the labels are rolled onto a cardboard cone. This cone is packed into a cardboard box.

- 3. Shrink-sleeve label

As shown in figure 7.7.1.2 the shrink-sleeve label has the highest Co2 emission, 7,6 ton per ton of product, of all three labels. The inputs contribute 77%. As discussed to produce this label the thick PETG material is used, as indicated in table 7.7.1.2c. The production process as indicated in image 4. is divided into 4 steps: "Printing", "Formation", "Revision"and "Packaging". During the printing the ink is printed on the PETG material, the sides of the label are brought together which is then revised. The labels are rolled onto a cardboard cone and packaged into a cardboard box. As discussed the main challenge of these types of wrap labels is the recycling of the label and the PET plastic bottles where it is attached to. PETG film is less contaminating to produce and there are biodegradable shrink-wrap labels. Positive is that shrink sleeves reduce the weight of packaging material, eliminate the use of adhesives and the need for secondary packaging, and optimize shelf space through uniquely designed combo packs.

| Process | Material/input |
|---|---|
| **Printing** | PETG<br>Liquid paint<br>Cardboard cone |
| **Revision** | Cardboard cone |
| **Packaging** | Box |

*Table 7.7.1.2c. Material inputs Shrink-sleeve label*

*7.7.1.3 Label Image*

Image is a key word in producing product labels. When a product image attracts the consumer, this product most likely will be chosen over its competitors. For this a label has to be made of the best quality and needs a good design. Besides paper, this is where foil, varnish and paint plays a role. These make a label more complex to produce but also more beautiful. Beautiful and complex labels are often less sustainable.

- Paper

Paper is for all labels the input that has by far the highest emissions (Carbon footprint Collotype). It is important that sustainable decisions are made here. Made of paper, with a label the same dilemmas arise as with the cardboard boxes. No paper is 100% recycled and recycled paper is darker and therefore possibly less attractive.

As discussed plain paper is more complicated and messy to put on a bottle. Self-adhesive is both safer and cleaner. Producers prefer clean and neat product labels, moreover easy to apply, so they increasingly choose for self-adhesive labels. For the back of the paper on which self-adhesive label are attached, a client chooses between liner paper or transparent paper or PET, less transparent more white paper. PET appears more sustainable because it is better degradable. Because these labels cannot be recycled this is perceived as unsustainable given they cannot be burned and therefore contribute to landfill.
Clients take the decisions on their label format, these can be all shapes and sizes, and clients can be very creative. In the cutting process of the labels, high quantities of paper are lost. The simpler the label, such as a rectangular or square label, less paper loss. So instead of a highly complex and original label, a client in order to become more sustainable could discuss his design with the producer to avoid paper loss.

- Foil

As for material besides paper, foil has been identified as the main hotspot in label production (Carbon footprint Collotype). For two reasons: like paper a lot of foil is wasted during production process and the material is non environmental friendly. Very small lines of foil are used which cannot be applied efficiently. Foil is highly aesthetic and will be hard to get rid of. Alternative foil: Eco friendly metallic.

- Packaging

Packaging of labels can be perceived as unsustainable. In particular the self-adhesive and shrink-sleeve labels that need a cardboard cone and a cardboard box. The fact that glue applied labels are packaged with plastic bags, plastic film, pallets and corners for protection can be perceived as highly excessive. Some clients ask instead of a plastic bag for brown craft paper.

So a more complex label is less environmentally friendly. The best would be a white label, but this kills the product's image. A summary of ideal sustainability of labels is shown in table 4.

| **Ideal sustainability Label** |
|---|
| Plane paper label |
| Simplicity |
| No or less foil |
| No self-adhesive paper |
| Remove unnecessary packaging |

*Table 7.7.1.3. Ideal label sustainability*

*7.7.1.4 Wine Clients*

A product's image may be important, to wine it is crucial. The innovation director of Collotype Chile explains that the importance of a concept behind a wine's label is what differs it from other products. Expensive and traditional wine often comes with a serious and traditional label. Varietal wines usually go

with more daring and playful labels. A wine bottle is emotion, and the label plays a big role in creating this emotion. Not surprisingly, wine labels are the ones that most use the luxurious foil. Sometimes up to 4 different kinds of foil. They are also creative with colors.
According to this innovation director 'eliminating foil and colors, of course this is more environmental friendly. But the problem is killing the image. Your wine will lose value which is exactly what wine producers do not want'. As a consequence it is very difficult for the designer of wine's label to change his mind on the material he wants to use.

The Chilean wine is increasingly packaged in bottles instead of bulk, which means more demand for glass bottle labels. The director of Collotype Chile notes that amongst vineyards there is a mayor concern and requirements with respect to traceability, data, carbon measurements. Companies are becoming more green and increasingly want their chain to have less negative environmental impact. Clients are demanding more and more of their supply chain, not just quality. The director believes that after the bottle has been 100% neutralized, wine clients attention will be focused on improving the label's sustainability and of its supplier.

But what lacks according to him is willingness to spend a bit more money on a environmentally friendly paper label, which does not necessarily implies a change of image. It is uncertain to what extent this vision is true. This seems to be specially true for Collotype's envirolabel which is more expensive than similar labels of other manufacturers. Wine clients only want little volume production lines with envirolabels. because of international competition and higher costs. More research is needed to evaluate the willingness of wine companies to pay a higher price for more sustainable labels. Furthermore it is uncertain if label companies cannot produce more sustainable labels at lower prices.

He expects: 'Spending more money on an environmental label, it is a process that will advance with time, by demand of Europe, giving more resources to labels. When glass is optimally carbon neutralized, they will move to another actor in the chain. To lower the average.'

As far as this research goes, wine companies do not use shrink wrap labels so they choose between glue applied and self-adhesive labels. The world market is more and more heading to self adhesive labels, more practical and cleaner.

*7.7.1.5 Characteristics of Labels Caliterra*
As shown in figure 7.7.1.5 the labels for Caliterra's wine in organic conversion had a very sustainable image. They were made a 100% of recycled paper and had the following certifications: Green seal certified paper (made a 100% of recycled post consumer and alternative fibers), FSC (sustainable forest management), Green E (renewable energy certificate), Chlorine Free (label process).


*Figure 7.7.1.5. Caliterra's Organic label*

As discussed, Caliterra stopped their organic line and has now three different wine lines: Cenit, Tributo and Reserva. The Reserva and Cenit labels are produced by Collotype Labels Chile. The Tributo is produced by Acrus, because of a price difference. The characteristics of the three labels are indicated in table 7.7.2.1. Reserva and Tributo labels are glue applied labels, except for Cenit which has a self-adhesive label because it is the premium wine. Furthermore this label is more chic and is not free of acid nor elemental chlorine. Labels only wear a FSC certification. The labels have a rectangular design. All labels have 2 foils, no varnish. An example of Caliterra's Reserva label model is given in appendix II.

The manager of Collotype and contact person for Caliterra argues that there has been no effort at all from Caliterra in aiming for a more sustainable label. No other questions than commercial questions were asked, no studies were demanded. The sustainable aspects of Caliterra's labels are the FSC certification and the fact they use glue applied labels, which is really for practical application reasons. Caliterra's label demand or need is aesthetic. No environmental condition plays a role.

### *7.7.2 Business Analysis: Collotype*

*7.7.2.1 Supplier Description*

Collotype is part of Multicolor holding; the world's second biggest label producer. Because of the relatively small market, the Chilean factory has a mixed production area, ranging from industrial labels to wine, rum and beer labels. Labels for all main vineyards are being produced, Concha y Toro being the biggest client. Collotype Chile solely focuses on labels with aggregated value, not on the simple or cheap labels that supermarkets may use. Collotype Chile also exports in Latin America, mainly for spirits such as rum. So far

| **Reserva** | **Tributo** | **Cenit** |
|---|---|---|
| Estate label 2 | Estate label 24 | Cuvee Martele White |
| 3 Colors | 3 Colors | 3 Colors |
| 2 Foils<br>Stamp | 2 Foils<br>Relief | 2 Foils<br>Relief<br>Stamp<br>Adhesive |
| 115 x 80mm | 115 x 90 x 84mm | 298 |
| 80 gr/m2 | 80 gr/m2 | 194 ± 9 g/m2 |
| Especially designed for wine<br>Adequate resistance to humidity<br>High resistance abrasion<br>FSC certified<br>Free of acid<br>Free of elemental chloor | Especially designed for wine<br>Adequate resistance to humidity<br>High resistance abrasion<br>FSC certified<br>Free of acid<br>Free of elemental chloor | Especially designed for wine<br>Adequate resistance to humidity<br>High resistance abrasion<br>FSC certified |

*Table 7.7.2.1 Characteristics Caliterra's labels*

the firm has been mainly focused on internal market expansion, in 2016 plans are to expand on the export market. The principal strategies of Collotype are internal strategies; to grow profitable, to automatize the process, to install a wine area, to increase capacity, to continue developing staff and to create a free and creative culture within the firm. The director explains that they have an production growth of 15% and are already the biggest label producer of Chile, however the current objective is to double that difference. According to the director Collotype needs to further materialize their concept, 'we will never be the cheapest. Quality is most important to us, then service. The other producers do not understand this, they want to deliver rapidly, but are inefficient'.

Collotype aims to grow in future technology. The plant is now concentrated on plain, digital flexographics. However the world market is more and more heading to self adhesive labels. So investments will increasingly go there.

*7.7.2.2 Sustainability Policy*

This client's attention on sustainability of the label and its supplier is a big reason Collotype has engaged with a sustainability policy about one year ago. The main driver for this new focus is their main client Concha y Toro. With their supplier evaluation policy, Concha y Toro helps them with a sustainability transition divided into 4 points: *carbon measurement, an environmental policy, recycle plan* and *saving of raw material*. As a first step, Collotype has performed a carbon footprint measurement in 2015 because of Concha y Toro's help or pressure. Collotype now claims to have a good overview of their life cycle but recognizes to be just in the first phase. An environmental policy, recycle plan and saving of raw material will have to come next.

Concha y Toro, aside from environmental policy, also aligns its ethical policy with the label producer focused on *discrimination, child's labor, legal concepts, syndicates, fraud* etc. Not only Concha y Toro, also other vineyards ask them to fill in questionnaires about themes such as ethics, practices and carbon footprint before purchase. Increasing attention is paid to these social topics.

The good thing is their increasing interest and good intention of making sustainability more of a priority in their firm and production process. Quite a difference with another Chilean label company Acrus who currently has no sustainability management at all, nor a clear understanding of what sustainability is. Acrus has been receiving visits of Concha y Toro in 2015 and has been persuaded to align their ethical policy with Concha y Toro a few months ago. However they have less of a sustainability vision than Collotype and will not yet perform a carbon footprint measurement.

Aside from the first steps in sustainability and good intentions, the logistic manager of Collotype states the quality of the product keeps them occupied at the moment. Sustainability is not a priority, security, quality and service are. The sustainability definition of Collotype is summarized by the director as 'use less off all but produce the same quality'. This is more about product efficiency than about a systematic sustainability policy. So instead of eliminating foil, Collotype aims to use it more intelligently and have less error and loss. While a recommendation of the Carbon Footprint analysis was to 'eliminate foil in justified cases'. The director responds 'yes, if you have 3 foils, maybe you could ask yourself if that is really necessary. But really, a correction could make the difference'. He believes that one can even make a highly complex label more sustainable than a simple one as long as it is more intelligently produced.

The other four recommendations were:

1. Determination of the real emission factor of paper, PETG film and foil
2. Determinate the electric consumption of the company per area
3. Evaluate the installation of a self generating renewable not conventional system
4. Implement a Energy Management System (ISO 50.001)

Collotype is not very transparent on their sustainability policy or achievements. Collotype does perform several sustainable practices (changing light to led, and restructuring water use, EMS ISO 14001) but the director acknowledges the firm lacks documentation to indicate practices and achievements. Now that Collotype performed a Carbon Footprint and must increasingly pay attention to an environmental policy, recycle plan and saving of raw material, the firm needs environmental friendly technology, a complete traceability system to optimize energy and water use and implement a Energy Management System. For this they must continue their measurements.

- Product Efficiency

In the entire production process Collotype does aim for efficiency in use of materials, specially paper. Collotype has some Digicom machines that produce labels with less errors. Label companies always work with a paper margin and label error margin and when there is an error in a label, always a bigger part of the paper is cut. Paper waste is thrown in a waste container which is all sold and recycled. Excess paper is recycled and use in the firm's office. Other waste sources are self-adhesive paper, foil, aluminum plates, polymer, copper/gold plates, cardboard rolls. Cardboard is sold to a recycling company. Aluminum plates, foil and self-adhesive paper can not be reused. Copper/gold plates to print the foil into the label, reused until logo is changed by vineyard or it brakes.

Purchase of raw materials is always on demand. The demand of the clients implies how much raw material is needed. It is important not to buy too much because of a financial reason; a stock is immobilized capital, it is a cost to hold it there, and a quality reason; a material loses characteristics after a year, such as bonding.
Collotype has no packaging reduction strategy. However Concha y Toro has plastic and wooden round boxes for label rolls, and plastic square boxes for labels without rolls to avoid the continuous use of new carton boxes. No other vineyard has this yet, while it is more economical for both parties. Collotype could promote this amongst the other clients. The logistical manager does emphasize that if such a sustainable change would mean higher costs, the client would have to pay. Some other innovations on packaging were investigated by Collotype on demand of Concha y Toro but these did not work out. A different vineyard asked Collotype to reuse their labels, this did not work either and would probably be economically unsustainable for Collotype. There is another vineyard concerned with its packaging, eliminating the separators in the bottle box because English supermarkets demand this. In this case Collotype, feeling responsible for being a innovation leader in Chile, activates its network trying to facilitate contact between clients or producers in the world that have a solution to this.

- Sustainable product solutions

Collotype offers an alternative for foil: Eco friendly metallic. It is not clear to what extent this is more or less sustainable. Several more sustainable product options are HP electro ink, FSC certified and recycled paper and the self-adhesive Enviro Label. On the website it says: *developed specifically for the wine industry, Enviro Label is the first 100% recycled uncoated label stock that equals the whiteness and visual appeal of traditional uncoated papers. Produced from 100% recycled certified pulp, the chlorine free face stock is laminated onto fully recyclable PET liner, eliminating by-product waste.* However Collotype has difficulties selling this label because it is more expensive than similar concepts of competitors, partly due to the fact this paper is produced in and imported from Australia.

- Raising Clients Awareness

Collotype provides for many innovation meetings with clients in all areas. So that clients can implement changes and improvements such as the Killer white label for the ice test, substrates that are more resistant against velocity during application or infrared labels against falsification. The innovation manager explains however that the clients interest rises usually one or two years after an innovation is introduced, it is a slow process. Collotype Chile does not develop new things however adopt these from other factories within the holding. Then they diffuse these innovations in Chile to their clients.
Collotype does want to investigate and develop sustainable options, but many vineyards do not know of these options nor do they ask. There are innovation meetings and commercial support, moreover clients can ask for a new type of product or investigation, but an agreement with the client to sell and purchase more sustainably is missing.

In the end Collotype can only show options, the client, often very determinated, decides. Often a client wants a certain label but does not understand the difficulties and inefficiency to produce this. There are choices the client can take within its label design and within the production process also. But without awareness raising on the more sustainable product choices a client can make in a label, these will not be taken unless a client asks for it, because of the label's crucial role in product image. Awareness raising is important because each label has different sustainability implications because of material and production process. This leaves many opportunities unseized and suppliers and clients will have to work together to grasp these.

*7.7.2.3 Hot Spots: more important positive and negative aspects of their sustainability policy*

Collotype Chile is a company recently engaging in sustainability. This is due to corporate pressure, but also the company understands this is where future is heading. The company aims for product efficiency, recycling of materials and some eco friendly technologies but these are all separate issues. In order to become more sustainable Colltype needs to develop an overarching environmental and social sustainability plan with goals and actions. Concha y Toro can help them with these but they also have to decide for themselves and really make a priority of sustainability. Specially if the director believes clients will increasingly address their attention on label production and suppliers sustainability. The Carbon Footprint measurements and its recommendations is a first step into the right direction and can really help with this action plan. A key factor furthermore is the collaboration of supplier and client. The supplier needs to offer more sustainable product

solutions, discuss these with the client, and raise awareness on the label production process to achieve besides better quality also better efficiency.

| Positive aspects | Negative aspects |
|---|---|
| Restructuring of policy, including sustainability<br>Efficiency in use of materials<br>Sustainability transition: environmental and ethical policy<br>Economically strong | Cost reduction and quality before sustainability<br><br>No sustainability report, few certifications<br><br>Lack of focus on social sustainability |
| Increasing knowledge and measurements to reduce negative environmental impacts<br>Investigation role | Insufficient transparency on strategies and reduction rates<br>Lack of documentation |
| Offer several sustainable product solutions<br>Recycling practices | Need for more sustainable product options<br>Insufficient awareness raising of sustainable product solutions for clients<br>No packaging reduction strategy |
| Engagement in clients sustainability transition (Concha y Toro) | Needs to develop own sustainability transition strategy |

*Table 7.7.2.3a. Positive and negative aspects sustainability policy of Collotype Chile*

The negative aspects are explained by the fact that sustainability is no priority to Collotype Chile. The company has a good intentionality, but no proper sustainability definition. This definition deals more with product efficiency than with a sustainable system of production. Also for product solutions the company mostly focuses on innovative options without sustainability aspects. Negative aspects also exist because Collotype has only recently made a start with sustainability, they have to learn and practise. It is a good thing they receive help from Concha y Toro but it is important they develop their own sustainability strategy.

| | |
|---|---|
| **Clear and transparent sustainability policy** | 2 |
| **Sustainability strategy with prevention, reduction goals and action plan** | 2 |
| **Environmental sustainability (Waste, energy and water management)** | 2 |
| **Production efficiency** | 3 |
| **Product recycling rate** | 3 |
| **Impacts measurement and knowledge** | 2 |
| **Sustainable product solutions** | 3 |
| **Social sustainability focus** | 1 |
| **Strong relationship with clients and awareness raising strategy** | 1 |
| **Help improve sustainability own suppliers and supplies** | 1 |

*Table 7.7.2.3b. Evaluation sustainability Collotype Chile*

## 7.8 Supplier 4: Corrugated Box – Envases Impresos Roble Alto

### *7.8.1 Product Analysis: The Corrugated Box*

*7.8.1.1 A Variation of Corrugated Boxes*

Paper is the primary material to form a corrugated board needed to produce a corrugated box which is used in the food sector to transport a high variety of products safely. Paperboard is thicker than paper with a higher weight per unit area and often made in multiple layers. It is commonly used to make containers for shipping—such as boxes, cartons, and trays—and seldom used for direct food contact. Within the variety of paperboards two types are mostly used for corrugated board; white board[9] and fiberboard[10].

Corrugated boxes are named as such because of the fluted inner layer that is sandwiched between layers of linerboard. Three types of paper are used to form the board: a central nerve of undulated paper (onda 40%), strengthened externally by two paper layers: kraft liner (30%), test liner (30%), which are glued on the crests of the onda. Corrugated cardboard is a light material which resistance is based on the completeness and vertical work of these 3 paper lamina. Even though corrugated cardboard is quite a simple product surprisingly there is a great variety to be found. Other inputs besides paper are: adhesives, ink, printing plates, knives, zester and boards to form the boxes, straps and stretch film for packaging of boxes.

*7.8.1.2 Recycling*

Corrugated packaging is the largest segment of the packaging industry. It is perceived as an environmental friendly packaging material because it is made of a renewable resource: paper. This also makes a corrugated board relatively easy to recycle. As a consequence corrugated board is the most recycled packaging material on earth. This would also mean that a recycled board could be easily used to produce another corrugated cardboard. This is not entirely true, the recycled content of a corrugated board is highly variable. A number of factors contribute to the feasibility of incorporating recycled content into corrugated board. Each time fibers are recycled they become shorter and weaker. It makes sense for some end-users of corrugated boxes to opt for the highest content of virgin fiber attainable to assure quality.

Corrugated boxes that contain no recycled content at all are rare, if not nonexistent. Moreover corrugated boards with recycled-content can have equally good quality. There are producers, in for example Canada, who reached a 100% recycled content for their corrugated board. However the average corrugated sheet has a minimum of 35% recycled content and usually tops at no more than 50%. There are products durable enough to require less than maximum protection from boxes or they have primary packaging, such as metal cans. This is also the case for wine, being transported in bottles the product needs less protection from the boxes and may therefore favor recycled-content boxes.

Recycled contents are derived from two different sources; pre-consumer and post-consumer recycled content. “Pre-consumer” recycled content includes cardboard that is left over from the process of converting board from a mill into a converted product (a box, bag, or carton) and then sent back to a mill for recycling, while “post-consumer” material is a converted package that is sent for recycling after use by industrial, commercial, institutional or residential users. Though some post consumer waste is sometimes used, most of this recycled content is post production or pre-consumer waste. That essentially means trim, cut off, rejects, die cutting waste, returns, etc.

A corrugated box can be said to contain a specified percent of recycled content, but the exact makeup of that content is usually unknown by client or end-user. The primary reason most corrugated manufacturers refuse to commit to a guaranteed recycled content percentage is the fact most of this recycled content is pre-consumer waste. In house waste varies from day to day and so does the paper and board that are produced

9 Made from several thin layers of bleached chemical pulp, white board is typically used as the inner layer of a carton. White board may be coated with wax or laminated with polyethylene for heat sealability, and it is the only form of paperboard recommended for direct food contact.

10 Fiberboard can be solid or corrugated. Fiberboard’s resistance to impact abrasion and crushing damage makes it widely used for shipping bulk food and case packing of retail food products.

from it. And even if a given box does contain recycled fibers, there's no way of ascertaining what percentage of the fibers have been recycled once, twice, thrice, etc. Paper fibers can generally be recycled between four and nine times. The fact that recycled fibers lose their strength means that each preparation of paper used for cardboard is different, this depends on what kind of quality one desires for a cardboard. To achieve this quality the industry cannot exist without the introduction of virgin fiber at some point in the paper cycle. It needs longer virgin material to replenish the shorter and thinner paper fibers that gradually wear out as a result of repeated recycling. It is the changing character of the recycled content in a box, due to post consumer waste variability and unique preparations, that complicates its communication.

It is not impossible to communicate though. The percentage of recycled content of a box for the client should be known in order to avoid misleading of clients and for clients to make a good purchase decision. In the case of EIRA, the paper certificate of Papeles Cordillera, the paper and board supplier of Envases Roble Alto indicates that*: "The elaborated products by Papeles Cordillera S.A. in the factory in Puente Alto- Santiago, Chile, are fabricated with recycled fibers of pre-consumer and post-consumer corrugated board, of national origen"*. On the website is written: *"Our paper is principally fabricated with recycled material, recollected in the city"*. It is positive that the use of recycled fibers is communicated but no percentage of the recycled content is given. Furthermore the certification leads to believe their papers are produced with a 100% recycled content. This is also understood by their clients such as Caliterra. As discussed these percentages vary a lot in practice and EIRA could be more transparent and give clear data on the percentage of recycled-content of their corrugated boards and boxes.

The future of recycled fiber is assured because of its association with sustainability and environmental friendliness[11]. Aside from environmental friendliness, 100% recycled content for boxes is very likely to reduce material cost and to improve productivity. The future of virgin fibers also is assured because the supply of recycled is not large enough to completely supplant virgin. In conclusion, it's the end-users' responsibility to make decisions about virgin vs. recycled. In so doing, end-users need a good understanding of the differences between the two and suppliers should provide this information.

Aside from paper, the second primary material are adhesives, used to put the three plates of the corrugated cardboard together. The adhesive is made with corn starch and chemical components. A third important input is paint/ink. The paint is used to decorate the cardboard according to the brand of product it is destined for.

*7.8.1.3 Wine Boxes*

The boxes made of corrugated cardboard used to store and transport wine bottles are simple boxes in comparison to other categories. Wine is already bottled and therefore requires less protection from a cardboard. The importance of a corrugated box for wine is mainly to provide resistance and printing possibilities. A wine box needs a separator within the box to separate the wine bottles from each other to avoid the friction of glass and a white or transparent paper wrap for aesthetic purpose.

The sustainability options of a wine producer in a corrugated box are limited. Wine boxes are already more simple of character which works out positively for product sustainability. Most choices are linked to the use of paper. The most sustainable option is a box with high/maximum recycled content (craft), less virgin cellular is believed to be more sustainable because this means a higher amount of recycled paper and less new raw material whereas the resistance of the box can be the equally strong. If printing quality is very important, a white liner paper is recommended. White liner paper is more expensive paper. So printing quality shouldn't be a requisite of the wine producer. Also less use of paint and less different colors for the design of the box is favorable. On the other hand, a box with high recycled content is brown and a together with a simple printing design such a box could be perceived as cheap, contrary to the image the winemaker wants. The box had best be produced without any protective wax layers within the box, for those eliminate the possibility to recycle.
Also the packaging of the boxes should be taken into account by the client. The amount of plastic material

11 It is important to mention this higher environmental friendliness of corrugated boards with 100% recycled content compared to virgin boards has not been proved scientifically. The COMPASS software tool used by environmental advocate GreenBlue and the Sustainable Packaging Coalition (SPC) shows that 100% recycled content has greater global warming potential (GWP) than virgin corrugated board (even when using European data).

used for protection against climatic contamination can be reduced to a minimum or perhaps eliminated entirely. To avoid contamination in a different way more structural measures should be taken.
Also wine producers could consider to eliminate the transparent wrapping paper. Separators may be not so relevant when this contains recycled board. The adhesive cannot be eliminated, however the client could look at natural glue instead of chemical-based adhesives.

Important is that a wine producer understands the production concept of a corrugated board and box. Then a wine producer could meet with the supplier to discuss the design of the box and aim for an eco design with bigger cuts and less border loss. A summary of characteristics of a sustainable wine box versus an unsustainable one is given in table 7.8.1.3.

| *Sustainable box* | *Unsustainable box* |
|---|---|
| 1. Box with maximum recycled content | Box with high virgin fiber content |
| 2. Eco design | No attention on cuts and border loss |
| 3. Printing quality no requirement<br>Little use of paint | Printing quality priority and therefore use white paperboard |
| 4. Minimum packaging material | Double protection layer boxes |
| 5. No wax layers | Wax layer |
| 6. Natural glue | Chemical-based adhesive |
| 7. 100% recycled separator | Separator with high virgin fiber content |
| 7. Elimination of transparent wrapping paper | Aesthetic details inside box |

*Table 7.8.1.3. Characteristics of a sustainable and unsustainable corrugated wine box*

The sustainable characteristic of the Caliterra wine boxes is that they are brown craft boxes which contain recycled content, without a wax layer. Unsure whether they have double packaging protection.

## *7.8.2 Business Analysis: Envases Impresos Roble Alto*

*7.8.2.1 Supplier Description and Production*
Envases Impresos Roble Alto (EIRA) is the supplier of corrugated boxes for Caliterra and Errazuriz. EIRA is a daughter company of the Chilean holding CMPC S.A (Compañia Manufactura de papeles y cartones), and part of the CMPC papers department together with Forsac, Chimolsa, Papeles cordillera and Cartulinas CMPC.

Envases Impresos (industrial boxes) and Envases Roble Alto (horticulture) fused into one company Envases Impresos Roble Alto. This means that Envases Impresos Roble Alto now has three plants located in different areas of Chile namely Til til, Buin and Osorno. The factory in Osorno is the most southern of all corrugated board companies in Chile. EIRA's plants are all able to produce any type of box for all sectors, so that whenever there is an error at one factory other factories can produce the same. This strategy implies higher costs but for EIRA quality and service are valued higher. Today EIRA produces corrugated board for industrial packaging purposes for the wine sector and the industrial sector (horticultural, meatpacking and salmon industry). EIRA is the biggest corrugated board producer in Chile, the firm produces 167.486 ton of corrugated cardboard annually which means a 33% market share. The production of corrugated board per factory is shown in table 7.8.2.1.

| **Business unit** | Headquarter | Buin Fabric | Til Til Fabric | Osorno Fabric | Total |
|---|---|---|---|---|---|
| **Production ton/year** | 0 | 88.709 | 49.934 | 28.843 | 167.486 |

*Table 7.8.2.1. Corrugated cardboard production per factory (sustainability report CMPC)*

Being part of the CMPC holding is beneficial to EIRA and leads to differentiation from other Chilean corrugated board producers. Because the entire chain belongs to one group EIRA has no risk on stock outs.

Economically they are more sustainable than others. The Buin factory buys 20% of that paper compared to production, the other factories only around 5%.

*7.8.2.2 Sustainability Practices and Evaluation*

In 2009 CMPC started to include objectives in its strategy on climate change mitigation through both the increase of renewable energy sources and a focus on sustainable development through carbon footprint measurement of its products. Consequently, EIRA is pressured to follow this lead. In the paper section of their holding, EIRA is however the only company not certified with FSC so it could be said that instead of taking the lead in this process they rather follow the holding's developments.

Under influence of the holding and foreign pressure, EIRA has developed a good intentionality concerning sustainability. It has made them rethink corporate definitions. Recently in 2014 the company has put one officer in charge of environmental responsibility. They have implemented a renewed policy on sustainability. They have defined what changes they want to make and in what way they want invest in sustainability, goals and objectives identification. They have chosen a variation of certifications that correspond to these goals. Now they aim to reach the newly chosen certifications. These certifications are FSC, HACCP, Good practices manufacturing industry and Clean production agreement. Moreover EIRA is assisted by Concha y Toro in an ethic transition/alignment: discrimination, child's labor, legal concepts, syndicates, fraud etc. This indicates their taking the first steps towards a sustainability transition of their policy and production process.

- Carbon Footprint

In 2011 the firm started measuring its products' carbon footprint. The carbon analysis showed that the main part of the carbon footprint was formed by paper consumption, this primary material makes up 82% of the footprint. The other two important carbon indicators were the transport of inputs (5% of footprint) and electricity consumption (4% of footprint). The produced cardboards have an emission of 1031 Kg CO2/ ton product in 2014. For corrugated cardboard inputs account for 92,8% of the footprint, 948 Kg CO2/ ton product. The production process itself only adds a small 5,6%, 58 Kg CO2/ ton product. EIRA has a higher than average CO2 equivalent per ton of packaging. The average calculated greenhouse gas balance associated with the production of corrugated packaging is 784kg (Fefco, 2010).

Aside from carbon other important unsustainable aspects of the production process investigated were cardboard loss, because of cuts (main waste, 14% of loss) and borders; energy use in the factories (fuel of own boilers, to generate heath and steam) which is a big part of the total production costs and excessive packaging material (plastic).

- Environmental Sustainability

EIRA's program focuses on environmental sustainability. EIRA has measured its carbon footprint through a life cycle approach two times, in 2011 and 2014. This has helped them a lot to understand their business better and to analyze before taking action. EIRA uses the carbon footprint measurement also to position themselves on the international market.

EIRA has good knowledge on their environmental impact in terms of waste and resources. They measure gas, oil, electricity consumption on a monthly basis. Also monthly, they check water quality and control. Each factory has a liquid industrial waste treatment plant under Chilean norms that treats the effluents and recycles water. It remains unclear how much waste water recycled. There is no action plan on how to improve these actions. The environmental management program deals with revision, sampling, control and declaration of emissions, waste and resources. No items on sustainability improvement or goals are included.

Production waste of the factories is divided in three: cuts and boarders of the cardboard, domestic/industrial waste and dangerous waste. The factories produce a minor quantity of dangerous waste: batteries, solvents, machine maintenance (oil), contaminated clothes or textile. This waste is stored in a special storage. The burning process of photo polymers leaves waste: the rests that are not burned because of the ultraviolet light during the process. Also during the cleaning process of these photo polymers chemicals are used. The factories have disposal containers for industrial waste, some plastic and domestic waste. Both industrial and domestic waste (wood and plastic) is recycled. Solid waste, sacs and plastic bags of adhesive materials, is bought by a company and reused. Liquid waste of maintenance is also sold and reused.

No policy exists on waste reduction nor is there an unnecessary packaging strategy. Double protection of cardboard packets is the clients' choice, although they could be advised not to. This does not happen because there is no direct contact with the client. Awareness raising of the client could help to avoid the use of unnecessary packaging or additional coating layers on the cardboard for climatic protection.

- Product Efficiency

Positive for sustainability is that all surplus of the corrugated boards is transformed under pressure into a bale by a machine, transported to Papeles Cordillera (also part of CMPC), where is its transformed and recycled again into primary material, paper or cardboard rolls. Other companies also send their paper and board rests to Papeles Cordillera. The estimated recycling rate of paper and cardboard in Chile in 2010 is 82% (Ministerio del Medio Ambiente, 2012). This rate is perceived as very high and its correctness may be questioned, but of all packaging material (glass, metal, plastic) paper and cardboard has the highest recycling rate. During the production process the paper maker decides how many virgin cellular it should use in order for the paper to be strong enough. The CMPC sustainability report stated that in 2014 Papeles Cordillera in Chile had a recycled paper consumption of 434 thousand tons. Papeles Cordillera corrugated board production in 2014 was 394 thousand tons. Papeles Cordillera paper production in 2014 was 294 thousand tons. Total production paper and cardboard combined (394 + 434=) 688 thousand tons. This means some 63% (434/688) of total production of Papeles Cordillera in Chile was based on recycled fibers.

Thanks to improved efficiency in the production of corrugated boards, in 2009 manufacturers used only 1.09 tonnes of paper to produce one ton of corrugated packaging (compared to 1.13 tonnes in 2006). EIRA uses more paper to produce corrugated boxes than the corrugated industry on average. EIRA's Buin factory needs 1.18 ton of paper to produce 1 ton of corrugated packaging, the other two factories even use 1.28. (Fefco, 2010).

- Sustainable Product Solutions

With paper consumption indicated as main polluter it becomes clear that EIRA is quite dependent on their own suppliers. And with production inputs making up 92,8% of the carbon footprint, EIRA realizes this is where changes should take place. But what to do with the high negative environmental impact of paper inputs when you already use recycled paper? One possible answer is investing in Eco design of the corrugated cardboard. This is intended to use as less paper weight with same resistance, a design on positioning of fibers that makes the paper more resistant. It seems EIRA is working on this, but still silently. Another option would be working on the cuts, making them bigger to use less paper. However, reducing cuts and borders is complex, because all cardboard dimensions are different. On the other hand, less cuts would mean higher profit. True, the cuts are sold and recycled, but the value in the product is higher than in the sub product. Even though clients need to understand the changes and the concept of eco design, so far EIRA does not intend to develop any kind of meeting with the client.

The main goal for EIRA is to continue to maintain leadership in corrugated board markets, both in capacity and service. Staff will be working on continuous product improvement. Also they want to further develop a good and clear vision for improvement and continuity. They are thinking about making the carbon footprint measurement an annual practice. And the goal according to the interviewee is to decrease the footprint by 15% in 4 years . They will continue working on eco design of cardboards: less paper weight, bigger cuts and less borders. Their goals are mainly environmental goals. Their main challenge will be to meet the requirements of their newly developed certifications.

*7.8.2.3 Hot spots: more important positive and negative aspects of their sustainability policy*

In order to provide a more sustainable supply box manufacturers should focus on:

- High production efficiency to reduce usage and losses of paper per product
- Reducing Co2 emission per product
- Producing a high quality box with 100% recycled content
- Researching and developing creative product solutions to reduce paper use

Envases Impresos Roble Alto is a company recently engaging in sustainability. This due to corporate and international pressure, but the company does understand this is where the future is heading. They realize they need to keep up in order to be productive. Moreover, they expect some sustainability practices to lower production costs. In this light they have started redefining their corporate identity which goes hand in hand with their aim for various certifications that encompass sustainability aspects. The firm has started to perform a basic evaluation of their environmental performance where one employee is in charge of themes such as environmental qualification, hygiene, legal documentation and waste management. Through carbon footprint measurement they identified the main working areas of sustainability and this has led them to analyze possible solutions such as eco design.
Even though good intentionality in sustainability of the company has been identified, a lot of work still needs to be done in order to become a sustainable supplier for clients. The global corrugated sector is already a pioneer in CO2 measurements so this is nothing high standard (Fefco 2010). The important issue here is that the company through measurement will start to set goals, act and reduce their negative impacts. EIRA so far lacks clear sustainability goals and reduction objectives. When asked for these goals during the interview the person in charge only send EIRA's environmental program with an activities description, without any environmental goals, performance evaluation or strategy. Furthermore any sustainability strategy they have, even though it solely has an environmental focus, and achievements within this strategy lack transparency and could be communicated better. They recently started thinking on solutions such as eco design, but when will it be put into practice? How will they reduce their energy use? Is this a priority? What are their thoughts on renewable energy sources?

Furthermore a corrugated box manufacturer this dependent on the input (paper) of its suppliers for sustainability, such as EIRA, might want to take on an active role improving and requiring optimal sustainability of its suppliers. EIRA does not do this. With their clients EIRA has a mere commercial relationship, where there is an opportunity for an awareness raising strategy because it has been identified that clients who know the production process better can make sustainable decisions (on packaging for example) and further pursue tactics such as eco design.

| **Positive aspects** | **Negative aspects** |
|---|---|
| Basic evaluation environmental sustainability of company and product | Evaluation exists of measurement, no reduction. Lack of goals and action plan to achieve those goals. |
| Person in charge of environmental performance | Person in charge does not focus on real sustainability practices, more on environmental qualification, hygiene, legal documentation etc. |
| Redefining corporate identity | Lack of transparency sustainability strategy |
| Engagement in clients sustainability initiatives (Concha y Toro) | Mere commercial relationship with clients. Not active to improve sustainability of own suppliers, even though high dependency on sustainability supply |
| Offer clients corrugated boxes with recycled content to a certain extent (both pre- and post-consumer consumer content) | Lack of transparency on % recycled-content of corrugated box |
| Focus on sustainable product solutions (eco design) | High Co2 emission per product compared to industry |
| Recycling of production waste | High paper use per product, low efficiency? |
| Sustainability intentionality | Lack role and transparency social sustainability |

*Table 7.8.2.3a. Positive and negative aspects of sustainability policy Envases Impresos Roble Alto*

Maybe most important, EIRA could learn from international corrugated manufacturers and move toward producing 100% recycled-content boxes. In table 7.8.2.3a. the sustainability policy of Envases Impresos Roble Alto is divided into positive and negative aspects for a better overview.

- Reasons why some aspects are negative

The negative aspects are explained by the fact that sustainability is not top priority to EIRA. The company has only recently started to engage with sustainability and still lacks a sustainability strategy. Perhaps even more important than increasing measurements and knowledge, a concrete action plan on enhancing sustainability in both the product and production process is missing. Finally, environmental sustainability is a priority over social sustainability.

| | |
|---|---|
| **Clear and transparent sustainability policy** | 2 |
| **Sustainability strategy with prevention, reduction goals and action plan** | 2 |
| **Environmental sustainability (Waste, energy and water management)** | 2 |
| **Production efficiency** | 3 |
| **Product recycling rate** | 3 |
| **Impacts measurement and knowledge** | 2 |
| **Sustainable product solutions** | 3 |
| **Social sustainability focus** | 1 |
| **Strong relationship with clients and awareness raising strategy** | 1 |
| **Help improve sustainability own suppliers and supplies** | 1 |

*Table 7.8.2.3b. Evaluation sustainability Envases Impresos Roble Alto*

## 7.9 Supplier 5: External Grape Supply

### *7.9.1 Product Analysis*

*7.9.1.1 External Grape and Sustainability*

Estimates are that per ton of grape one can produce 756 bottles of wine (Cornell University, 2011). Wine companies need large quantities of external grape from other vineyards to produce enough wine volume. Grape used by Viña Concha y Toro in 2014 for its wine production consisted for over 70% of external grape (Sustainability Report CyT, 2014). Though a firm can make sure its own practices on the vineyard are managed well, it is more difficult to assure similar management on the vineyards of suppliers. Good management of the vineyard is important since grape quality is associated to it. Because of the difficulty to control suppliers, the firm's proper grape is mainly used for premium wines. Since the grape quality of small producers[12] is not so well developed, wine companies tend to buy grape from the relatively bigger vineyards in Chile, acording to the representative of fruits and vineyards of Indap.

Wine companies are highly dependent on their external grape and its production process is hard to control. In addition, experts of Santa Rita and Wines of Chile believe this is the weak part of the wine supply chain sustainability.

12. Dividing producers between small-medium-big however is a criteria and unclear definition

*7.9.1.2 Grape Supplier and Client*

For this analysis external grape sustainability is divided into two parts; sustainability of the relationship Caliterra-supplier and the sustainability of the supplier itself. First of all, the relationship between grape supplier and client must be 'sustainable' and fair. This is important because a grape supplier tends to be more vulnerable than other suppliers. A grape supplier is not the huge manufacturer, such as glass, that offers its product in a way he wishes. Grape is a primary good and it could be said that often a grape supplier needs the client more than the other way around. Instead of supply, demand rules in the grape business, the client (the big and powerful wine company) rules and when unsatisfied one grape supplier is easily substituted for another.

Important aspects that weaken this relationship in Chile have been identified during this research: unfair prices, lack of self-organization of grape suppliers, spot contracts and a lack of negotiation possibilities for the supplier.

- Unfair Prices

As the representative of fruits and vineyards of Indap states the grape market in Chile is currently experiencing a price crisis. Grape prices are currently extremely low, as has been discussed in chapter 4 This constitutes the most critical point for grape producers, especially for those grape producers that produce for volume, not so much for quality production. With quality grape a producer can differentiate himself and despite higher production costs, higher prices tend to make quality grape a more profitable good.
A representative of the Foundation for Agricultural Innovation (FIA, Fundación para la Innovación Agricola) explains that 'the price for grape in Chile is highly affected by the international market. The impact of this price change lies upon the shoulders of the grape producer'. The representative of fruits and vineyards of Indap adds that 'prices are not just low, they are below production costs. The price for one kilo of grape is 50-80 pesos. The production costs, even for a small producer without labor force, are more than 80 pesos. Some producers do not yield because of this'. The Chilean Fair Trade representative confirms that in the conventional market the price for grape lies sometimes lower than production costs. She explains that some grape producers need a second salary or must simply stop producing.

The representative of the FIA argues that, because of these low prices, grape producers are looking for alternatives and strategies to increase their capabilities and options; 'vineyards that produce their own wine have increased in number a lot. Probably producers have done this mainly because of price'. The Fair Trade representative points out that producing wine as a strategy is not possible for small scale producers since it is very difficult when resources are scarce. She states that production of Fair Trade grape has provided an alternative for small scale producers; 'they have started to understand the benefits of Fair Trade: a minimum price and a premium. Furthermore it is a more transparent business where prices always cover production costs'.
Both the representative of Fair Trade and of Indap emphasize the importance of companies and producers alleviating market price fluctuations. Concha y Toro claims to be very sustainable, also with its suppliers, but they set the market price at a level far too low for grape producers. The Fair Trade representative states that Concha y Toro, by far the largest wine company of Chile, should do more to change the status quo. 'Be a true leader in these themes, because with more power comes more responsibility'.

- Lack of Self-organization of Grape Suppliers

How come grape producers are not demanding a higher price, when market prices do not even cover their production costs? Both vineyards, governmental institutions and organizations blame this partly on Chilean culture. Despite some success stories cooperation in Chile is difficult because Chilean people due to culture and history tend not to unite. The representative of the FIA explains that 'while some vineyards are pushing their producers to the limit on price levels, paying them as little as possible, there is a total disconnection between grape producers'. Even though they know, especially now with the wine market being challenging, this will provide them with better chances to compete. According to the Fair Trade representative producers within a cooperation can develop different strategies to compete on the market. She argues that they are assured of a buyer and that often prices are better also. The group can sell its grape as a whole to stand stronger and have better negotiating power. Chance of achieving financial access improve and they could unite and provide technical assistance to the ones in need. Now vineyards are working individually which of

course diminishes their possibilities to negotiate. Indap's representative adds that commercial, technical, price and market information flows to the grape producer directly from the wine company. Other information sources are hard to find. If the grape producers would organize themselves they could have their own information flow which would increase their knowledge and power. At the end of the day, the grape production is of fundamental importance for vineyards.

The manager of the vineyard San Pedro y San Pablo also sees a big limitation in the Chilean culture in order to respond to low prices. 'Chileans believe they are very self sufficient. In the valley we grape farmers should unite and demand a common price for our grape. But instead several farmers tend to lie about production numbers (costs, prices) in order to attract clients by prestige'.

- Spot vs. Long term contracts

Providing technical assistance and maintaining a good relationship is essential to achieve high quality and sustainable grape. Therefore long term relationships are believed to imply higher quality and sustainability achievements since client and supplier can work towards a goal. In short term relationships this will be more difficult. In the '90's in Chile long term relationships between client and producer where somehow valued; contracts were signed for more than 20 years. Today, contracts are rarely longer than 3 years and the majority of grape producers are contracted annually. These annual contracts are called spot contracts. The reason for this is according to Caliterra's grape supply manager that 'its a dynamic business and grape can lose its quality. You do not want to be stuck to a producer'.

Client and supplier being bound to each other for only one harvest works out positively for the client and negatively for the supplier. For the client a spot contract is rather attractive, if unsatisfied about the grape's quality he can simply stop the collaboration the next year. When satisfied he can always renew the contract with approval of the producer. A spot contract is very risky for grape suppliers, prices are often lower and production sales are uncertain in terms longer than a year which negatively affects investment. Producing in a more sustainable way or even shifting from conventional to organic production will be very hard or even impossible in those circumstances. Moreover, the Codigo Nacional de Sustenabilidad requires that a certain percentage of suppliers is sustainable (see next paragraph), but this percentage is linked to long term suppliers only. So any wine maker who cannot find enough sustainable suppliers might be tempted to reduce its share of long term suppliers and increase the short term share to satisfy the requirements of the Codigo. To grape producers spot contracts imply higher vulnerability because of market fluctuations, so the grape producers are the ones that have to deal with demand variations. All interviewed grape producers prefer a long term contract. They understand the market is very variable but they need a contract for at least three years. As a consequence the strategy of the producers is to maintain close relationships with buyers and obtain as many long term contracts as possible. According to Caliterra's representative a spot contract is the logical way to start of with a producer. Moving on to a long term contract is dependent on the quality of grape and the relationship with the producer. When the grape quality is good and constant and the producer can be trusted, the client will want to assure the purchase of this grape.
The relationship between client and producer consists of visits to the vineyard, to provide technical assistance or to check on progress. The number of visits can vary from two times at the beginning and end of harvest, or every two weeks. The producer needs to satisfy certain requirements of the client, mainly of the wine maker. Requirements deal with the production process, which agrochemicals used, when to harvest and more. Producers state that every client has other requirements and that for a higher quality grape more labor is required. These requirements are settled in the contract. The commercial relation is complicated because of the broker's presence, discussed below.

- Lack of Negotiation Power of the Supplier

When the producer has delivered its harvest, he will not be payed right away. The client decides on a number of payment quotas, up to eight or more. This can be complicated for the producer given he has invested a lot before and during harvest. According to the Fair Trade representative quotas do help producers to not spend everything right away but they should be able to decide that for themselves. According to her this aspect can be compared to a class difference. All producers interviewed express that they have little to no negotiation power during the set up of the contract. Of course they can refuse, but often they are happy with big clients and they prefer to sell. The client decides the price, amount of quotas, payment period, contract period etc.

As discussed, this lack of negotiation power has to do with producers acting individually.

For the settlement of a deal between client and producer a broker is used. A broker has detailed information on all the lands they manage and helps a client find a specific grape in a specific area. The broker selects several producers in the database and takes the client on a visit to these vineyards. After selecting a producer the client discusses the price with the broker and the broker discusses the conditions with the producer. When unsatisfied, some negotiation on price levels is possible. When both parties are satisfied the broker then asks a commission of 1%, both from the client and producer. The client benefits because it is more efficient and less risky because of the broker's knowledge of the area. The producer benefits because it is hard to find buyers by yourself and he wants his grape to be bought quickly, preferably by a good vineyard (higher price), and best of all a vineyard with prestige (propaganda for producer itself).
However, according to the representative of Indap there are way too many actors in the grape commerce. So many brokers and intermediate actors are active, sometimes up to three to find more remote producers and all brokers need a share of the profit. These intermediaries cost money, reducing the supplier's share. Furthermore, she argues brokers are representatives of the client rather than of the producer. The broker looks for grape for the vineyards, he is not a sales agent hired by producers. Indap lobbies for less intermediary power. This view appears to be linked more to the small producers because the interviewed bigger producers do not share this view. According to them brokers are their representatives, they help them find adequate buyers and mediate during conflicts.

- Initiatives to Improve Grape Suppliers Self-organization

There are several governmental and non governmental organizations active in Chile working to improve the situation of grape producers. Governmental organizations such as Odepa, Corfo and Indap mainly support small and medium scale producers, since these are much less capable of dealing with crisis than bigger producers with more resources.

Indap is primarily active in grape sector in the seventh and eight region of Chile (Colchagua is a province in the sixth region O'higgins). There 90% of wine makers work with Indap. In these regions a large part of all vineyards have only around half a hectare. Indap has development projects all over the country in various categories divided into three groups of support programs: credits at low interest rates., investment and technical assistance. According to Indap's representative credits are relevant because financial access is very complicated in Chile because an institution has to exist for several years in order to apply for a credit or loan and interest rates are high. Also the applicant can only borrow on security, and some producers or organizations do not have anything to serve as security.

Indap and Odepa promote traditional grape production amongst small scale producers, such as the grape variety País, because these are becoming interesting for wine makers. Indap has formed alliances with companies such as Concha y Toro and Miguel Torres to work together and technically train the producers. These companies are interested to develop producers in the region where they are operating and particularly interested in that grape because of wine quality. According to Indap this training will help producers with improving their technical development, their market performance and obtaining higher prices.

Representatives of Indap and Odepa state that government organizations cannot interfere in private business. 'We hear about conflicts on water use, small grape producers believe the bigger wine companies use too much water, that they obtain too big a part of water rights. Another conflict has to do with transparency of the buying market of grape and the price fixation. But there is a limit to what public institutions can do for private ones. Even so, the representative of Indap admits that what lacks is to sit around the table with the wine companies and look for possibilities together.

NGO's such as Fair trade are providing market alternatives for grape producers. As discussed they provide producers with a minimum price and a premium. They also offer different contracts compared to the conventional market since due to a purchase plan no spot contracts exist. Moreover Fair Trade stipulates no more than six payment quotas and the premium must be payed within 30 days. Also Fair Trade provides alternative banks, where producers can get financial access for investments. The reason not all producers engage with Fair Trade is because certifications costs are sometimes considered too high and there is not yet

a sufficient market for Fair Trade grape producers.

*7.9.1 3 Sustainable Grape*

Aside from the socio-economic relation between client and producer, the grape the wine company purchases must be sustainably produced. Ideally just as sustainable as the wine company produces its own grape. This can be achieved by technical assistance, inspection visits and management unification. Both environmental and social sustainability of grape suppliers is important. Environmental sustainability to reduce negative environmental impact of the external grape production (pesticides, water, energy, IPM, ecological practices) and social sustainability to assure the grape supplier's labor quality of temporary staff in particular and the inclusion of the community. A representative of Vinos de Chile explains that as vineyards relate sustainability often only with environmental changes, social sustainability is rarely included. Especially for the smaller vineyards it is difficult to convince them to include social sustainability because it is perceived less important and they do not want higher costs. Vinos de Chile therefore intends to educate vineyards on these matters. A representative of Concha y Toro adds that it is very hard to seduce your suppliers to become sustainable because they resist change. So convincing grape suppliers that sustainability is important is the first step. Then suppliers need to be evaluated and clear goals need to be developed.

When a vineyard supplies grape to multiple clients, often each client has different requirements that are applied on the hectares that client is buying from. It is better to assure that the entire management of the supplier is sustainable or to purchase from an already sustainable supplier. And again, long term relationships are important to establish goals.

- Codigo Nacional de Sustentabilidad

As discussed, the Codigo Nacional de Sustentabilidad includes sustainability of grape suppliers in their sustainability evaluation. These suppliers when included, will meet the same sustainability points as their certified client vineyards. What it does not focus on is a sustainable socio-economical relationship between client and producer. The representative of the code states that the certification is not focused on fair price for grape suppliers.

In the code only a percentage of grape suppliers need to be included by a certified vineyard. In the first year certified vineyards need to include 15% of all hectares of long term contract grape producers. This percentage needs to increase each year, to 30, 45 until it reaches 50% (Estandár de Cumplimiento, 2014). The Codigo assumes that with 50% the vineyard has included their most important grape suppliers and the other 50% will be suppliers with spot contracts that are more difficult to manage. For this reason vineyards choose their main grape producers to be included in the code, this way a high percentage is more easily reached. Concha y Toro evaluated the sustainability of 22% of their grape suppliers, for the Codigo Nacional de Sustentabilidad (Sustainability report, 2014).

*7.9.1.4 Characteristics Grape Supply Caliterra*

The Errazuriz group is highly dependent on external grape, 40% of their wine production is with grape from external producers. For Viña Caliterra this share is even higher, they use 54% external grape. Caliterra's representative explains that the percentage of external grape depends on the wine demand of the global market and the quality of grape that is needed. With that info Caliterra plans a grape demand and starts looking for new grape suppliers when vineyards are already spouting. Table 7.9.1.4 gives the ratio of external grape to proper grape of the latest four production years.

| | 2012 | | 2013 | | 2014 | | 2015 | |
|---|---|---|---|---|---|---|---|---|
| | Kilo | % | Kilo | % | Kilo | % | Kilo | % |
| Proper grape | 3.608.820 | 66 | 4.756.984 | 66 | 2.850.370 | 63 | 2.475.880 | 46 |
| External grape | 1.867.672 | 34 | 2.435.905 | 34 | 1.708.597 | 37 | 2.919.700 | 54 |
| **Total kilos** | **5.476.492** | | **7.192.889** | | **4.558.967** | | **5.395.580** | |

*Table 7.9.1.4a Historical data external grape,Viña Caliterra*

From 2012 to 2015 Caliterra's use of proper grape has always been higher than of external grape. In 2015 this proportion changes to higher use of external grape. According to Caliterra's grape supply manager this grape demand is not that dynamic. He explains that 'you might need a bit more or less next year, but the base is made by producers with long term contracts'. But what if the market wine demand decreases and Caliterra has a good harvest, how does Caliterra resolve this with their grape suppliers? 'We buy a lot of grape from spot producers as well, they are the ones that cover demand variations. For example when all of a sudden we need a lot of Sauvignon Blanc. Those are particular cases. Besides, plans the company has on grape quantities do not change suddenly, we have 5 year plans.' This implies that spot contracts are ended when not needed anymore.

- Contracts

In 2015 Caliterra works with 25 grape suppliers, of which 14 are contracted as a spot producer. The characteristics of the suppliers are indicated in table 7.9.1.4b. Most of the long term contracts are valid for 2 to 3 years, there is one contract of 4 years and Caliterra is left with three old contracts of 22 years from 1998. Caliterra purchases only from big and developed suppliers, not from small producers. This is probably due to the discussed quality considerations. The least Caliterra uses of a supplier is 1 hectare, the most 30 hectares. Prices are settled in American dollars. For almost all suppliers a price range is set, which means price varies by grape quality. This gives producers the ability to increase their income and pressure to increase quality. When a grape type is scarce, its price may rise as well.

The majority of the sales goes through brokers, 20 suppliers of Caliterra are contracted under a broker. Caliterra works with four brokers: *Vial & Cía, Siegel y Cía, Sutil y Cía* and *Jordán Corredores SPA*. Caliterra visits producers before the selection, other than that Caliterra does not have any contact with producers before the contract.

Contracts of Caliterra are quite clear. However there is quite some margin for clients. Long term contracts have a few extra quality and management requirements. A Caliterra contract is designed in the following four steps:

- Contract Design

1. General data of the client and supplier.

2. Sale information: total surface, tons of grape that will be bought per hectare (8 to 10 ton per hectare), the way grape per hectare must be separated and identifiable.

3. Quality norms (exportation quality, residues, maximum volumes, no diseases/plagues, clean and healthy grape, control Lobesia Botrana according to SAG norms, harvest order with several days of anticipation, harvest by hand or machine) and management norms (sprout, irrigation, power, thinning, chemical products), transport requirements.

4. Price and Payment, amount of quotas. Price per hectare, whenever the producer meets the minimum production. Possible conflicts to be solved by a commonly chosen arbitrage.

The most important part is part 3 about grape quality and vineyard management requirements. The most determining factor for the grape quality is the selected annual volume per hectare, less is better, the producer by all means must not exceed this maximum volume to assure quality. During the production process Caliterra can demand to thin the grape volume on the vineyard. If the producer by the time of harvest still exceeds this maximum the client can even refuse the grape, this is also true for failure in other quality requirements.

In part 4 a minimum production is specified, the production may not be less than this minimum production. If because of natural reasons production is less a lower price will be payed per kilo, without consideration of the alcohol percentage. However when producer and client have settled a fixed price per hectare, payment or prices cannot be adjusted no matter if production is higher or lower than expected. So a price per hectare is in

| Supplier | Grape | Surface | Contract period | Price (USD) |
|---|---|---|---|---|
| 1 | Sauvignon Blanc | 18,28 | 2015-2017 | 0,75-1,10 |
| 2 | Sauvignon Blanc | 7,88 | 2015 | 0,75-1,10 |
| 3 | Sauvignon Blanc | 26,00 | 2015 | 0,75-1,10 |
| 4 | Cabernet Sauvignon | 7,10 | 2015 | 0,90-1,20 |
| 5 | Sauvignon Blanc<br>Chardonnay | 3,11<br>1,79 | 2015<br>2015 | 0,75-1,10<br>0,85-1,30 |
| 6 | Sauvignon Blanc | 6,68 | 2015 | 0,75-1,10 |
| 7 | Sauvignon Blanc | 16,79 | 2015 | 0,75-1,10 |
| 8 | Malbec | 2 | 2015 | 1,25 |
| 9 | Malbec | 1 | 2015 | 1,10 |
| 10 | Sauvignon Blanc | 7,10 | 2015 | 0,75-1,10 |
| 11 | Cabernet Sauvignon | 5,80 | 2015 | 1,10 |
| 12 | Sauvignon Blanc | 3,50 | 2015 | 0,85 |
| 13 | Sauvignon Blanc | 7,90 | 1998-2020 | 0,75-1,10 |
| 14 | Chardonnay | 5,10 | 1998-2020 | 0,85-1,30 |
| 15 | Chardonnay | 8,90 | 1998-2020 | 0,85-1,30 |
| 16 | Sauvignon Blanc<br>Chardonnay | 6,80<br>21,10 | 1998-2020<br>1998-2020 | 0,75-1,10<br>0,85-1,30 |
| 17 | Cabernet Sauvignon | 30 | 2012-2016 | 0,95-1,10 |
| 18 | Tintorea | 10 | 2015 | 150 pesos |
| 19 | Carignan | 10 | 2014-2015 | 0,95 |
| 20 | Carignan | 5 | 2015 | 0,95 |
| 21 | Sauvignon Blanc | 14,23 | 2014-2016 | 0,75-1,10 |
| 22 | Sauvignon Blanc<br>Chardonnay | 10,02<br>4,65 | 2014-2015<br>2014-2015 | 0,75-1,10<br>0,85-1,30 |
| 23 | Sauvignon Blanc<br>Chardonnay | 11,66<br>10,05 | 2014-2016<br>2014-2016 | 0,75-1,10<br>0,85-1,30 |
| 24 | Carignan | 3,22 | 2015 | 1,25 |
| 25 | Cabernet Sauvignon | 18,40 | 2015 | 0,75 |

*Table 7.9.1.4b. Characteristics Grape suppliers Caliterra*

this case often preferable over a price per kilo for two reasons: a price per kilo is usually lower than a price per hectare and a price per hectare cannot be adjusted according to production variations. It is unclear how many supplier are payed per hectare. Known is that supplier with a spot contract usually are payed per kilo. Suppliers must follow the rules and may be rather vulnerable to climatic circumstances but clients have the power to dismiss grape, which is logical but also increases suppliers vulnerability. According to Caliterra's grape supply representative so far it has only happened once that Caliterra refused grape of a supplier.

All suppliers of Caliterra receive technical assistance, to help develop the supplier and to allow Caliterra to check and regulate the grape quality. 'We help them technically. Plant protection applications are very important because some plagues multiply exponentially. Our mission is that the plant reaches yield in the best possible conditions, a healthy plant (physiologic state) and a sustainable plant (that it lasts)'. Assistance is given on quality and vineyard management, not on sustainability.

The two suppliers of Caliterra that follow the Codigo Nacional de Sustentabilidad are Santa Marta and San Isidro, indicated in table 7.9.1.4c.

In 2015 Caliterra added the second supplier to this list. The supply grape representative of Caliterra explains that the long term producers with most hectares were included to include as few suppliers as *possible. 'We*

| Viña Caliterra S.A | Sup. (hs) |
|---|---|
| San Isidro (ha) | 30.0 |
| Santa Marta (CH) (ha) | 21.1 |
| Total | 51.1 |

*Table 7.9.1.4c. Suppliers under Codigo Nacional de Sustentabilidad.*

buy a lot from spot producers but they are not included in the Codigo, besides they wouldn't want to make investments for one year only'. He adds; 'with the producers it's a matter of mentality. If they are not interested in sustainability it's very hard to convince them. Maybe for a small scale producer it's not convenient because he needs to invest, has less possibilities to make changes, and for me its not convenient either because it will only make up a small percentage.' Caliterra does not support financially, only technically. In order to convince suppliers they try and explain to them sustainability will grow, that someday it will not be voluntary any more and therefore it is better to hop on now. The main difficulty Caliterra experiences is that the producer does not see any benefits in implementing the codigo, specially no short or mid term benefits. They only see losses in investment costs, both money and time. The producer wants to win something more tangible. The representative believes that the ones that do make the change and go sustainable probably value Errazuriz as a customer. Another obstacle constitute the many registers that are needed to certify, producers are not used to this.

*7.9.1.5 Conclusion*

In general, wine companies depend highly on external grape supply. This may well be the weakest part of the supply chain sustainability of wine. Both because of relationships between client and supplier and of the sustainability of the supplier's grape production.

Wine companies tend to engage with big grape suppliers because they produce grape of higher quality than small scale suppliers. Sometimes because of specific grape characteristics, grape location or lower prices companies may buy from smaller suppliers, which then receive technical assistance.
In the deal the client generally has more power than the grape supplier. The main critical points in this socio-economic relationship are: low or even unfair prices, lack of self-organization of grape suppliers, short term spot contracts and a lack of negotiation power of the supplier. Government institutions provide support to a certain extent only, to avoid interference with businesses. Government support is mainly targeted at the smallest suppliers. There are market alternatives for the grape suppliers of which they may not be aware, like Fair Trade, but this market may be too small or investments may be perceived as being too costly.

To address the sustainable grape production of the supplier, both environmental and social sustainability must be included. For the client it is difficult to control the supplier's production and to increase its sustainability. Suppliers are not easily convinced of sustainability as an advantage. Important for this is the settlement of a long term relationship between client and supplier, this way suppliers will be more willing to engage and invest in sustainability and can work towards a common goal with the client. Clients could search for grape suppliers that are already producing sustainable or are more willing to engage.

As Caliterra's wine production is highly dependent on external grape, so is its sustainability. The majority of Caliterra's suppliers are bigger and more developed suppliers and have a spot contract. Grape price varies by quality and a price per hectare is more beneficial than per kilo. Suppliers with a spot contract and on a price per kilo are most vulnerable, for the sake of sustainability it would be preferable that suppliers have long term contracts and are payed a fixed price per hectare. The burden of demand variations should ideally taken away from spot producers. Caliterra provides their suppliers technical assistance when necessary to increase grape quality, not grape sustainability. Caliterra has just two suppliers certified with the Codigo Nacional de Sustentabilidad, and therefore producing under higher sustainability requirements. Sustainability had better

be part of the requirements to all suppliers. Suppliers improving on sustainability may be rewarded.

### *7.9.2 Business Analysis*

Out of the 25 suppliers, four have been interviewed. The intention to select a heterogeneous group has resulted in certified and non certified suppliers with the Codigo Nacional de Sustentabilidad, suppliers with a spot, a medium and a long term contract, with very experienced versus less experienced suppliers. All suppliers are bigger companies which made it impossible to select a small scale producer. This selection is representative for Caliterra's suppliers but not for all grape suppliers in Chile. It is believed that in Chile more suppliers are smaller than in this selection, but clear data on this has not been found. Also conditions for grape producers varys in different Chilean grape regions. None of the interviewed suppliers is fully dependent on Caliterra as a client, most suppliers have much demand, mainly because they produce good quality grape, and prices do not differ a lot.

The next section evaluates both the sustainability of the relationship between Caliterra and the supplier and the sustainability of the supplier itself. Next negative and positive outcomes of this evaluation are compared and discussed. These items are drawn from earlier discussion.

*7.9.2.1 Grape Producer 1: Viña Santa Cruz*

| **Characteristics Viña Santa Cruz** | |
|---|---|
| 70% of grape production to 8 clients<br>30% of grape production to own winery | 2013: 80 planted hectares<br>2015: 150 planted hectares |
| 25.000 annual tourist visits | Staff of 80 people |
| 3 clients long term contract<br>5 clients spot contract | Six red grapes, for high quality wine |
| Future goals: grow vinification volume, grow in CNS, become more profitable, and obtain more long term contracts | Estimated production cost: 4200 dollars per hectare |

*Table 7.9.2.1a Characteristics Viña Santa Cruz*

- Part 1: sustainability relationship Caliterra and Viña Santa Cruz

| | |
|---|---|
| *Contract type* | Spot contract - 2015 |
| *Grape* | Malbec |
| *Volume* | 41.780 kilos - 3.50 hectares. |
| *Price (USD)* | Fixed price of 0.85 per kilo. |
| *Broker*[13] | Yes |
| *Technical assistance* | Yes, mainly collaboration and check on the vineyard |
| *Quotas* | 6 to 8 quotas |
| *Dependency* | Independent |

*Table 7.9.2.1b. Relation between Caliterra and Viña Santa Cruz*

The vineyard manager of Viña Santa Cruz states they have a good and close relationship with Caliterra. Caliterra has been purchasing from Santa Cruz for years. Santa Cruz explains they would prefer to settle long

13 The presence of a broker is perceived as positive because interviewed suppliers perceive they help them find adequate buyers and mediate during conflicts.

term contracts with Caliterra. Because of the spot contract the price they receive for a kilo of Malbec is lower than it could be. The manager states that the buyer has 100% negotiation power. Santa Cruz does not necessarily need technical assistance from Caliterra, but they do collaborate and discuss the vineyard management and the grape's quality.

- Part 2: sustainability of Viña Santa Cruz

*Environmental and social dimension*

Santa Cruz has a high intentionality on sustainability. Santa Cruz is certified by Codigo Nacional de Sustentabilidad since the first year the code was developed. This means they meet the majority of these sustainability requirements, both in environmental and social dimension. Aside from the codigo Santa Cruz performed an energy efficiency study and saved 40% on their energy. They will re-certify the Codigo and continue to improve these points. Santa Cruz is focused on the well being of their staff allthough they do not have a syndicate and believe this shows the satisfaction of the workers. Santa Cruz employs temporary workers. Striking is that the interviewed vineyard manager of Santa Cruz believes that workers actually want to work on a temporary basis because it pays better. This indicates that since each vineyard fills in the code in his own way, Caliterra had better try and unify sustainability practices and improve where necessary.

*7.9.2.2 Hot Spots: Positive aspects vs. Negative aspects*

| **Positive aspects** | **Negative aspects** |
|---|---|
| Good and close relationship with Caliterra | Spot contract |
| No dependency | Lack of negotiation |
| Annual purchase | Low price perception |
| Relatively high prices<br>Broker | Assistance management, should also be on sustainability. |

*Table 7.9.2.2a . Evaluation socio-economic sustainability relation Viña Santa Cruz and Caliterra*

| **Positive aspects** | **Negative aspects** |
|---|---|
| Differentiation, economically strong | No syndicate |
| High technical development and IPM | No good vision on temporal workers |
| Focus on quality grape and growth production | |
| Certified by Codigo Nacional de Sustentabilidad<br>Good environmental and social sustainability management | |

*Table 7.9.2.2b . Evaluation sustaianbility Viña Santa Cruz*

- Conclusion

In order to improve sustainability, Caliterra could purchase grape of Santa Cruz on a long term basis. Santa Cruz production sustainability is relatively good. Caliterra had better unify their sustainability management with that of Santa Cruz, and not just look at it through the eyes of the CNS but also with more focus on social sustainability, which seems less included at Santa Cruz.

*7.9.2.3 Grape Producer 2: Viña San Pedro y San Pablo*

| Characteristics Viña San Pedro y San Pablo | |
|---|---|
| Grape production to 8 clients<br>No wine sale, 2000 bottles for proper consumption | 150 planted hectares: 100 Sauvignon Blanc and 70 Chardonnay |
| 6 clients, the majority spot contracts | High quality grape |
| Future goals: mechanize the vineyard to reduce production costs, obtain more long term contracts and higher prices | Estimated production cost: 5000 dollars per hectare |

*Table 7.9.2.3a. Characteristics Viña San Pedro y San Pablo*

- Part 1: sustainability relation Caliterra and Viña San Pedro y San Pablo

| | |
|---|---|
| *Contract type* | 2 year contract - 2014-2015 |
| *Grape* | Sauvignon Blanc (SB) and Chardonnay (CH) |
| *Volume* | SB: 10,02 hectares and CH: 4,65 hectares |
| *Price (USD)* | SB: 0,75-1,10 per kilo and CH: 0,85-1,30 per kilo |
| *Broker* | Yes |
| *Technical assistance* | Yes, mainly collaboration and check on the vineyard |
| *Quotas* | 8 quotas, negotiable |
| *Dependency* | No |

*Table 7.9.2.3b. Relation between Caliterra and Viña San Pedro y San Pablo*

Viña San Pedro y San Pablo claims to have a good relationship with Caliterra. The vineyard has supplied grape to Caliterra repeatedly, both of Sauvignon Blanc and Chardonnay. In the contract a price range has been settled for both grapes, with price varying according to quality. This is quite a high price range given that the going price for Sauvignon Blanc is 70 to 80 cents. They do receive technical assistance allthough this is mainly to check in on the production process and the quality of the grape.The vineyard produces quality grape which implies somewhat higher prices. However the manager explains no negotiation on pricing is possible, 'if you try to negotiate you will be stuck with your fruit. 99% of the negotiation power lies with the buyer. The market sets the price, at least we earn something'. They explain that Caliterra understands costs are high and that as a client Caliterra is flexible. 'They know how we work. A good relationship is important. Nonetheless, clients know the market price so they all pay the same.'

Low prices and spot contracts are a problem for the vineyard. The vineyard had one long term six year contract with Santa Rita, which ends in 2016. It has helped them to further develop. 'With shorter contracts it is difficult to plan ahead and invest. It is complicated to get longer contracts, because of market price instability. We prefer to have long term contracts. Chile is very small, you know your clients and you need to have a good relationship with them. Selling annually is a risk and very unstable.'

- Part 2: sustainability of Viña San Pedro y San Pablo

*Environmental and social dimension*

Viña San Pedro y San Pablo has low intentionality of sustainability. They have no environmental nor social sustainability management. Sustainable practices of the vineyard are mainly related to costs and efficiency, such as water and energy efficiency and chemical application. Clients help them with several aspects. The vineyard is not certified by the Codigo Nacional de Sustentabilidad. The vineyard does have a high technical development. They implement IPM practices with water, energy, chemicals.

*7.9.2.4 Hot spots: Positive aspects vs. Negative aspects*

| **Positive aspects** | **Negative aspects** |
|---|---|
| Good and close relationship with Caliterra | Spot contract |
| No dependency | Lack of negotiation |
| Annual purchase | Low price perception |
| Relatively high prices<br>Broker<br>Caliterra is flexible, negotiable quotas | Assistance management, should also be on sustainability. |

*Table 7.9.2.4a . Evaluation socio-economic sustainability relation Viña San Pedro y San Pablo and Caliterra*

| **Positive aspects** | **Negative aspects** |
|---|---|
| High technical development and IPM | No cooperative |
| Focus on quality grape | Not certified with Codigo Nacional de Sustentabilidad |
| Various clients | No social nor environmental sustainability management<br>Little differentiation: no tourism, no wine |

*Table 7.9.2.4a. Evaluation sustainability Viña San Pedro y San Pablo*

- Conclusion

Viña San Pedro y San Pablo indicates to have some economic difficulties due to low prices and spot contracts. They perceive to have almost no negotiation possibilities. In order to increase sustainability, Caliterra had better purchase grape of San Pedro y San Pablo under long term contracts. During the settlement of these contracts negotiation on price range is necessary. Production sustainability of San Pedro y San Pablo is insufficient. Caliterra can also require sustainable management of the vineyard, both on environmental and social themes and support the vineyard during this process.

*7.9.2.5 Grape Producer 3: Agrícola Valle Alegre*

| **Characteristics Agrícola Valle Alegre** | |
|---|---|
| Grape production to 1 client: Caliterra, since 4 years. Grape production more as a hobbby. Main strenght is the avocado production | 25 planted hectares: 17 sauvignon blanc and 8 avocado |
| 6 clients, the majority spot contracts | High quality grape and very beneficial location: 8 kilometers from the coast, very dry, no frost, eucalyptus trees |
| Future goals: mechanize the production, exploit the territory's capacity and grow, arrive at a total of 40 planted hectares | Estimated production cost: 5000 dollars per hectare |

*Table 7.9.2.5a. Characteristics Agrícola Valle Alegre*

- Part 1: sustainability relation Caliterra and Agrícola Valle Alegre

| | |
|---|---|
| *Contract type* | 3 year contract 2014-2016 |
| *Grape* | Sauvignon Blanc |
| *Volume* | 14,23 hectares |
| *Price (USD)* | 0,75-1,10 per kilo |

| | |
|---|---|
| *Broker* | Yes |
| *Technical assistance* | Yes |
| *Quotas* | 8 quotas |
| *Dependency* | No |

*Table 7.9.2.5b. Relation between Caliterra and Agrícola Valle Alegre*

Agrícola Valle Alegre perceives the long term contract of 3 to 4 years with Caliterra as very beneficial, whenever a good price is agreed and the relation is good. In the contract a price range has been settled for the grape, which means price varies by quality. The vineyard manager explains the price is quite good for Sauvignon Blanc, but doesn't quite cope with high production costs. The firm especially considers low prices and quotas as a very negative thing, because according to the manager 'in the end the client is playing with our money'. Also the negotiation power is perceived to lie with the client, more specifically their wine maker. Because of wine requirements it is they who decide in the end, which can lead to differences in opinion.

The vineyard does receive technical assistance of Caliterra, which is necessary because the vineyard is currently in a learning period. They follow the vineyard practices and management of Caliterra. During a visit from Caliterra to Valle Alegre it became clear Valle Alegre was not following all instructions of Caliterra and in this occasion they were applying manure in excess. This is not only bad for the soil but also negatively affects the grape quality. This relation between client and supplier is not yet optimal, but still attractive for Caliterra given the grape is of high quality because of the location. Besides inspection visits, Caliterra furthermore sets up a memo with an action checklist. The supplier will not be very dependent of Caliterra in 2016 because they sell good quality grape and more clients will most likely be interested. Aside from a good relationship, the manager does state that when another client offers a better price they will switch.

- Part 2: sustainability of Agrícola Valle Alegre

*Environmental and social dimension*

Agrícola Valle Alegre has low intentionality of sustainability. They have no environmental nor social sustainability management. Sustainable practices are mainly related to Caliterra's production management and requirements. The vineyard is not certified by the Codigo Nacional de Sustentabilidad. The vineyard is technically well developed. They implement IPM practices with water and chemicals. The firm is investigating the feasibility of implementing renewable energy sources.

The firm experiences the same problem with water scarcity due to rain shortages. Similar to Viña San Pedro y San Pablo they have a reservoir that accumulates water but without rain this doesn't work. Another strategy they have are horses on the territory to reduce the high risk of fires in the area.

*7.9.2.6 Hot pots: Positive aspects vs. Negative aspects*

| **Positive aspects** | **Negative aspects** |
|---|---|
| Good and close relationship with Caliterra | Lack of negotiation |
| No dependency | Quotas |
| 3 year contract | Prices too low for production costs |
| Relatively high prices<br>Broker | Assistance management, should also be on sustainability. |
| High technical assistance, also some sustainability aspects | Not strict enough |

*Table 7.9.2.6a. Evaluation socio-economic sustainability relation Agrícola Valle Alegre and Caliterra*

| **Positive aspects** | **Negative aspects** |
|---|---|
| Technical development and IPM | No cooperative |
| Focus on quality grape | Not certified with Codigo Nacional de Sustentabilidad |

| | |
|---|---|
| Differentiation and growth plans | No social nor environmental sustainability management<br>1 wine client |

*Table 7.9.2.6b. Evaluation sustainability Agrícola Valle Alegre*

- Conclusion

The medium term contract between Caliterra and the supplier is sufficient, being a new supplier the relationship needed to be tested first before setting a long term contract and the supplier perceived it as beneficial. Sustainability of the production of Agrícola Valle Alegre is insufficient. Caliterra needs to require a sustainable management of the vineyard, both on environmental and social themes. Caliterra should support the vineyard during this process. Need for more strict sustainability practices. Sustainability may have consequences in the pricing, a higher price could also prevent the supplier to engage with other clients in the future.

*7.9.2 7 Grape Producer 4: Viña Santa Marta*

| **Characteristics Viña Santa Marta** | |
|---|---|
| Of 102 hectares, 60 to Errazuriz/Caliterra under a antique long term contract | 450 planted hectares in Casablanca Vineyard where Caliterra purchases has 102 hectares |
| Other hectares to 12 clients: the majority spot and medium term contracts. Spot clients changes annualy | High quality grape and very beneficial location: 8 kilometers from the coast, very dry, no frost, eucalyptus trees |
| When grape is not sold, wine production and sold in bulk | Estimated production cost: 6000 dollars per hectare |
| Future goals: mechanize the production, exploit the territory's capacity and grow, arrive at a total of 40 planted hectares | |

*Table 7.9.2 7a. Characteristics Viña Santa Marta*

- Part 1: Sustainability relation Caliterra and Viña Santa Marta

| | |
|---|---|
| *Contract type* | 22 year contract 1998-2020 |
| *Grape* | Sauvignon Blanc (SB) and Chardonnay (CH) |
| *Volume* | SB: 6,80 hectares and CH: 21,10 hectares |
| *Price (USD)* | SB: 0,75-1,10 per kilo and CH: 0,85-1,30 per kilo |
| *Broker* | Yes |
| *Technical assistance* | Yes |
| *Quotas* | 6 quotas |
| *Dependency* | No/Yes |

*Table 7.9.2 7b. Relation between Caliterra and Viña Santa Marta*

Viña Santa Marta has a 22 year contract with Caliterra and Errazuriz. This is an antique contract with a reasonable price, according to the vineyard manager of Santa Marta. Grape production of 60 hectares go to Errazuriz group, of which 28 hectares to Caliterra. Surprisingly, Caliterra set up the same price range for the other discussed vineyards with Sauvignon Blanc and Chardonnay. However they have possibly set up a higher price per hectare. Santa Marta is a very experienced vineyard with a high technical development, therefore receives minimal technical assistance.

The manager explains that in the case of the long term contracts the prices cover production costs. The other contracts leave almost no profit. The manager therefore prefers long term contracts. He explains there are no negative experiences in the relationship with clients, only that the market price is at its limit.The manager clarifies that in Casablanca producing grape is more expensive: labor and energy are higher, extreme frost increases production costs and the production roof isn't as high as in other, warmer areas of Chile. On the other hand, cold areas are beneficial for white grape quality. The manager recommends that specially smaller vineyards start making wine and wait until the prices rise.
Positive is that for Santa Marta the payment period and quotas are negotiable. Furthermore they happily work with 3 brokers, 'a broker works as an arbitrage in case of problems'.

- Part 2: sustainability of Viña Santa Marta

*Environmental and social dimension*
Santa Marta has a high intentionality for sustainability. This year is Santa Marta's third time they certify Codigo Nacional de Sustentabilidad. This means they meet the majority of these sustainability issues, both in environmental and social dimension. Four years ago they started certification in collaboration with Viña San Pedro. After a year they switched to Errazuriz and Caliterra. They have other certifications such as BPA, which according to the manager makes it easier to certify the codigo. The reason they will re-certify this year is to maintain a good relationship with Errazuriz and to continue the beneficial long term contract. The vineyard manager adds 'one day Chile will certainly require it from all vineyards. It is good to be sustainable'.

*7.9.2.8 Hot Spots: Positive aspects vs. Negative aspects*

| **Positive aspects** | **Negative aspects** |
|---|---|
| Good and close relationship with Caliterra | Prices covers production costs |
| No dependency<br>Some negotiation possible | Assistance management, should also be on sustainability |
| 3 year contract<br>Relatively high prices<br>Broker | |

*Table 7.9.2.8a. Evaluation socio-economic sustainability relation Viña Santa Marta and Caliterra*

| **Positive aspects** | **Negative aspects** |
|---|---|
| High technical development and IPM | No cooperative |
| Focus on quality grape | Climatic difficulties |
| Differentiation and various clients | High production costs |
| Certified with Codigo Nacional de Sustentabilidad | |
| Social and environmental sustainability management | |

*Table 7.9.2.8b. Evaluation sustainability Viña Santa Marta*

- Conclusion

Very beneficial to sustainability is the long term contract between Caliterra and Viña Santa Marta. The manager says that this is the only contract that sufficiently meets production costs. Negotiation is according to the supplier sufficient. Sustainability is good because of the CNS certification, but Caliterra needs to try and unify their sustainability management with that of Santa Marta.

*7.9.2.9 Final Conclusion Grape supplier*
Suppliers express to suffer economic difficulties through high production costs, In general prices are low and not sufficient to meet high production costs. For the sake of sustainability, this is a situation that cannot last. Grape suppliers prefer long term contracts. Long term contracts are more profitable and allow suppliers to

invest and develop towards sustainability, due to better prices per hectare and demand security.

Sustainability of Caliterra's grape suppliers is not well developed. Suppliers have no sustainability management, with the exception of the Codigo certified suppliers such as Santa Marta and Santa Cruz. Caliterra could unify management with these suppliers to promote and consolidate sustainability practices. Even better would be Caliterra putting sustainability practices with requirements in the contract to enhance sustainability with the suppliers that have no sustainability management. Especially social sustainability is very underdeveloped.

## 7.10 Conclusion Suppliers

The evaluation overview provided in this conclusion facilitate comparison of the five suppliers on their relationship with Caliterra, their sustainability and the main challenges and opportunities to enhance sustainability. This overview is given for each supplier in the tables 1 to 5.

| **2. Anasac: Agrochemical products** |
|---|
| **Relationship**<br>Commercial<br>Anasac grants clients technical assistance |
| **Sustainability not good**<br>Unsufficient transparency<br>Sustainability very bad in production process<br>No investment<br>No knowledge or measurements on sustainability<br>Technical assistance with some sustainability aspects<br>Mostly international pressure<br>Some juridical pressure<br>No internal business consideration<br>Environmental sustainability bad<br>Social sustainability increasing |
| **Sustainable product development**<br>Product development strategy for less toxicological products<br>High investment |
| **Main challenge**<br>Sustainability production process<br>Energy efficiency strategy: most critical in production process<br>Awareness raising or strategy to increase low toxicological product use of clients<br>Make sustainability a priority<br>Investigate and measure companies sustainability |
| **Main opportunities**<br>Inclusion of product choice in technical assistance<br>Learn from other companies, such as Bayer<br>Increasing requirements client |

| 1. Cristalerias Chile: Wine Bottle |
|---|
| **Relationship**<br>Commercial |
| **Sustainability good**<br>Transparant<br>Lot of investment<br>Lot of innovation<br>Good knowledge and measurement<br>Internal business consideration<br>External pressure of clients and international sector and the law<br>Receive some help of clients, but follow their own strategy<br>Environmental sustainability good but critical points<br>Social sustainability very good |
| **Sustainable product development**<br>Bottles with high recycled content and low weight |
| **Main challenge**<br>Recyling<br>Waste and water management<br>Strong relationship with clients and awareness raising strategy<br>Make a priority of sustainability |
| **Main opportunities**<br>Offer sustainable product solutions to clients<br>Increasing requirements client |

| 5. Suppliers: Grape |
|---|
| **Relationship**<br>Commercial<br>Technical assistance by Caliterra, many visits during the year<br>Management united<br>Sustainability not included, only with 2 CNS certified suppliers |
| **Sustainability in general not good**<br>No priority<br>No strategy<br>No knowledge nor measurements<br>No investment<br>No pressure<br>Social sustainability even worse |
| **Main challenge**<br>Long term contract<br>Low prices<br>Convincing suppliers of sustainability importance<br>Environmental and social sustainability |
| **Main opportunities**<br>Increasing requirements CNS<br>Increasing importance |

| 3. Collotype Chile: Wine Label |
| --- |
| **Relationship**<br>Commercial<br>Product innovation related |
| **Sustainability not good**<br>Unsufficient transparency<br>No priority<br>Recent start of including sustainability<br>Increasing investment<br>Increasing knowledge and measurement<br>No improvement strategy yet<br>Good intentionality<br>Both internal business consideration and external pressure<br>Environmental sustainability not good<br>Social sustainability not good |
| **Sustainable product development**<br>Unsufficient investment<br>Eco friendly metallic<br>HP electro ink<br>FSC certified and recycled paper<br>Self-adhesive Enviro Label |
| **Main challenge**<br>Develop sustainability strategy<br>Develop improvement goals and action plans<br>Social sustainability focus<br>Strong relationship with clients and awareness raising strategy<br>Make sustainability a priority<br>More documentation |
| **Main opportunities**<br>Currently in a transition towards sustainability<br>Increasing knowledge on sustainability<br>Possible increasing requirements clients<br>Client awareness raising on product choice |

| 4. Envases Impresos Roble Alto: Wine Box |
| --- |
| **Relationship**<br>Commercial |
| **Sustainability not good**<br>Unsufficient transparency<br>No priority<br>Recent start of including sustainability<br>Increasing investment<br>Increasing knowledge and measurement<br>No improvement strategy<br>Good intentionality<br>Both internal business consideration and external pressure<br>Environmental sustainability not good<br>Social sustainability not good |
| **Sustainable product development**<br>Increasing investment<br>Recycled content paper<br>Eco design |
| **Main challenge**<br>Recyling<br>Develop sustainability strategy<br>Develop improvement goals and action plans<br>Strong relationship with clients and awareness raising strategy<br>Make a priority of sustainability<br>Social sustainability focus |
| **Main opportunities**<br>Currently in a transition towards sustainability<br>Increasing knowledge<br>Client awareness raising on product choice<br>Sustainable product solutions in development<br>Research for diminishing raw material use |

What can we learn from this evaluation? Overall, the suppliers lack a clear sustainability management with data, goals and strategies. While suppliers may be interested in sustainability, this is not a priority. Suppliers are busy with price management and quality and service advancement. Grape suppliers cope with critical socio-economic characteristics which keeps attention away from sustainable production. Other suppliers are simply not interested in sustainability or do not know what the concept means.

Interested or not, in general the commercial relations suppliers have with their clients do not involve sustainability issues, which means no pressure to enhance sustainability. Promising is that suppliers do feel increasing pressure from various clients to enhance sustainable production. The suppliers in this evaluation that were in a sustainability transition have been motivated by pressure of clients, in this case viña Concha y Toro. Or in the case of the grape suppliers, sustainable production is increased because of the CNS certification demanded by their clients. Engaging in this certification implies a stronger and long-term relation with the client, which appeals to the grape suppliers. Within this pressure it seems extra attention is needed for social sustainability indicators.

External pressure is a good start, however it seems also important that suppliers develop an internal sustainability management. One, because this way the supplier is not dependent on the client or regulations and two, because it works often more innovative, faster and enhances investment in sustainability.

Suppliers with well developed sustainability practices may have a internal interest in efficiency of their production process for cost reductions. It appears this is dependent on the sector, in this case glass production requires high amounts of expensive energy which a supplier therefore tries to diminish. However, suppliers without sustainability management tend not to see these potential benefits or the advantages sustainability could bring.

In some cases the lack of sustainability practices is because a lack of knowledge of the impacts of their production process or product. Knowledge and measurements are essential to begin with improving sustainability. Other suppliers do implement sustainability practices but are unaware of the positive impacts or lack documentation of these actions.
In Chile, when suppliers work on improving sustainability, they are often doing this without government or other stakeholders incentives or help. This may be one of the reasons international suppliers seem to have a more developed sustainability.

Aside from their own production process, suppliers do not seem to see the importance of raising client awareness on alternative sustainable products. However, this is where great opportunities lie. Associations between supplier and client to raise awareness and discuss possibilities that will provide more sustainable decisions in product choices seem to be a key factor. Now decisions depend mainly on the client, and his will to inform himself, leaving many opportunities unseized, such as the identification of foil as the main hot spot in label production extensively used by wine companies.

In general, some efforts have been made by suppliers to sustain their business activities however there is still a lot to be won.

## 7.11 Conclusion Supply Chain Sustainability Caliterra

From the sustainability evaluation of a number of Caliterra's supplies and suppliers we may conclude that Caliterra does not have a sustainable supply chain management (SSCM).

First, many decisions on product supply can still be made to improve sustainability. The deliberate sustainable choices of Caliterra have been the large share of green labeled agrochemical products, craft cardboard boxes, light weighted bottles and FSC certified labels. Besides this, Caliterra in general has a purely aesthetic need in the purchase of packaging supplies. The purchase of grape and wine supplies is based on requirements of the company to achieve high grape and wine quality. This is sustaining the economic dimension, which is necessary of course, but disrespecting both social and environmental

sustainability in the supply chain. For a company that aspires to be sustainable this should not be the end goal.

For the lack of sustainable supplies there are several reasons. According to Caliterra's marketing manager current choices have been made because a lack of interest in sustainable supplies, higher costs and lower quality. The Caliterra supply manager confirms that currently the vineyard has no strategy on supply sustainability. He acknowledges that 'the main deficit is in the packaging area. We will have to change this because the consumers tendency in the world is aiming towards more sustainable products'. This would imply that with external pressure, Caliterra will start working on sustainable supply management. On the contrary, the marketing manager does not believe that sustainable packaging triggers the consumer to buy the product. She emphasized hat the vineyard practices have by far the best impact on marketing**,** 'horses sell better than craft boxes'. Yes, there are exceptions such as the Scandinavian markets, however this would imply increasing costs'. She states this is not desirable because the competition on the Chilean wine market is so big, that with a quality wine and expensive packaging the wine price would be high which would be bad for business. According to her, for the consumer price comes first and then image.

With their suppliers, Caliterra has a mere commercial relationship, sustainability items are hardly ever discussed. Caliterra does not include their packaging suppliers into sustainability. Aside from the two grape suppliers included in the CNS, grape suppliers are not supported in achieving or aiming for a more sustainable production process. There is no plan to decrease the critical social-economic points in Caliterra's relationship with grape suppliers: contracts, prices, negotiation. With several long term contracted grape producers they do have a deeper relationship than with other suppliers since they grant them technical assistance when needed, this is mainly to achieve good quality grape.

Caliterra furthermore lacks a good understanding of their own supply chain and on the profile of their suppliers. Long-term relationships and interdependence with their suppliers could promote sustainability. According to the supply managers, Caliterra works with tight margins in highly competitive environments which leave no time or energy for strategy. The supply manager indicates that Caliterra does not even privilege the suppliers with sustainability certifications or policy above the ones without. Instead, Caliterra could add a sustainability requirement to quality, service and price given that client pressure does influence the supplier.

What are some of Caliterra's options? First and foremost, discuss sustainability with all suppliers, explain what Caliterra is striving for and ask the question, what can the supplier do to help. As for packaging Caliterra could ask for a higher recycled content of its supplies and reduce unnecessary packaging. Caliterra could aim for even lighter glass bottles and perhaps even make a new packaging design of wine in a box. Caliterra could return to the label they previously had for organic wine with many certifications, foil substitute, no self-adhesive label for Cenit, not just consider aesthetic needs. More simplicity in the label design. Caliterra could aim for less polluting agrochemicals, dismiss the generic products of Errazuriz so that they can choose their own, and require the same from their grape suppliers. Maybe even influence packaging requirements on agrochemical products, to improve there too. In summary, Caliterra could decide on product solutions together with advice of the supplier to enhance sustainability, such as ecodesign of the cardboard boxes.

Caliterra had better realize and acknowledge that without sustainable supplies it will be virtually impossible to create a truly sustainable product.

# *Chapter 8: Sustainability and Agrochemical products*

## 8.1 Introduction

The suppliers evaluation in chapter 7 revealed several critical points in the wine supply chain, in both product choice of the client and production process of the supplier. These two aspects negatively influence the sustainability of the client, in this case the wine company Caliterra. In this chapter we will analyze how the supply chain's sustainability can be increased (sustainability transition) to finally produce a more sustainable wine.

For this, one supply is selected for further investigation. Given that agrochemical use and production is one of the most critical points for sustainability in the life cycle of wine, this supply is chosen. A technical analysis, that could indicate to what extent certain products improve the suppliers and client's sustainability with all its nuances, is missing in this research. Nevertheless, the debate on these products and their impact on sustainability will be briefly discussed. To understand this debate, first an indication of the development of agrochemical products is given.

Following the discussion, the analysis will focus on how and by whom a transition should be managed. This links to the theoretical framework. What are the dilemma's that inhibit the transition to more sustainable use of agrochemicals? An alternative for sustainability is searched after in organic wine production. The pro's and con's for sustainability of this production will be discussed. The objective of this analysis is to answer the question: *what kind of sustainability transition within the agrochemicals supply will lead to a more sustainable wine?*

## 8.2 Analysis of Agrochemical Products on the Vineyard

### *8.2.1 Sustainable Agriculture*

Global sustainable agriculture has not been established. In the 18$^{th}$, 19$^{th}$ and 20$^{th}$ century the world coped with many institutional and technical changes due to a growth in population, resource use and human welfare. The challenge of the 21$^{th}$ century will be to make the transition to sustainable growth in both presently developed and low income countries. This transition will include a stable global population, a stable level of material consumption, and a largely urban society. Current population and income growth raise the question: how should agricultural commodities be increased? This necessary increase on agricultural production copes with scientific, technical, resource and environmental constraints. Agricultural control is characterized by these constraints, in spite of dramatic advances in pest control technology (Ruttan, 1999).

For thousands of years agricultural practices relied heavily on crop rotation or mixed crop planting to optimize natural pest control. Moreover, biological control was used as a strategy. However in the 20$^{th}$ century the world became more and more dependent on extensive mono-culture and intensive agricultural practices (Dayan, 2009). Natural products were almost exterminated and producers turned to highly toxic organophosphates insecticides. As yields rose, the economic incentive to adopt chemical pest control technologies also rose. The successes of modern agricultural practices is due in part to the discovery and adoption of chemicals for pest control (Dayan, 2009). However, this chemical pest control caused resistance to these chemicals and their destructive consequences for beneficial insects, causing in turn an increasing use of synthetic pesticides due to increase of plagues and diseases. Very critical also were the direct and indirect effects on wildlife and human health. An answer to this 'pesticide crisis' was Integrated Pest Management, a safer pest control.

The current paradigm of relying almost exclusively on chemicals for pest control needs to be reconsidered. If this is not reconsidered it will be hard to enhance agricultural production for the rising global demand by using the same pesticides management that is degrading agricultural land. An increasing share of research budget is used just for maintenance research (Ruttan, 1999). Ruttan highlights that if the world fails to meet

the challenge of a transition to sustainable growth in agricultural production the failure will be similar in the area of technical and institutional innovation as in resource and environmental constraints.

### *8.2.2 Product Development*

According to the marketing manager of Bayer Chile, agrochemical producers prefer to talk about crop or plant protection products rather than agrochemicals. He argues that almost everything in the world is made of chemicals but no one ever questions the origin of a certain product. This may be true, but it also demonstrates the pressures these companies experience. The agricultural industry has a responsibility in achieving sustainable agriculture through innovation. Rising concerns regarding impact of pesticides on human health and environment but also the evolution of resistance to pesticides have challenged the industry and stimulated the development of new plant protection products (Dayan, 2009).

The evolution of resistance to pesticides is a big concern for the industry. Using the same chemical products repeatedly without rotation practices increases the risk of plagues' resistance to these products. As Bayer's marketing manager explains; 'we don't want the super fungi'. Therefore these companies provide technical assistance and develop less resistant products.

The Eco-toxicology of the product is another important factor for rising concern and pressures. There is a global tendency to use less toxic and more environmentally and human friendly products. The marketing manager of Bayer Chile explains that effectiveness of a product is not enough anymore. Strict environmental norms on the global market of agrochemicals have reduced the number of synthetic pesticides available. The supply and the use of organophosphates is declining (Dayan, 2009). The marketing manager states that not all old products have disappeared, several have been defended and accepted under the actual requirements.

Thirdly, there is the trace of residues a chemical product leaves within the product from the moment of the application. According to Caliterra's head grape grower these residues are a significant concern for wine companies. If not managed properly, residues of the chemical product will stay within the product, in this case wine, which will affect human health and will collide with international norms when exported. There are three important norms that set a maximum limit of residues within a product: the EEUU norms, the EU norms and Codex (FAO, 2015). Dependent on the norm one follows, a certain amount of residues is allowed. This also limit varies per product, so wine may posses more or less chemical residues than table grape.

Aside from demanding resistance, residues and Eco-toxicology solutions the western markets still expect 99% effectiveness, especially in fruit and vegetable production. Products need to arrive as beautiful as possible in our supermarkets without any imperfection. As Anasac's manager of the development and technical department summarizes: 'The big challenge is to meet the requirements of the clients and definitely the consumers, who are every time more demanding. It is harder and harder to meet norms. Moreover we have to deal with the biologic factor, insecure factors. In the end the farmer loses most, but he asks us please give me a solution. A solution that controls a plague, does not contain residues and is environmentally friendly. That is simply undoable'. As discussed, the dilemma is that cleaner products usually are less efficient.

As a consequence of these pressures, agrochemical companies perform more and more research on product development, new use of existing products or innovations related to product use and application. This is easier said than done. Product development is a long-term and expensive process for agrochemical companies. The increasing requirements make it even harder to develop new products. As a consequence, active ingredients have become more expensive and only two or three new molecules are developed every ten years.

A promising new developments is the increasing use and interest for biological products. These are microscopic biological agents or products derived from microorganisms. They are highly target specific, reduce the risk of resistance and leave no toxic residues (Cristi, 2005). According to Bayer, their estimated

proportion of the biological products currently in the industry of 4,3% will continue to increase (Bayer). Because of this increase in demand Bayer has invested in new fabrics, only producing biological products. The difficulty is that like all biological things, the degradation curve of these products is quite changeable, during product development you have to do the same test several times to give a good pre harvest interval. In addition there is a debate on their effectiveness (Cristi, 2005). Consequently Bayer pledges a mixed application of plant protection control, of both biological and conventional products. As a farmer you need a strategy and a good monitoring team to take into account the residuality (the period a product is capable to control a plague or disease) to implement this mixed application properly. A farmer could repeatedly choose for a conventional product application and then a biological, to diminish residues but assure a high level of control, or could apply biological products in the final period before harvest to reduce its residues population.

### *8.2.3 Natural vs. Synthetic Products*

Biological products are a step in the right direction, but they are still chemical products in a sense. The natural origin often requires some kind of chemical stabilization and product formation which transforms it in a chemical product. The difference is that the ingredients cannot be synthetic, they must be derived from natural sources (Cristi, 2005). Currently, very little is known about the actual environmental impact of natural products.

In organic farming only the natural products that receive an organic certification may be used. Compared to biological products originated from living organisms (bacteria or fungi), organic products originate from alga or minerals (Jones et al, 2001). The majority of these organic products also need chemical stabilization. Natural products can sometimes be used directly natural without the need for stabilization, such as tobacco. The typical discourse of organic farming is that organic production has less environmental impact because you change chemical inputs for less polluting inputs and secondly this also affects workers positively. As a consequence, those in favor of organic farming believe that organic farming shares fundamental objectives of agricultural sustainability. Others disagree and believe organic farming is overrated. To what extent is organic farming more sustainable? Following the debate on sustainability of organic production compared to conventional production will be discussed.

## 8.3 Organic Wine Production, an Alternative?

### *8.3.1 Organic Farming*

What in Spain and Germany it is called 'Ecologic farming', in France and Italy 'Biologic' farming, is called in South America, North American and English speaking countries 'Organic farming'. In 2008 the IFOAM aimed to create some consensus on this confusing term and approved the following definition: *'Organic agriculture is a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than the use of inputs with adverse effects. Organic agriculture combines tradition, innovation and science to benefit the shared environment and promote fair relationships and a good quality of life for all involved.'* (Ifoam, 2015). Organic farming is defined according to the Ifoam as a set of practices[14]. In this analysis organic farming in general will be discussed. Then the organic wine farming in Chile will be more specified.

#### *8.3.1.1 Environmental Impact*

According to Jones, sustainability of a farming system must be addressed both by the source of inputs and environmental hazard of the products used (Jones et al, 2001). The result of his analysis is that few organic products are obtained from renewable sources. The ones that are often require some processing prior to application. Generally organic products are less hazardous than those used in conventional systems, but there are clear exceptions. Sulfur, used a lot in organic production has a high negative impact (Sarandon, 2004). Moreover, in general organic products are less efficient and need to be applied more frequently, sometimes up to 7 times. Especially weed management in organic agriculture is problematic. Herbicides count for more

14 Some academic definitions define organic farming more as a set of aspirations (Jones et al, 2001).

than half of the volume of all agricultural pesticides applied in the developed world, of which the synthetic version is very effective. Of natural less effective herbicides the farmer needs relative large quantities for application which leads to undesirable effects on environment. This makes its use almost impossible for large scale farming of agronomic crops (Dayan et al, 2009). The use of natural herbicides in conventional agriculture is limited. Also high levels of supplementary nutrients in organic systems, such as manure, may have negative impact (Jones et al, 2001). Thus, when toxicity and volume are considered organic product use *may* have greater environmental hazard than conventional ones (Dayan et al, 2009).

*8.3.1.2 Costs Viability*

Furthermore, conventional agriculture is considered more competitive and alternative productive systems, such as organic farming, are viewed as non-profitable. Even though a price list of Bayer's products does not confirm this vision, organic products are more expensive than conventional products. A representative of the Chilean Organic Agriculture Congregation explains that the price per liter is not necessarily higher but it is calculated per unit of ingredient. A conventional product may have 45% of nitrogen, but a organic fertilizer may posses 14% nitrogen, so the farmer has to apply 4 times instead of one to achieve the same effect. This high application makes organic product purchase expensive. This is confirmed by the results of a cost-benefit analysis for both organic and conventional farms in Argentina indicate the viability of the organic system but strongly associated with the higher price of organic goods (Sarandon, 2004). According to this same study organic agriculture is considered as marginal, only for consumers who can afford it.

*Organic versus Conventional Production*

In summary, the sustainability of natural versus synthetic products is a gray matter. In addition, it appears uncertain which system is more harmful, organic or conventional production (Dayan et al, 2009). Thirdly, organic production is more expensive. Then why not use a more efficient, less expensive and possibly not an even more polluting conventional production system?

The first answer to this question is that the origin of organic products is still favorable than the conventional situation where most products are derived from fossil fuels (Jones et al, 2001). Furthermore, a life cycle analysis by research institutions Fundación Chile and Edge Environment has indicated that the production process of organic fertilizers, pesticides and herbicides has a much lower negative impact; less energy demand and GHG emissions (Fundación Chile, 2011).

This study also showed that that organic wine has a significantly lower agricultural impact. This is confirmed by the same cost-benefit analysis of Sarandon, which indicated that the organic farmers scored much better on the ecological and social sustainability dimensions (Sarandon, 2004). Also productivity of the organic farmer was higher.

How can the evaluations on sustainability of organic farming systems have such different outcomes? The explanation seems to lie in the fact sustainability of organic farming is dependent on a “holistic production view”.

*8.3.1.3 Holistic View*

To explain this holistic view we go back to the cost factor of organic farming. A representative of the Chilean Organic Agriculture Congregation explains that the cost factor of organic production is a much discussed theme amongst economists, universities and institutions. The director of Agroecologia clarifies that the discourse of a more expensive organic production is wrong, instead it is a systematic failure. There are two organic agriculture models: one based on the input of organic products and one based on organic methodology. Both representatives argue that when a farmer uses inputs as the primary method for his organic production (when the soil misses nitrogen I simply put nitrogen in the ground), he has about seven years before he goes bankrupt. This way a farmer achieves no balance on its farm but will only attain risks and fragility. This imbalance then leads to the extensive and unsustainable use of organic products, negatively impacting the environment. According to both representatives a lot of organic farmers do not realize this. They have a parallel organic and conventional production, their products are more expensive and less effective, and business is simply bad. According to a representative of the certification company Bioaudita, this failure seduces farmers to cheat in their organic production and they lose their certification.

*Vineyards that start producing organic grape and wine will fail, economically and environmentally, if they have a pure focus on the use of organic products.*

The solution lies with agro-ecological principles, these are able to decrease the need for organic product application and include a more holistic view of production. The strategy is to be preventive, not curing. The agro-ecological principles of wine production are described in the Chilean Manual of Organic Viticulture developed by Agroecologia together with other public and private institutions (Manual de viticultura orgánica, 2013). This document expresses the crucial element of agro-ecological principles in organic agriculture, to achieve sustainability of the system. Instead of focusing on product use farmers should diminish this use to a minimum for a successful organic agricultural system. This way the ecosystem will need less unnatural inputs. This document indicates that the transition to organic agriculture furthermore includes: the use of local resources, elaboration of own inputs, a recycling increase and the incorporation of renewable energy. The Chilean norm implies a three year during transition from a conventional vineyard to successfully make the transition to a organic vineyard, producing healthy grape and quality wine. The director of Agroecologia argues that this norm is just a minimum, a transition is a long term deal. Furthermore agriculture based on agro-ecological principles is strongly based on know-how and active application, actual agronomists may lack this training. Important to note is that grape for wine making purposes has to be of good quality, but it does not have to look beautiful (unlike table grape), therefore organic production is believed to be less risky and more viable for wine.

It is emphasized in the manual that in order to reach a balance, vineyards need to transform their entire production to organic. Organic vineyards should be located at a great distance from plots that use agrochemical products. These products can negatively affect the organic production by leaving traces of chemical products on the organic plot, which would lead to a certification problem or a major pest risk (Manual de viticultura orgánica, 2013). The representative of the Chilean Organic Agriculture Congregation explains that vineyards are a mono-crop, producers must understand they need more diversity on the territory. He states that 'producers find it difficult to let grass and flowers grow between their rows, they want direct fertilization when they need to produce and do not develop fertilization that takes 2 years. Where is the natural fertilizer?' He adds; 'the majority of the agronomists still have the impression they need to feed the plant. In organic agriculture we feed the soils. In the soil food web the things the plant needs are produced. We as humans are not capable to simulate that. For example worms are the best fertilizers, they create everything. Todays agriculture is looking for the input. We have to make production more holistic'.

Biodynamic production takes it even further, it also considers vineyards as living organisms but differs by the application of dynamic methods with the goal to revitalize the agro-ecosystem. These methods include the use of natural compost, some materials applied directly to the vineyard and the cosmic cycles to determinate the moment to realize the cultural practices like pruning, sowing and harvest (Manual de viticultura orgánica, 2013). Experts indicate that biodynamic transition takes seven years.

### *8.3.2 Organic Vitiviniculture in Chile*

In organic wine production, it is important to emphasize that there is a difference between organic wine and grape. In the vinification process there are limits on the use of sulphur dioxide and often proper yeast is required. Wine inputs are also regulated. There are three types of certifications for wine: organic wine (both grape and wine are organically produced), wine produced with organic grape and wine produced with organic grape in transition (Chilean certification). All countries, and even some regions, work with their own organic certification. This is quite confusing, some guidelines prohibit the use of synthetic inputs and stress the use of rotations and fertility, other guidelines accept some synthetic products in production. The main differences between certifications are the origin, use and prohibition of certain organic products and seeds. The Chilean organic certification uniquely includes vinification practices. Other requirements include traceability of grape and wine, waste management, (recommended) inclusion of specific vineyard practices, specific cleaning measures and the use and prohibition of certain organic products. Some requirements on packaging are also included such as: no synthetic corks, no PVC. It takes 36 months to reach a full transition and yield 100% organic grape. From 12 – 36 months the grape is called and can be marketed as organic product in transition. A negative point in the Chilean certification is that social sustainability is not included

in organic production, the only certification that takes this into account is the Brazilian one (Brazilian Ministry of Agriculture, 2007). The price of a organic wine certification lies between the 800 and 1500 euro (Bioaudita, 2015). In the certification no clear requirements on energy and water use exist, only mentioned as a recommendation. Furthermore vague statements are made such as: "limit the use of sulfur to a minimum". The SAG has a list on all prohibited and allowed products.

In Chile the organic demand comes from outside, for export. Most of Chilean organic wine is sold to Europe. As a consequence producers prefer to get a international organic certification instead of a Chilean one. National consumption slowly increases, but is still a very small percentage. This makes it impossible to follow the organic principle of local production is local consumption. More than 80% of the organic wine producers are located in the south of Chile, the Grupo de Vino Organico de Centro Sur being the biggest organization (Manual de viticultura orgánica, 2013).

Agro-ecologics has three dimensions: scientific base, practical realization and political or social movement. This political movement is very small in Chile. According to the representative of Bioaudita the promotional labor must be executed by the state, in eye of the beneficial effects of organic agriculture for the citizen. The certifiers cannot claim this role because of the law ISO 17065. The governmental organization that helps promoting organic export products is ProChile (ProChile, 2015). In Chile no governmental incentives exist for a development of organic production. There was one incentive of Corfo where they financed the first certification cost, but the transition takes three years. Another incentive existed of recovering degraded soils, but was for all production sectors. Because of this lack of support, the organic firms work alone. Agroecologia functions for a 90% out of private funds and only several public projects, is exemplary of the private interest in organic production.

The private sector, in this case wine businesses, is interested in organic production mainly because of the commercial and marketing value it provides. Even though organic grape production is more expensive than conventional grape production (as discussed specially if one merely has a organic product focus) the market price for organic wine on all markets is equal to conventional wine. This is different for other food products, such as organic table grape which does have a higher market price. Therefore vineyards that produce organic wine must find a way to decrease their production costs or find other competitive advantages. In spite of relatively low wine market prices for their expensive organic wine, it is attractive for vineyards to produce and sell organic wine. This is because they have a higher demand and higher market rotation than conventional wines. Especially for Chilean wine, since they sell cheap wine for a very good quality. Other countries that produce organic wine can have the same quality but demand a much higher price, at least 2-3 times as high. This means Chilean organic wine fills up a market gap. This market gap is especially beneficial given the earlier discussed global wine crisis. The experts on organic production in Chile estimated that only 10% of Chilean vineyards that produce organically do this out of conviction, for the remainder it is pure business. In Chile there is low demand for organic products.

In all grape producing countries organic grape is also produced, but always less than 5% of total production. In 2007 in Chile there were around 2.400 hectares with organic viticulture, in 2012 this increased to 4.500 hectares, making up around 4% of all Chilean vineyards (Manual de viticultura orgánica, 2013). Most Chilean organic vineyards produce wine made of organic grapes and do not include organic vinification process. But there are also several vineyards that include both processes. Chilean geography, soil and climate characteristics can be quite favorable for organic production (Conicyt, 2008).

The representative of Agroecologia notes that this growth is very positive but argues that in reality organic agriculture often promotes a legal mark for commercialization and often they forget about the initial ecological goal.

*8.3.2.1 Viña Emiliana*

Emiliana is a Chilean example of a wine company producing both organic and biodynamic wine, simultaneously the biggest organic wine producer of Chile. In 1998 the company started with a transition to organic production on several vineyards. This switch was triggered by the personal conviction of the owners,

who were deeply concerned by the negative environmental and human impacts grape production was causing at that time in Chile. The sustainability manager of Emiliana acknowledges that it has not been an easy transition. The beginning was characterized by a lot of insecurity, fear for loss of production, a lack of knowledge, and a very high cost of inputs application. It was more a transition of a conventional grape to a change of inputs, compared to implementation of the discussed agro-ecological practices. It took a while before Emiliana realized the importance of these practices, several vineyards had to be closed due to profit loss. The sustainability manager emphasizes that if the owners would have considered only the short term economic analysis, they would probably not have taken the step. Now Emiliana's vineyards need a lot less inputs, because of the ecological balance the company has created on its vineyards, making them healthier and more productive.

When the organic production became more successful, Emiliana started its biodynamical production. Currently the grape production of Emiliana is completely biodynamic. The company has two biodynamic wineries however only two biodynamic wines are certified as so. The manager explains not all wine is certified as biodynamic is because Emiliana has no biodynamic certified external grape producers. Also because of the additional costs, mainly due to high certification costs. In addition, according to the manager the biodynamic label is not always a plus, not all consumers recognize this value.

Emiliana uses only international certifications: organic certification for seven countries, biodynamic certification, Carbon Neutral, Fair for Life, Fair Trade and ISO 14001. The only national certification is the Codigo Nacional de Sustentabilidad. This is linked to the fact 95% of sale is export. The sustainability manager clarifies 'before it was hard to sell organic wine so we sold it without organic label. The wine segment is very dependent on quality-price relations. You have a segment between 10-12 dollars, then 17-18 dollars and if a wine company produces wine that is not the quality associated to it's price segment the importers do not buy your wine'. This creates complexity, because of the major cots of grape production, organic producers must be efficient in stabilizing the business. Emiliana's has a more stabilized demand now and the future is looking bright, the Netherlands being their second biggest importer (Sustainability Report Emiliana, 2014). The fact Emiliana is a 100% biodynamic vineyard permits them to work on long term projects because the clients take them seriously. Today around 20% of the wine is sold as conventional, these are deals from the past. Emiliana's goal is to dismiss all conventional commercialization. Furthermore Emiliana wants to continue improving organic production and become even stronger in agro-ecological practices. Emiliana believes there are still inputs permitted in organic certification that are harmful. There they try to innovate and find alternatives.

Positive for supply chain sustainability is the situation of the external grape producers of a company like Emiliana. These producers receive a much higher price than they would for conventional grape, and they have more stability because of medium term contracts. Vineyards wish to strengthen the relationship with these producers because they are hard to encounter in Chile and are dependent on the correct production under organic norms.

The story of Emiliana confirms the link between agro-ecological approach and a successful organic, even biodynamic, grape and wine production.. A company does need personal conviction, sufficient resources for the first years investment and a long-term vision. Market dimensions and marketing are probably most complex. The majority of consumers are not willing to pay a higher price for organic production in general. Some vineyards do not even sell their organic wine with an organic label because consumers may think they are paying more for the wine because of the certification, while this is not even true. Positive for Chile is that the Chilean organic wine production responds to a market gap, which has enabled this sector to grow.

## 8.4 Conclusion

The aim of this chapter was to answer the question: *What kind of sustainability transition within the*

*agrochemicals supply will lead to a more sustainable wine?*

The previous analysis concludes that organic grape and wine production, together with an agro-ecological approach, is more sustainable than conventional production. Agro-ecological practices diminish the need of relying almost exclusively on chemicals (organic products) for pest control. As a consequence, this production system diminishes the negative impact of the agrochemicals supply and application. The organic agrochemicals that are used are more sustainable than conventional products, both in origin and production process. In addition it may increase sustainability of grape suppliers who receive a higher product price and attain long-term relationships with their clients.

Organic grape and wine production is not the absolute solution to sustainability of wine. Organic certifications do include various important issues, especially at the vineyard, that conventional vineyards do not take into account: the use of less chemical pesticides which implies reduction of environmental negative impact and also for the workers, different vinification inputs such as natural yeast, different cleaning practices. The production is also more focused on nature conservation and trying to connect nature and biodiversity to the vineyard to enhance the total balance. However some issues organic certifications do not take into account or are debatable such as management on energy or water optimization. Therefore, organic production could go hand in hand with other sustainability certifications, as viña Emiliana aims for, to achieve sustainable wine production.

## 8.5 Transition

Organic production with agro-ecological practices increases sustainability of the agrochemical supply. How do we achieve the transition of a wine company from conventional to organic wine production? For this we will evaluate the steps a wine producer must take in order to develop this transition. Not only the steps but also the drivers that may help the producer to take these steps. Furthermore the roles of other actors will be given.

**Producer**

Steps

- Investigate the negative impacts of conventional agrochemical products
- Investigate the benefits of organic products for sustaining this supply
- Investigate agro-ecological practices
- Analyze the economics of the switch to organic production
- Develop a market strategy
- Engage with and learn from other wineries who are successfully producing organic wine

- Include organic production focus into sustainability management
- Switch to a 100% organic farming and wine making and develop clear objectives for good implementation
- Use agro-ecological practices to create a balance on the vineyard

- Select agrochemical suppliers with a broad range of organic products
- Search for organic grape suppliers or support grape suppliers in their transition

Resources and time are needed to succeed the transition, therefore the producer must be willing to invest and needs a long-term business vision. Knowledge of negative impacts conventional production and sustainability of organic production is necessary. Also on the successful implementation of organic production. This needs to be managed with help of external experts.

Market for organic wine can be complicated, because of price-quality relations or consumers rationalization, which leads to some organic wines being sold as conventional. Therefore a market strategy is important. Organic wine can be promoted as a high-quality, sustainable and healthy (no residues) product. The benefit of wine is that it has identity and that sustainability can be communicated and leveraged, in which lies a key role for marketing. Organic wine could also enhance sustainability of other supplies, labels etc, for green image of organic wine. All this to develop a differentiated product.

Drivers transition

*Personal conviction*: rising concerns of the negative impacts of conventional agrochemical products could lead to enhancing sustainability. It appears that most vineyards chose to produce organically out of business motivations, however this may lead to the loss of the initial ecological goal.

*Commercial value*: even though organic wine should not necessarily count on higher prices, organic wines seem to have a market gap with higher demand and rotation. Plus the value of a differentiated “green” product. Niche market value.

*Balance on the vineyard*: organic production finally makes the vineyard more productive and healthier, which results attractive for grape producers/wineries. This could furthermore lead to a cost reduction, when this balance is achieved less products will need to be applied and purchased.

*External pressure:* international pressure to stop relying 100% on agrochemical control. Risk of negative media. Consumer requirements.

*Government incentives:* facilitate the transition to organic production.

**Role Agrochemical Supplier**

- Raise awareness amongst clients on positive impacts organic products of both production and application
- Investigate own production sustainability and strengthen sustainability management
- Support the organic transition of clients
- Identify possible benefits for agrochemical companies to sell organic products

**Role Consumer**

- Get to know the higher sustainability of organic wine compared to conventional wine
- Value organic wine
- Be prepared to pay a higher price organic wines

**Role Government**

- Provide incentives for organic wine production. Do not leave this responsibility entirely with the private sector.
- Promote organic wine amongst national and international consumers
- Increase requirements organic certification to enhance sustainability of this system

**Role Research and Development**

- Provide a deeper understanding of the consequences of the transition from conventional to organic farming and how best to deal with them
- Provide a deeper understanding between organic wine production and competitive advantage
- Provide a deeper understanding of successful organic farming
- Develop technologies that support effectiveness of organic farming (measure risks of plagues)
- Develop less polluting organic products

# *Conclusion*

Wineries do not pay much attention to their supply chain sustainability and few research is conducted on wine supply chain and sustainability. However, wine cannot be sustainable without sustainable supply chain management. There is still a lot to win in wine supply chain sustainability. Therefore, the main purpose of this research is to include supply chain into the sustainability evaluation of wine, and to explore how to make a transition towards increased sustainability in the supply chain. This analysis has been applied on a Chilean winery, viña Caliterra. This research aim led to the following central research question:

> *"To what extent is viña Caliterra's wine supply chain sustainable and what kind of sustainability transition within the supply chain will lead to a more sustainable wine?"*

To answer this question a qualitative case study design has been chosen to explore the paths towards a sustainability transition within the wine supply chain. The research has focused on five different supplies and suppliers of Caliterra. The three sub-questions related to the central research question, and the central research question itself, will be answered below.

*1. What are the most critical points in the wine supply chain that prevent sustainable wine production?*

In summary main sustainability issues in the wine supply chain are:

*Production*

- Environmental negative impacts of application of fertilizers/pesticides/herbicides
- Improper soil management
- Water and energy consumption for mechanical irrigation practices
- Situation for employees.

*Supplies*

- GHG emissions and energy demand due to production of fertilizers/pesticides/herbicides
- GHG emissions and energy demand due to production of wine packaging, mainly energy consumption of glass bottle production.

Energy consumption of packaging and production of fertilizers/pesticides/herbicides, which is related to the supply chain, are most critical for sustainability of the entire wine life cycle.

Social sustainability seems to be inferior in literature studies. Experts interviews have indicated that the sustainability situation of both workers of the winery and grape supplier, and the relation between winery and grape supplier can be very critical.

*2. To what extent are the 5 product supply chains of Caliterra sustainable?*

Caliterra has no specific sustainable supply chain management. This management is divided into supply and supplier sustainability.

<u>Supply</u>

Supply purchase of Caliterra is realized on economic and quality terms. Sustainability is not a requirement. Yes, a few deliberate choices have been made such as; a craft wine box, agrochemicals with low environmental impact, two grape suppliers with a CNS sustainability certification, labels with FSC certification and light weight bottles.

Main critical points of Caliterra supply management are:

- Not open to communication on sustainable product solutions with suppliers
- Sustainable supply is perceived as more expensive
- Do not expect a premium of consumers for sustainable supply

Because of this management, a lot of opportunities are missed. One such opportunity is that Caliterra uses three different foil in their label design, while a more sustainable alternative is available. Information on more sustainable options are not provided by the suppliers nor does Caliterra ask for them. Caliterra is taking too much of a wait-and-see attitude on their supply.

Suppliers

Caliterra has no requirements on supplier sustainability. Caliterra is not well-informed on sustainability of the supplier. Caliterra has few knowledge on the production process of their suppliers or on possible sustainability options within this process.

Following the outcomes of the sustainability evaluation of the five selected suppliers will be given: agrochemical supplier, label supplier, bottle supplier, cardboard box supplier and external grape supplier.

1. Agrochemical supplier

Caliterra's agrochemical supplier is unsustainable on the environmental dimension. The supplier has no intentions on sustainability nor plans. The supplier's energy management is critical. The supplier possesses no data on its current sustainability nor of its own suppliers. The supplier does not communicate sufficiently with clients on sustainable product options. Positive is the technical support the supplier grants its clients. The supplier has a good social sustainability management.

2. Label supplier

Caliterra's label supplier started a sustainability transition since one year. The supplier has a good intention and motivation to increase sustainability. Furthermore the supplier has increasing knowledge of its own production process and product sustainability. The supplier possesses a good paper recycling rate as well.

However, the supplier is not sustainable yet. Viña Concha y Toro, a powerful client of the supplier, requires sustainability of the supplier. It is necessary the supplier develops its own sustainability strategy. So far the supplier lacks sufficient sustainability measurements. Furthermore the supplier lack an energy management, has a high carbon footprint mainly because of the production inputs and provides many unsustainable product options.

3. Bottle supplier

Caliterra's bottle supplier is the most sustainable of all five producers. The supplier aims for increasing energy efficiency in order to reduce its production costs. The supplier has a long-term business vision and is proactive on innovation and glass recycling. Moreover, social sustainability is good. The supplier has a good sustainability report however lacks sufficient transparency on sustainability improvements. The supplier could also aim for better communication to clients on sustainability product options.

4. Cardboard box supplier

Caliterra's cardboard box supplier is medium sustainable. The supplier started recently a sustainability transition in collaboration with viña Concha y Toro, a powerful client. The supplier is mainly focusing on recycling and product optimization through sparing eco-design. Furthermore the supplier has increasing knowledge of its own production process and product sustainability. However the supplier lacks transparency, vision and goals of sustainability. Negative is that the supplier does not communicate the recycled content of the cardboard boxes, this is important information for the client. Furthermore the supplier

has little SSCM on its own paper supply purchase.

5. Grape supplier

Sustainability of the grape suppliers varies. A part of the suppliers is certified with the sustainability certification CNS, this means a part of Caliterra is managed sustainable. A larger part however is not. Grape supply purchase is realized by price ans quality considerations. The preference of Caliterra is on the short term. However this short term focus complicates sustainability of this supply.

Overall, amongst Caliterra's suppliers there are some good intentions to be found but there remains a lot to win. The box and bottle suppliers are investigating and enhancing sustainability. The rest is not. Many chances lie with measurements on demand and wastage etc. The preference of Caliterra could provide a good kick-start on energy, label material and external grape production. Even if all more expensive options are not applied. This kick-start needs a five year sustainability plan instead of one year, with sustainability requirements.

*3. What sustainability transition would provide a solution?*

1. Communication and collaboration within the supply chain. The aim for a shared common vision and by gradually taking steps together.

2. A way out of the sustainability problems could be organic wine production. Organic grape and wine production, together with an agro-ecological approach, is identified as more sustainable than conventional production. Three reasons are given to explain this. Agro-ecological practices diminish the need of relying almost exclusively on chemicals (organic products) for pest control. As a consequence, this production system diminishes the negative impact of the agrochemicals supply and application. The organic agrochemicals that are used are more sustainable than conventional products, both in origin and production process. Not only does this work out positive for agrochemical supply impacts, but also the sustainability of grape supply, another critical point, is likely to improve since they may receive a higher product price and attain long-term relationships with their clients.

Furthermore, a transition to organic wine could prove to be positive for other supplies in order to develop a differentiated “green” product. The benefit of wine as a product distinct from others, is that it has an identity and that sustainability can be communicated and leveraged, where there is a key role for marketing. Organic production is not the 'absolute' solution in the sense that it is the only way towards more sustainable wine, there is the piecemeal approach where every phase in the supply chain individually tries to take little steps towards more sustainability, and organic production can go hand in hand with other sustainability certifications to achieve sustainable wine production. In order to achieve a transition to organic wine production a multi stakeholder approach is needed including agrochemical producers, consumer, government and research and development

# *Discussion*

*Limitations of the research*
In order to explore supply chain sustainability and possible transitions, a qualitative case study design was a suitable research design, but this approach does come with a number of limitations. The external validity of the research is limited because of the single case study that has been chosen. Furthermore the geographical location of the case study may influence the outcomes. This may cause difficulties in generalizing the research. Nevertheless, it appears that the supplies and suppliers of wine internationally have similar activities, meaning they can be compared to a large extent.

The proposed transition framework in the research is most likely incomplete. The function of this framework is that it provides an insight on steps to be made and roles to be executed of different actors within and outside the supply chain.

*Theoretical implications of the research*
Despite these limitations the research has provided a number of interesting results. The research has shown that most companies within the wine supply chain are sustainable within their own yard, but do not possess a sustainable supply chain management (SSCM). This implies that these companies are insufficiently sustainable. The fact companies focus most on their proper production processes is because that kind of sustainability can be positively used for marketing. Companies are rather opportunistic on their "green" practices. In addition they use the aesthetic value of these practices to attract or impress clients and consumers. Sustainability practices are realized when this reduces costs or increases consumer value. Especially for wine companies, this is explained by the fact that the companies act on a competitive market where production is higher than consumption, therefore the main focus lies on the costs.

There are a few exceptions to the lack of SSCM, due to efficiency considerations or the green image of the supplies; a craft wine box, agrochemicals with low environmental impact, grape suppliers with a sustainability certification, labels with FSC certification and light weight bottles.

The lack of SSCM is explained by several causes. First of all, companies do not experience consumer demand for SSCM. Secondly, there are no public sector incentives or pressure on supply chain sustainability. Third, companies compete on a competitive short term market. In addition, the expectations are that sustainable supply chain practices cause rising costs. And finally, SSCM is no topic of deliberation, actors do not communicate on these matters.

The results are to a big extent confirmed by the theory. There are companies who experience sustainable business as their responsibility, while others do not and merely focus on profit making. Logically, least of all they would include sustainable supply chain management. The companies compete internationally in ‘buyer-driven’ world markets, of which the supply chains are complex. This turns out bad for sustainability. In these markets, the consumer acts as a driver for increased SSCM. In this case the consumer fails to do so. Furthermore, the benefits of sustainable supply chains are perceived as difficult to promote. The competitive advantage of more sustainable supply chains appears to be uncertain and each company does implement a different strategy. The lack of clear evidence of the link between supply chain sustainability and competitive advantage enhances the need of a interaction with public sector support for sustainable supply chains. In this case, both actors within and outside the wine supply chains need to make changes to make supply chains more sustainable.

The results indicate that a way out of the sustainability problems could be organic wine production. In order to achieve a transition to organic wine production a multi stakeholder approach is needed including agrochemical producers, consumer, government and research and development. It is impossible for a wine to be truly sustainable without sustainable supply chain management. The present results are to be considered in order to produce a true sustainable wine, including its supply chain.

# *Recommendations*

Further research to the link between competitive advantage and sustainable supply chain management is recommended. Competitive advantage due to increased efficiency or premium pricing could provide sustainable supply chain management support. Research could look at a possible best practice, a company that is successful in sustainable supply chain management and experiences competitive advantage. Furthermore a technical analysis of supply chain sustainability could provide interesting insights on this concept.

Research could also provide a deeper understanding of the consequences of the transition from conventional to organic farming and how best to deal with them. Research on organic farming could furthermore develop technologies that support effectiveness of organic farming, develop less polluting organic products as well as a deeper understanding between organic wine production and competitive advantage of niche markets.

Governmental policy is recommended to acknowledge the importance of sustainability in general and in supply chains. Policy could be developed to encourage sustainable supply chain transitions. An example of this is adjusting the Chilean sustainability wine code to stricter norms. Moreover, policy needs to both pressure and support companies on sustainability management, such as realizing a carbon footprint analysis.

# *References*


Abraham, L., Alturria, L., Fonzar, A., Ceresa, A., Arnes, E. (2014) Propuesta de indicadores de sustentabilidad para la producción de vid en Mendoza, Argentina. Sustainability indicators proposal for vine production in Mendoza, Argentina. R*evista FCA UNCUYO, 46* (1): 161-180

Anasac Chile. (n.d.). Retrieved October 18, 2015.

Anderson, K., & Wittwer, G. (2015). Asia's evolving role in global wine markets. *China Economic Review,* 1-14.

Annual Report Bayer (2014). Combined Management Report of the Bayer Group and Bayer AG

Ayres, R., Berrgh, J., & Gowdy, J. (2001). Strong versus Weak Sustainability. *Environmental Ethics, 23* (2), 155-168.

Bayer Chile. (n.d.). Retrieved October 18, 2015.

Bioaudita (n.d.). Retrieved October 18, 2015.

Bisson, L., Waterhouse, A., Ebeler, S., Walker, M., & Lapsley, J. (2002). The Present And Future Of The International Wine Industry. *Nature, 41* (8), 696-699.

Caliterra Winery. (n.d.). Retrieved October 18, 2015.

Carroll, A., & Shabana, K., (2010) The Business Case for Corporate Social Responsibility: A Review of Concepts, Research and Practice. *International Journal of Management Reviews*

Castillo-Valero, J., & García-Cortijo, M. (2015). Price adjustment in world wine markets: A cointegration analysis. *Wine Economics and Policy*. doi:10.1016/j.wep.2015.05.004

Chiara, A., & Spena, T. (2011). CSR strategy in multinational firms: Focus on human resources, suppliers and community. *Journal of Global Responsibility JGR,* 60-74.

Codigo Nacional de Sustentabilidad. (n.d.). Retrieved October 18, 2015.

Conicyt (2007) El sector vitivinícola en Chile. Capacidades de investigación y áreas de desarrollo científico-tecnológico.

CORFO. (n.d.). Retrieved October 18, 2015.

Cristalerias Chile. (n.d.). Retrieved October 18, 2015.

Darnall, N., Jolley, G., & Handfield, R. (2008). Environmental Management Systems And Green Supply Chain Management: Complements For Sustainability? *Business Strategy and the Environment, 18*, 30-45.

Dayan, F., Cantrell, C., & Duke, S. (2009). Natural products in crop protection. *Bioorganic & Medicinal Chemistry,17*, 4022-4034.

DEFRA-Department for Environment, Food & Rural Affairs. 2008 Guidelines to Defra's GHG conversion factors: methodology paper for transport emission factors. Department for Environment, Food and Rural Affairs.

Desai, V., & Potter, B,. (2010) *Doing Development Research*. London: Sage.

Edwards-Jones, G., & Howells, O. (2001). The origin and hazard of inputs to crop protection in organic farming systems: Are they sustainable?*Agricultural Systems,67*, 31-47.

Ekins, P., Simon, S., Deutsch, L., Folke, C., & Groot, R. (2003). A framework for the practical application of the concepts of critical natural capital and strong sustainability. *Ecological Economics,44*(2-3), 165-185.

Fairtrade (2014) Criterio de Comercio Justo Fairtrade para Trabajo Contratado.

Fefco. (2010). Retrieved October 18, 2015.

Felzensztein, C.,(2011) The Chilean wine industry: new international strategies for 2020. *Emerald Group Publishing Limited*, *1* (1), 1-12

Flint, D., & Golicic, S. (2009). Searching for competitive advantage through sustainability: A qualitative study in the New Zealand wine industry. *International Journal of Physical Distribution & Logistics Management, 39* (10), 841-860.

Flores, C., & Sarandón, S. (2004). Limitations of Neoclassical Economics for Evaluating Sustainability of Agricultural Systems: Comparing Organic and Conventional Systems. *Journal of Sustainable Agriculture, 24*(2), 77-91. doi:10.1300/J064v24n02_08

Food and Agriculture Organization. (n.d.). Retrieved October 18, 2015.

Gavrilescu, M., & Chisti, Y. (2005). Biotechnology—a sustainable alternative for chemical industry.*Biotechnology Advances, 23*, 471-499.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy, 12*(1), 78-104.

Global Agricultural Information Network. (2013). Retrieved October 18, 2015.

Green Business Report, Nordic Innovation. (2012). Retrieved October 18, 2015.

Hanfield, R., Nicols, E, (1999). Introduction to supply chain management. Integrated chain management and supply chain management comparative analysis and illustrative cases, *Journal of Cleaner production 12.*

Hughey, K., Tait., Connol., (2005) Qualitative evaluation of three 'environmental management systems' in the New Zealand Wine industry. *Journal of Cleaner Production, 13,* 1175-1187

Hutchins, M., & Sutherland, J. (2008). An Exploration Of Measures Of Social Sustainability And Their Application To Supply Chain Decisions. *Journal of Cleaner Production, 16*, 1688-1698. doi:10.1016/j.jclepro.2008.06.001

IFOAM. (n.d.). Retrieved October 18, 2015.

Isaak, R. (2002). The Making of the Ecopreneur. *Greener Management International, 38*, 81-91.

Ilbery, B., & Maye, D. (2005). Food Supply Chains And Sustainability: Evidence From Specialist Food Producers In The Scottish/English Borders. *Land Use Policy, 22*, 331-344. doi:10.1016/j.landusepol.2004.06.002

Jr, K., Zelbst, P., Meacham, J., & Bhadauria, V. (2012). Green supply chain management practices: Impact on performance.*Supply Chain Management: An International Journal, 17* (3), 290-305.

Kloepffer, W. (2008). Life cycle sustainability assessment of products. *Int J Life Cycle Assess The International Journal of Life Cycle Assessment, 13*(2), 89-95.

Labuschagne, C., Brent, A., & Erck, R. (2003). Assessing the sustainability performances of industries. *Journal of Cleaner Production,* 373-385. doi:10.1016/j.jclepro.2003.10.007

Lam, P., Chan, E., Chau, C., Poon, C., & Chun, K. (2011). Environmental management system vs green specifications: How do they complement each other in the construction industry? *Journal of Environmental Management, 92*, 788-795.

Lambert, D., Cooper, M., & Pagh, J. (1998). Supply Chain Management: Implementation Issues And Research Opportunities. *The International Journal of Logistics Management, 9*(2), 1-20.

Lamberti, L., & Lettieri, E. (2009). CSR Practices And Corporate Strategy: Evidence From A Longitudinal Case Study. *Journal of Business Ethics, 87*, 153-168. doi:10.1007/s10551-008-9876-z

Levett, R. (1998). Sustainability Indicators-integrating Quality Of Life And Environmental Protection.*Journal of the Royal Statistical Society: Series A (Statistics in Society), 161*(3), 291-302.

Lummus, R., & Vokurka, R. (1999). Defining Supply Chain Management: A Historical Perspective And Practical Guidelines. *Industrial Management & Data Systems, 99*(1), 11-17.

Maloni, M., & Brown, M. (2006). Corporate Social Responsibility In The Supply Chain: An Application In The Food Industr *Journal of Business Ethics, 68*(1), 35-52.

Mcmichael, P. (2005). Global Development and The Corporate Food Regime. *New Directions in the Sociology of Global Development Research in Rural Sociology and Development, 11*, 265-299.

Milieu Analyse Dranken Consumentenbond. (2011). Retrieved October 18, 2015.

Morrow, D., & Rondinelli, D., (2002) Adopting Corporate Environmental Management Systems: Motivations and Results of ISO 14001 and EMAS Certification. European Management Journal, *20* (2): 159-171

Morthorst, P. (2003). National environmental targets and international emission reduction instruments. *Energy Policy, 31*(1), 73-83.

Muñoz, L., & Romero, H. (2007). La vitivinicultura moderna en Chile: Caracterización de su evolución reciente y dificultades para el desarrollo local. *Departamento De Geografía Universidad De Chile*.

Odepa (2013) Superficie y producción de vides para vinificación.

Odepa (2014) Comision Nacional de Viticultura.

Odepa. (n.d.). Retrieved October 18, 2015.

OIV - Plan Estratégico. (2011). Retrieved October 18, 2015.

OIV - State of the Vitiviniculture. (2015). Retrieved October 18, 2015.

Olmos, X. (2012) La huella de carbono en el comercio internacional: el caso de las viñas chilenas. Universidad de Chile, Magister en Estrategia Internacional y Política Comercial.

Orduña, R. (2010). Climate change associated effects on grape and wine quality and production. *Food Research International, 43* (7), 1844-1855.

Our Common Future: Report of the World Commission on ... (1989). Retrieved October 18, 2015.

Porter, M., & Kramer, M., (2006) Strategy and society: the link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 84 (12), 78-92

Porter, M. (2011). Creating Shared Value - Harvard Business Review. Retrieved October 18, 2015.

Pullman, M., Maloni, M., & Dillard, J. (2010). Sustainability Practices in Food Supply Chains: How is Wine Different? *Journal of Wine Research, 21*(1), 35-56.

ProChile. (n.d.). Retrieved October 18, 2015.

Product Group Assessment and Benchmarking: Wine. (2011). *Fundacion Chile & Edge Environment*.

The Sustainability Consortium. (n.d.). Retrieved October 18, 2015.
Reporte de sostenibilidad Viña Errázuriz corporativo. Gestión 2009-2010.

Rugani, B., Vázquez-Rowe, I., Benedetto, G., & Benetto, E. (2013). A comprehensive review of carbon footprint analysis as an extended environmental indicator in the wine sector. *Journal of Cleaner Production, 54*, 61-77.

Ruttan, V. (1999). The transition to agricultural sustainability. *Proceedings of the National Academy of Sciences, 96*, 5960-5967.

SAG (2011) Lsistema Nacional de Certificación de productos Orgánicos Agrícolas.

SAG (2013) CatastroViticola Nacional.

Santiago, S., & Claudia, F. (2009). Evaluación de la sustentabilidad en agroecosistemas: Una propuestas metodológica. *Agroecologia*, 19-28.

Santini, C., Cavicchi, A., & Casini, L. (2013). Sustainability in the wine industry: Key questions and research trendsa. *Agric Food Econ Agricultural and Food Economics,* 9-9.

Sarandón, S. (n.d.). El desarrollo y el uso de indicadores para evaluar la sustentabilidad de los agroecosistemas. *Agroecologia El Camino Hacia Una Agricultura Sustentable*.

Sarkis, J. (2002). A Strategic Decision Framework For Green Supply Chain Management. *Journal of Cleaner Production, 11*, 397-409.

Servicio Agrícola y Ganadero SAG. (n.d.). Retrieved October 18, 2015.

Seuring, S., & Müller, M. (2008). Core Issues In Sustainable Supply Chain Management - A Delphi Study. *Business Strategy and the Environment, 17*, 455-466. doi:10.1002/bse.607

Soosay, C., Fearne, A., Dent, B., (2012) Sustainable value chain analysis – a case study of Oxford Landing from "vine to dine. *Supply Chain Management: An International Journal*, *17* (1), 68 – 77

Smith, B. (2007). Developing Sustainable Food Supply Chains. *Philosophical Transactions of the Royal Society B: Biological Sciences, 363*, 849-861. doi:10.1098/rstb.2007.2187

State of The Vitiviniculture world market. April 2014. (2014). Retrieved October 18, 2015.

Sustentavid. (n.d.). Retrieved October 18, 2015.

Sustainability Report VSPT Wine Group (2013-2014)

Sustainability Report Santa Rita. (2011). Retrieved October 18, 2015.

Sustainability Report Emiliana. (2014). Retrieved October 18, 2015.

Sustainability Report Concha y Toro. (2013). Retrieved October 18, 2015.

Sustainable Wine Growing California. (n.d.). Retrieved October 18, 2015.

Sustainable Winegrowing New Zealand • NZ Wine. (n.d.). Retrieved October 18, 2015.

Sustainability Report Cristalerias Chile. (n.d.). Retrieved October 18, 2015.

SAW - Sustainable Australia Winegrowing. (n.d.). Retrieved October 18, 2015.

Sustainable Wine Growing South Africa. (n.d.). Retrieved October 18, 2015.

Torres, C., (2013) Manual de viticultura orgánica.

Vergara, S. (2001). El mercado vitivinícola mundial y el flujo de inversión extranjera a Chile. *CEPAL-SERIE Desarrollo Productivo*.

Vermeulen, W., & Ras, P. (2006). The challenge of greening global product chains: Meeting both ends. *Sustainable Development, 14*, 245-256.

Walker, H., & Jones, N., (2012) Sustainable supply chain management across the UK private sector. *Supply Chain Management: An International Journal*, *17* (1), 15-28

Wines of Chile. (n.d.). Retrieved October 18, 2015.

Wines of Chile (2014) Estandar de Cumplimiento, version 2014.

Thach, L. (2002) Social sustainability in the wine community: managing for employee productivity and satisfaction. *Wine Business Monthly,* July. Available at www.winebusiness.

# *Appendix*

**Appendix I Caliterra Certificacion Codigo Nacional de Sustentabilidad, 2013**

CERTIFIED SUSTAINABLE WINE OF CHILE

CERTIFICATE

i+D Consorcio Vinos de Chile

AWARDED TO:

**VIÑA CALITERRA S.A.**

**Av. Nueva Tajamar 481 - Oficina 503, Torre Sur.**
**Las Condes, Santiago, Región Metropolitana.**

STANDARD

**SUSTAINABILITY CODE OF THE CHILEAN WINE INDUSTRY**

VERSION 2.0

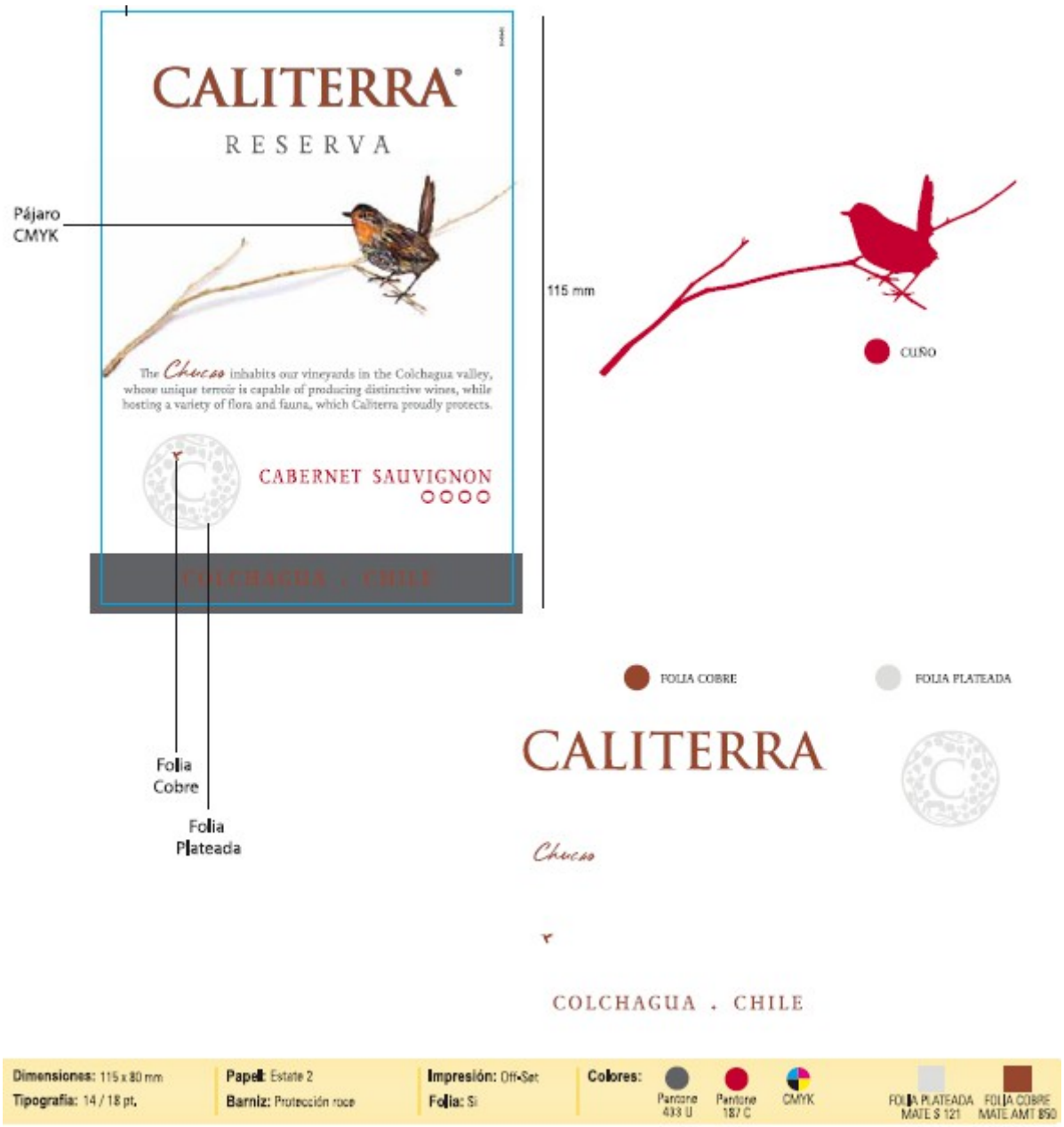
Vinos de Chile through its Technological Consortia, I+D Vinos de Chile, grants the certification "Certified Sustainable Wine of Chile" to "Viña Caliterra S.A." with scope in the green, red and orange areas.

Claudia Carbonell P.
Manager R&D+i
Vinos de Chile

| Certificate valid from: | Certificate valid to: | Registration Number: | Certificate Number: |
|---|---|---|---|
| **August 08th, 2013** | **August 08th, 2015** | **CNS-03-052011-077** | **CNSV02-20130808-077** |

To validate a Certificate, enter the Certificate Number in www.sustentantavid.org

**Appendix II** Caliterra Label Design Reserva



**Appendix III** Sustainability Evaluation Caliterra ,Vineyard and Winery

# *Sustainability Framework Caliterra, Vineyard and Winery*

In order to evaluate Caliterra's sustainability several indicators have been designed to score sustainability of a vineyard and winery. The packaging area is perceived as part of Errazuriz and is not included in this research. These indicators have a environmental and social dimension. Available information for the economic dimension has been discussed chapter 6. Because of lack of data on Caliterra's economic viability, this viability is presumed. The growth in sale and in cultivated hectares support this presumption.

The indicators are chosen according to its relevance to sustainable wine production. Relevant themes on wine sustainability have been drawn from literature and wine sustainability certifications such as the Chilean Codigo Nacional de Sustentabilidad, the California Sustainable Winegrowing Alliance and the Sustainable Winegrowing New Zealand. Expert interviews have helped in identifying most important themes related to wine sustainability. Each indicator is considered of equal importance in the evaluation.

In the sustainability evaluation the vineyard and winery are united in the indicators. For each indicator positive (strong) and negative (weak) sustainability points are listed briefly on separate sides of the table and are discussed in the comment on the particular indicator. Based on these positive and negative points and the inherent discussion, a score on sustainability is then given and explained. Scores vary from 1 to 4; 1 being insufficiently sustainable and 4 being sufficiently sustainable. Through these scores we can see what Caliterra is doing good and what not so good. Sufficient sustainability, or a score of 4, does not mean sustainability on this indicator is perfect and may still include critical factors. Probably companies interpret this as an indicator to deal with now or later. Along this line of reasoning an indicator with a score of 1 had better be addressed as soon as possible. Unfortunately we do not know what budgets are needed to improve the various indicators. This research does not address this.

The comments underneath the tables give not only the score and its build up, but also tips for improvement and is lined out what further information or data is needed to make good policy.

## Environmental dimension

**Fertilizers, Soil and Nutrition**

Sustainability important for quality of the vineyard on the long term and to avoid soil erosion. And to use less chemical fertilizers.

| **Fertilizers, Soil and Nutrition**<br>-Score 3- | |
|---|---|
| Positive | Negative |
| Documented and integrated management plan of nutrition for plants and soil at the vineyard | Areas (cartels, conservation areas) at the vineyard are not sufficiently mapped or indicated |
| <u>Agrochemical precision practices</u><br>Multi-spectral aerial photography: vigor mapping<br><br>Soil chemical and physical analysis<br><br>Use of soil thermometers<br><br>Foliar nutrient analysis<br><br>Permanent evaluation of the verdure condition<br><br>All year long technical fundaments on compaction degree of soil<br><br>Realization of periodic monitoring | No erosion prevention implementation nor action plans<br><br>Fertilizer use of Caliterra is very variable, lack of clear sustainable application and product management<br><br>No measurement on impacts of sustainable practices on use fertilizers |
| Use of organic matter in soil coverage | |
| All organic solid waste from the vinification process is transformed into compost for soil nutrition | |
| Products with a nitrogen base are avoided. If necessary provided organically | |

Comment

Caliterra possesses a documented management plan on nutrition for plants and soil at the vineyards, incorporating evaluation, risk analysis and action measures related to: erosion, compaction, drainage, PH level and other factors the vineyard considers relevant. Caliterra's goal is to minimize the use of chemical products in fertilization and to know what, when and how much is needed to avoid any excess of fertilizers.

Caliterra is considered to have good sustainability on fertilizers, soil and nutrition and implements many sustainable practices. The table shows more positive than negative points. Most positive points are part of the agricultural precision practices that aim to reach this goal. The advanced monitoring systems allows the segregation of control areas. Also Caliterra provides natural coverage for soil. However several critical points remain that need improvement, such as erosion prevention. It is important for Caliterra to have cartographic information of the vineyard to help manage sustainability.

Table 1 shows a decrease of 35% in fertilizer costs since 2013. However, this is not the case because less fertilizers are used but because of doing away with organic management of 50 hectares. Organic fertilizers are more expensive than conventional products, hence the cost reduction. Besides good sustainable practices of Caliterra aimed to minimize the need for fertilizers, there are no data on the impact of these practices on the use of fertilizers. Usage of fertilizers remains very variable and is only demonstrated in total costs. Aside from minimizing fertilizers use, Caliterra could aim to implement more natural fertilizers.

Conclusion

A **score of 3** is given, because Caliterra's management of fertilizers, soil and nutrition is sustainably organized but is still too variable and lacks both good data collection and reduction goals.

To implement good policy data is essential as well on the usage of fertilizers in volumes per year and per type (red, green or yellow labeled), as on the impact of sustainable practices on this usage of fertilizers.

| **Group – Year** | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|
| Acaricides | 4,20 | 8 | 11,6 | 8,4 | 3,8 | 3,3 | 6,5 |
| Fungicides | 62 | 49,7 | 68,7 | 47,3 | 37,6 | 40,7 | 38,7 |
| Herbicides | 6,9 | 6,7 | 5,5 | 2,5 | 2,4 | 2,7 | 11,1 |
| Insecticides | 8,3 | 8,9 | 5 | 9,8 | 9,6 | 12,3 | 13,3 |
| Others | 1,7 | 2 | 0,2 | 0,8 | 0,2 | 0,3 | 0 |
| Nematicides | 4,5 | 1,7 | 0 | 0 | 0 | 0 | 0 |
| Fertilizers | 12,4 | 23 | 9 | 31,2 | 46,4 | 40,7 | 30,4 |
| Total | 100% | 100% | 100% | 100% | 100% | 100% | 100% |

*Table 1. Supply agricultural products Caliterra in % of total costs, Valle Colchagua.*

**Weed and Herbicides**

Important to reduce the use of chemical herbicides, very high use by Chilean vineyards.

| **Weed and Herbicides** -Score 2- | |
|---|---|
| Positive | Negative |
| Documented and integrated management plan of plagues and diseases on the vineyard | No herbicides rotation |
| Realization of periodic monitoring | |
| All green labelled products | |
| Control alternatives<br>18 alpacas and 48 horses that diminish weed levels in winter season<br><br>Rows in between the plants are planted with native flora, which cuts available space for weed. | No measurement on impact of these sustainable practices on the use of herbicides |

Comment

Caliterra has a documented management plan in place for weed on the vineyard incorporating evaluation, risk analysis and action measures. The vineyard aims to minimize the use of herbicides by monitoring and alternative control practices. The advanced monitoring system allows the segregation of control areas. Through the monitoring, a systematic inspection of weed intensity, Caliterra is able to perform local application of herbicides. In summer horses are moved uphill where they eat pasture that surrounds the vineyards, this way helping to reduce the forest fire rate.

Since all herbicide products they use are green labeled, this means inherently that all herbicides Caliterra uses are less toxic. Although the sustainable practices of Caliterra are aimed at minimizing the need for herbicides, there are no data on the impact of these practices on the use of herbicides.

Aside from the sustainable practices the costs indicated in table 1 spent on herbicides in 2015 were way higher than in 2014. The use has diminished since 2010, but 2015 shows a big increase. This increase is due to the herbicide “Basta” used for weeding instead of the traditional mechanical weeding. Caliterra chose to use more chemical herbicides for practices previously realized manually. According to Caliterra, this will be the first and last time chemical weeding is used instead of mechanical weeding, because even though more economical it does not meet the sustainability vision of the vineyard. The fact Caliterra has implemented this practice while promoting minimal herbicides use is critical and contradictory. As a sustainable vineyard these choices simply cannot be made.

Conclusion

A **score of 2** is given, because Caliterra's management of weed is sustainably organized but unsustainable choices are made and both measurement and goals are missing.

To implement good policy data are needed on the impact of sustainable practices on the use of herbicides. Also data is needed on the actual use of herbicides in volume and type over the years

**Plant protection, plagues and diseases**

Important to use as less chemical products for plagues and diseases as possible in favor of more natural practices. Also negative externalities of application should be avoided.

| **Plant protection, Plagues and Diseases** -Score 2- | |
|---|---|
| Positive | Negative |
| Documented and integrated management plan on plagues and diseases on the vineyard | No management on avoiding externalities |
| Realization of periodic monitoring | No data on impact of sustainable practicies on the use of agrochemicals |
| Promotion of products with low environmental impact | High usage of toxic yellow and blue labeled products |
| Biological control on natural enemies is favored: biological corridors and roses on each side of a plants cue to distract insects. | No use of biological or natural products<br><br>No clear reduction of chemical products use |
| Canopy management: assuring adequate light and ventilation which allows minimizing of diseases. | No rotation of active ingredients insecticides, increases plague resistance |
| Adequate machinery and equipment to apply plant protection products<br><br>Product application by moistening | Lack of anti-spill barriers in the cerral of agrochemical products |

Comment

Caliterra possesses an integrated management of plagues and diseases; a combination of cultural practices to minimize environmental, chemical and biological impact, for a healthy cultivation with the least possible effect on ecosystems. The advanced monitoring system allows the segregation of control areas. Monitoring includes plague or disease description, caused damage on vineyard, cycle in which it occurs, development during the season and what would be the optimal timing of chemical or biological product application. After the monitoring economic damage thresholds and control options are analyzed. Biological corridors promote proliferation and refuge of natural enemies or fauna.

Agrochemicals are applied manually with a backpack or with a machine through a moistening method. Using 300 (or 600, 800 or 1200) liter per hectare. Each moistening has a calibration procedure, this is a efficient and therefore sustainable method. Caliterra operates under the Good Agricultural Practices (Buenas Prácticas Agrícolas, Chile), principles that indicate a proper use of agrochemicals.

Aside from the aim to minimize agrochemical products application, no clear gradual reduction of chemical products use can be shown by Caliterra. The impact of the biological corridors is not certain. Suggestions are it has led to an estimated 30% reduction of pesticides which in 2016 should become 45%. However there are no clear data on this. Since 2011 use of insecticides has increased because of the recent arrival of Lobesia botrana, the European grapevine moth in Chile. Increase in 2015 of acaricides is due to a false detection of the red spider mite.

Even though products with a low environmental impact are favored, too much yellow and blue labeled chemical products are being used. Figure 1 demonstrates that in 2014 37% of agrochemical products used were of high negative impact. Caliterra aims to purchase as many green products as possible, however as wine grower Oliva indicates: 'the green labeled products are always more expensive in the end, they have to be applied more often and more labour is needed. Sometimes they are even less efficient. For some plagues you have to apply the more toxic products'.

Unfortunately some product applications are done preventively, on the entire vineyard. Caliterra should try and increase the use of biological and natural products.

Conclusion

A **score of 2** is given, because even though several practices aim to minimize the use of agrochemical products, there is a lack of a clear management strategy on the reduction of these products, on the increase of low environmental impact products combined with a lack of knowledge on the impact of sustainable practices.

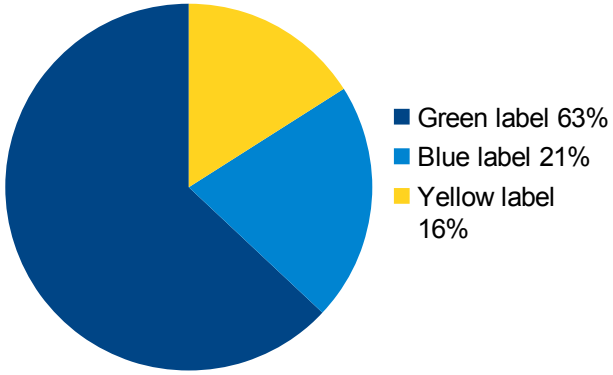



*Figure 1. Caliterra's use of agrochemical products per label color, 2014.*

Table 1 shows only proportions of each product. To implement good policy data are needed on the actual use of agrochemicals in volume over the years and the impact of sustainable practices on the use of agrochemicals. Also data are required on the proportions per toxic label color of these products over the years and for 2015, as indicated for 2014 in figure 1.

**Biodiversity protection**

| **Biodiversity Protection** -Score 4- | |
|---|---|
| Positive | Negative |
| Properties of Caliterra and surroundings not declared as high biodiversity areas, this means less biodiversity impact is created due to construction | No knowledge on negative environmental impact or contamination of soil, water or nature |
| Biodiversity protection included in their strategy | No evaluation of the impacts of toxic products on the surrounding biodiversity |
| Caliterra owns approximately 1.085 hectares, of which 75% is virgin land | Reforestation not considered |
| Caliterra prohibits the hunting of rare species and the logging of native forests | No conservation areas of biodiversity within property |
| Caliterra promotes fauna conservation on property and promotes flora in slopes and between vineyard rows | No clear numbers of data on biodiversity preservation |
| Caliterra promotes and conservates the presence of predatory birds | |
| Caliterra has implemented biological corridors: almost 1000 mts2 surface corridors. In 2014 five new corridors where planted | Biological corridors are not made with native plants |
| Caliterra is associated to the project “Vino, Cambio Climatico y Biodiversidad” | |

Comment

Caliterra promotes the vineyard as taking care of the natural surroundings, without changing the existing

native flora nor fauna. They are realizing this increasingly well through biological corridors, preservation of native forest and promotion of birds of prey. Caliterra is associated to the project "Vino, Cambio Climatico y Biodiversidad", a scientific initiative of the Ecological and Biodiversity Institute and the Austral University which aimes at demonstrating the compatibility of biodiversity conservation and development of the vitiviniculture industry of Chile. They have registered all flora species on the vineyard and they facilitate free training on biodiversity and climate change for the workers of Caliterra.

On possible externalities of toxic products for plague and pest management Caliterra has no information. Caliterra does realize management on clean production practices under Chilean certification. For example application equipment is washed in a habilitated area and waste is accumulated in a special tank to avoid soil contamination. But there are no studies as to what extend Caliterra is currently contaminating soils, water or conservation areas. More attention to good information is needed to develop better prevention strategies.

Conclusion

A **score of 4** is given, because Caliterra does have sustainable biodiversity management although Caliterra should pay more attention to biodiversity conservation areas within the property itself.

For good policy implementation more information on negative environmental impact needs to be collected leading to a clear documentation on current and growing biodiversity.

**Waste management**

| **Waste Management** -Score 3- | |
|---|---|
| Positive | Negative |
| Documented and integrated management plan of solid, liquid, organic and dangerous waste during use, storage and final disposal, meeting the legal normative | Uncomplete documentation on waste generation and disposal<br><br>Lack of clear strategy on waste optimization |
| All **solid non organic** waste from suppliers products are recollected, separated and handed over to recycling companies<br><br>Glass is donated to Coaniquem<br>Barrels are sold or donated<br>Wooden masts on vineyard are recycled and accumulated within the vineyard. The vineyard reuses them on the territory or they are donated to different institutions. 2014: donated to Los Olmos school to build playing constructions for the children<br><br>Leader recycle route of paper and cardboard in the community of Palmilla | Offices Caliterra in Santiago do not recycle any waste |
| Compost: **organic** waste management of vinification process and pruning back to the vineyards | |
| Geobarra collects **dangerous** waste 2 times a year.<br><br>All contaminated agrochemical plastic containers are recollected, washed and perforated.<br><br>Batteries recyclement together with municipality of Palmilla<br><br>Special cerral for dangerous waste | |
| Storage spaces for supplies or materials that count with conditions to protect and maintain these products, avoiding degradation or loss | No unnecessary packaging management of supplies |

Comment

Caliterra has a documented and integrated management plan of solid, liquid, organic and dangerous waste during use, storage and final disposal, meeting the legal norm.

- *Solid waste: organic and non-organic waste.*
- *Non-organic waste: empty containers from plant protection products and wine production materials, cardboard, plastic, paper.*
- *Organic waste of cutting: pieces of shoots, trunks, leaves, branches and grape bunches in a bad*

*state.*

- *Organic waste vinification process: stalks, dross and borras. These are reusable.*
- *Dangerous waste: used oils, batteries, oil filters, fluorescent tubes and others.*

Through waste recycling Caliterra aims to reduce their environmental impact and support community goals. Caliterra also aims to increase recycling rates in the community. Caliterra has positively changed practices such as disposal of contaminated plastic containers to the triple wash, perforation and disposal. Safe disposal of these dangerous containers is very important. Organic waste from vineyard from the cutting process is not recollected, instead is left on the property for it to degrade.

Caliterra operates under the Clean Production Agreement (Acuerdo de Producción Limpia), indicating principles on waste management. Caliterra is perceived to have good and safe waste management and recycling practices. In the documentation Caliterra has on waste disposal over several years the quantities are not compared to total waste generation, which is not registered. Thus it remains unclear what part of total waste is actually recycled and whether this decreases or increases. The lack of numbers and measurement go hand in hand with a lack of strategy on waste optimization.

Conclusion

A **score of 3** is given, due to the unclear data on Caliterra's waste reduction, recycling and the lack of strategies or goals.

To implement good policy, data are needed on both total waste generation and recycling.

**Water management**

| **Water Management**<br>-Score 2- | |
|---|---|
| Positive | Negative |
| Measurement of water consumption vineyard, per month and per year in liters<br><br>Measurement of water consumption winery, per m3 or per liter of wine, in liters | No measurement system of hydrological flows on vineyard and winery<br><br>Lack of master plan and documentation on optimization, reduction and reusing water, without affecting business operations |
| Efficient irrigation method<br><br>IPM practices<br>Multi spectral aerial photography: water use mapping<br>Scholander Camera: plant water status measurement.<br>Use of automatic weather stations | No knowledge of water hotspots or reduction opportunities because lack of footprint<br><br>No creation of natural water sources<br><br>No management on irrigation during hours water evaporates less |
| Use of uncontaminated water resources: every 2 years, chemical or biologic analysis of irrigation water | |
| Reuse of waste water from vinification process: stored temporally in wells, is then send to degradation pools where organic bacteria help degrading particles to reuse water for irrigation of territory | |
| Implementation of equipment more efficiently using water in winery<br><br>Training of staff on water use | Changes but no measurements to prove effectively the reduction of water use |

Comment

Through water measurements in both the vineyard and the winery Caliterra is making its first steps towards a sustainable water management. However hydrological measurements lack. The current measurements should be used for water use optimization. Instead it seems they are currently only used for cost calculations. Water use on the vineyard varies a lot each year due to climatic circumstances, nevertheless a master plan and strategy for reduction are possible. Positive are the controlled drip irrigation and the IPM practices calculating how much water the plant needs, allowing minimal use of water resources.

Compared to previous years the average water use in the winery per liter of wine is lowest in 2015, although this figure does not include all twelve months yet. Mainly a winning can be made in the winery. Some equipment in the winery has been adapted over the years according to the winery manager, such as a washing system spraying water with pressure to waste less water or a changed humidification system in barrel hall that is more efficient, but the impact of these changes on water use are unclear. Furthermore these seem to be loose actions without an overarching master plan to achieve bigger wins or at least know what one wants to achieve. Caliterra claims to be looking into investment in reusing water from cube to cube.

Conclusion
A **score of 2** is given, because a master plan on water use optimization, reduction and reuse needs to be developed to improve water management and sustainable water use.

To implement good policy more specific water use data are required to increase knowledge and understanding on water hotspots.

**Energy management**

| **Energy Management** -Score 1- | |
|---|---|
| Positive | Negative |
| Weekly energy use measurement in the winery | Measurement is not used for a reduction or optimization strategy.<br>No measurement of energy use on the vineyard |
| In 2015 a project on carbon footprint measurement will be started | No clear master plan on energy use, optimization nor reduction, with clear and verifiable goals |
| Barrel hall needs a specific temperature: natural freezing system, in months with cold nights these halls let natural air enter to cool down the hall which saves energy | No evaluation of the incorporation of non-conventional renewable energy, both economically and technically |
| The cerral is an open space where natural light is exploited during the day illuminating the entire space which is positive. Low consumption lights that light automatically when it gets darker outside | The cerral has no roof. Negative for vinification because a lot of energy is necessary to get the adequate temperatures in the cubes: it hinders the thermic winning process in the winter and reduction of temperatures in summer |

Comment
Caliterra's principal energy sources are diesel fuel, bulk gas and electric energy. Caliterra realizes an energy management to the extent that when energy rates are high, costs rise and need to be decreased. Through the energy measurements in the winery Caliterra is making its first steps for a more sustainable energy management. However energy flows in the winery still lack and there is no energy measurement for the vineyard.

Even though energy use in the winery is measured, no energy use reduction plans have been made and there are no indicators on energy use. Therefore it remains unclear what impact the changes in winery equipment have on total energy use.

Caliterra has petitioned the construction of a roof above the fermentation cubes to Errazuriz many times, for sustainability reasons. These are big investments and have to be discussed with Errazuriz. Errazuriz perceived the investments as too high and repeatedly dismissed the petition. This has caused frustration with Caliterra management.

Conclusion
A **score of 1** is given, because little attention is given to energy consumption now and because of the need for continuous work on the development and implementation of an optimization policy of energy and fuel

use.

For this policy more specific energy use measurements need to be developed to increase knowledge and understanding on energy hotspots.

## Social Dimension

**Sustainability Policy**

| **Sustainability Policy** -Score 3- | |
|---|---|
| Positive | Negative |
| Caliterra has a great sustainability philosophy on the vineyard, different from the rest of Errazuriz. | Caliterra does not have a documented sustainability policy. |
| Ethical code created in 2013 | Ethical code is not actual, not of publicly accessable, not well known and Caliterra has not worked on its difusion<br><br>No compromise of senior management on completion of the goals or revision of this completion |
| Health and security protocol, latest version September 2010 | Internal work protocol is not publicized anywhere |
| Certified with Codigo Nacional de Sustentabilidad | No other certifications |

Comment

Caliterra has an ethical code created in 2013 where the principal ethical standards that Errazuriz' vineyards should meet are mentioned. The firm should finalize the diffusion of the ethical principles of the firm. The firm should have some institution or internal structure which independently to other responsibilities, promotes its ethical principles throughout the organization. The company respects a person's rights and is against discrimination on any ground, explicitly written in the ethical code. The company has not had any incidents of discrimination however it does not develop anti-discrimination practices either. Aside from better revision and diffusion of ethical principles, the ethical code should be more actualized. The company has no policy on incorporation of discapacitated people or members of vulnerable groups. Indigenous rights are not officially taken into account either.

The company has a health and security protocol, of which the latest version dates from September 2010. Most significant point is the protection against ultraviolet radiation. All permanent and temporary workers know this protocol and have a copy but the internal work protocol is not publicized anywhere. This protocol should also be renewed.

Caliterra has a high intentionality level for sustainability management but the company does not have a documented sustainability policy and report. Caliterra is currently working on a sustainability report to document all actions and focal points on sustainability. Sustainability policy and documentation should provide detailed information and critical points and not merely exist of propaganda. For everyone to check and to know where to work on. The documentation should be compared with a sustainability report and provided each year.

Also Caliterra should engage with more specialized social certifications such as BSCI.

Conclusion

A **score of 3** is given, because it is believed the sustainability responsibility and philosophy is definitely

there, however it urgently needs to be documented, and it needs expanding with more social sustainability.

**Community compromise**

| **Community compromise** -Score 3- | |
|---|---|
| Positive | Negative |
| Caliterra is member of the environmental committee of the Palmilla community with other actors. | Besides many ideas and initiatives, an integrated management plan of Caliterra for the community of Palmilla lacks. |
| In 2013 Caliterra won a price from the municipality of Palmilla for their constant support and work creation in the community | No preference for local suppliers, only price and quality criteria |
| Help with development community by concrete projects | Most big actions happened in former years 2014 and 2015 no clear concrete project planning |

Comment

Caliterra is active in their community Palmilla. There are monthly meetings of the environmental committee supporting projects and comparting initiatives. Principally Caliterra supports through donations, technological transfer and project participation.

Caliterra has created clean/green points in the community and has provided training for communities on recycle issues. They donated recycle points in schools, consulting rooms and public offices in the same community. Schools are welcome to visit the vineyard so that they can learn about agriculture through training. Caliterra gave a motivational discourse on the school Los Olmos.

Big actions have mainly occurred before 2014. From 2007 to 2011 a folkloric group of Santa Cruz received instruments, clothes and sound equipment. Mutual agreement: the group would play when clients came to visit the vineyard. Even though the agreement ended a few years ago, it is still being promoted on their website. In 2013 Caliterra donated wooden masts and pallets to Los Olmos school to construct a playground. The school Santa Matilde has a group called “Environmental smiths”. Caliterra has donated them materials to create organic gardens within the school such as compost, chips, masts, planks.

Prominent is that donations go mostly mostly to schools. Actions are less for the entire community.

Critical however is that instead of having clear focal points, they are involved in several loose projects that arise in the process. Caliterra should go for an integrated management plan for community inclusion.

Conclusion

A **score of 3** is given, because over the last two years Caliterra has been involved less in their community, they still promote ended collaborations and they lack an integrated management plan. In this plan or documentation, Caliterra should also give a good overview of all their actions together.

**Labor quality**

| Labor Quality<br>-Score 3- | |
|---|---|
| Positive | Negative |
| Anual labor evaluation by Caliterra's staff | However no measures have been taken on results |
| Specified work hours defined by the company | In practice, not always the case |
| Equal salary between men and women when developing a similar activity.<br>No differences in agricultural area. | Temporal workers: salary differences between men and women because of different salary dependent on the daily advance on yield |
| Company is concerned with workers and family members having a complementary insurance | Managers concerned with good work ing conditions but no working plan on company level |
| Caliterra has normative and procedures in case of accidents or emergencies<br>Certification and exams on contamination of chemical products<br>Good protection measures | Highly toxic products of group III are occasionally used against plagues<br><br>No plan with goals and indicators. Training and informs not registered. |
| Workers have complete liberty to affiliate and form syndicates They provide facilities to realize meeting between members<br><br>Caliterra maintains workers close and generates motivation<br><br>Company has a training program on different themes | No worker belongs to a syndicate<br><br>No concrete mechanisms that allow them to receive their ideas or suggestions.<br><br>Neither are the companies results shared with the workers as a motivational strategy |
| Only broad benefits for workers with an indefenite contract | No remuneration system considering wage raises or additional economical benefits such as bonuses |

Comment

Caliterra's staff is happy to work for the wine company. They are well taken care of and there is a friendly and close vibe on the working floor and in the field.

Safety of the staff is important to Caliterra. The staff on the vineyard uses Buzo Tyvek trousers to protect application workers against organofosforados in their blood. Clothes are well cleaned, there are showers and exclusive dressing rooms for application workers. Staff is trained on the risk of sun exposure and how to protect itself. Each month a joint committee takes places, with both agents of the company and of the workers where they analyze hygiene and security themes. Caliterra has a preventionist who analyzes risks and potential accidents twice a week and organizes trainings related to health and security. However, again a clear management plan lacks with goals and indicators to measure and achieve improvement on these matters.

The principal training focal points are pesticides use, work security and environmental care. Caliterra has a total budget of 6 million Chilean pesos for trainings, in different departments. In 2014 there were trainings on leadership, vinification processes, waste management, irrigation bombs operation, motivational techniques and organizational quality of life.

Caliterra counts with a broad spectrum of benefits for their staff namely:

- *Complementary insurance without costs (health care, life, catastrophic)*
- *Chilean holidays and Christmas*
- *Box of wines on Chilean holidays and Christmas (6 bottles of white and 6 of red wine)*
- *Transport close to fabric and vineyards*
- *Compensation box Los Andes (deals to which workers can access like health, education, culture and others)*
- *Deal with Associacion Chilena de Seguridad (labor risk prevention)*
- *Celebration of festivities like Christmas, end of the harvest, national holidays (company has a*

*budget for these festivities for all work areas)*

There has also been a education program for interested workers to complete their scholar studies, in 2008 eleven workers met their goal.

Temporary workers however do not receive benefits. Caliterra works with three types of contracts: indefinite, fixed term and temporary. In 2014 the monthly average of temporary workers was 120 compared to 14 permanent workers at Caliterra. During research several temporary workers have indicated that they, not rarely, work 12 hours per day without having time to lunch.

Caliterra needs to communicate better with their staff, on evaluation and on results. Concrete mechanisms need to be developed for this.

Conclusion

A **score of 3** is given, because in general staff is treated well and feels welcome. However there is a lack of communication, no inclusion of the temporary workers and goals and indicators are missing.

4. Conclusion Sustainability Evaluation Caliterra

Total score

*Environmental dimension*

Prevention of environmental negative impacts

- Fertilizers, Soil and Nutrition **3**
- Weed and Herbicides **2**
- Plant protection, plagues and diseases **2**
- Contamination and surrounding area **1**

Biodiversity protection **4**

Waste management **3**

Water management **2**

Energy management **1**

*Social dimension*

Sustainability Policy **3**

Community compromise **3**

Labor quality **3**