VINIFERA

THE WINE-GROWING GEOGRAPHY OF CHILE

2019

GONZALO ROJAS AGUILERA

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THE WINE-GROWING
GEOGRAPHY OF CHILE
2019

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Pacific Ocean.
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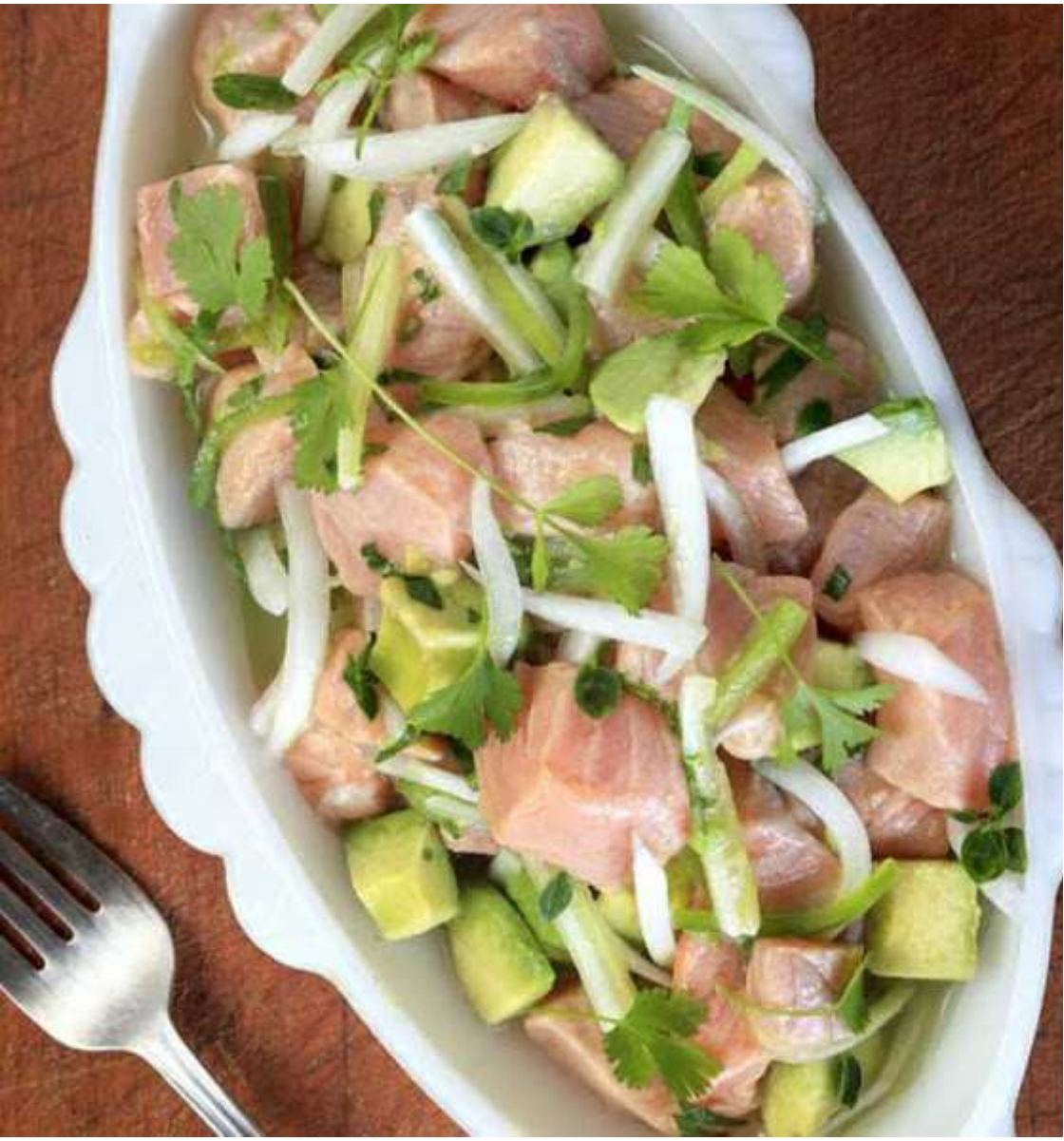

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Valle de Almahue.

1. INTRODUCTION TO GRAPE AND WINE-GROWING AND GEOMORPHOLOGY OF CHILE

Chile is member of the group of countries collectively referred to as Latin America. Its territory is described as being tri-continental, meaning it possesses land in the three continental areas of America, Oceania and the Antarctic. Chile is located entirely in the southern Hemisphere (south of the parallel zero or Ecuador) and Western hemisphere (according to the Greenwich Meridian).

This South American country is situated in the Western part of the Southern Cone, between parallels 17° 30' SL.—the point where Chile, Perú and Bolivia converge--and 56°32' SL—the southernmost point of the continent where Diego Ramirez islands are located.

Transversally, Chile extends westward between meridian 66°33' and 75°40'. It is located in the meridian 70 'L.0. time zone.

The Chilean Antarctic territory begins approximately at parallel 62° S.L. and its surface extends westward from the meridian 53 'to 90' Greenwich.

Chile's oceanic territory extends further than the continental shelf and 12 nautical miles west of the furthermost island considered Chilean territory.

A) San Félix and San Ambrosio (26° South Latitude) located 927 km from the mainland.
B) Sala y Gómez located almost at the same latitude but 3,400 kms. From the south American mainland.
C) Easter Island o "Rapa Nui" 3.760 km from the mainland. (27° South latitude).

D) The Juan Fernández archipielago (30° south latitude) is constituted by Robinson Crusoe, Santa Clara and Alejandro Selkirk islands and is situated at 800 Kms from the mainland.

CHILEAN MAP

Fuente: Enciclopedia Encarta

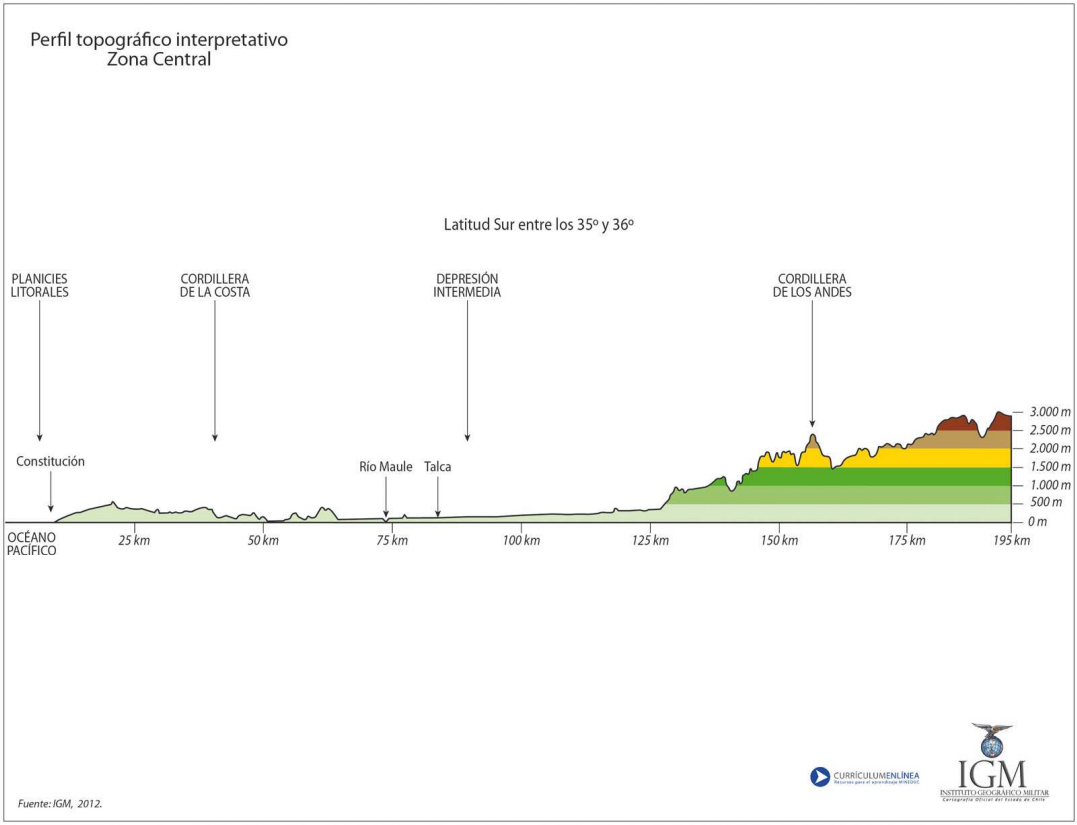
Chile is divided in fifteen political regions. It extends 4,360 kilometers from north to south and is approximately an average of 185 kilometers wide. Chile is comprised of different geo-climatic regions and a variety of landscapes. Because of this, it boasts a range of different flora and fauna.

The country is divided into three geographic and cultural zones: The Northern Zone, where the world's driest desert is located, the Atacama Desert: the Central Zone where there

is a Mediterranean climate that allows for diverse agricultural production, including fruits, cereals, vegetables, industrial crops and, of course, grapes; and, the Southern Zone, where unique flora and fauna exist due to the increased rainfall in the region.

These climatic and geographic characteristics make Chile a country extraordinarily attractive not only for tourists but for viticulture. Wine production takes place in various regions of the country, though it is most concentrated in the central zone. Over the years other less-centrally located areas in both the North and South of the country have been discovered as being great for wine production.

Chile has four Geographic Macroforms which vary according to the latitude and are key to understanding the country's geo-climatic variations. Starting from east and extending into the western part of the country, the macroforms include: The Andes Mountains; the Intermediate Depression; the Coast Mountains; and, finally, the Coastal Plains.



The country's most important mountain range is the Andes. Over the years the Andes region has taken more prominence in Chilean and South American viticulture. The Andes mountain range is approximately thirty million years old and is the world's second biggest mountain range, following the Himalayas. The Andes stretches along the western part of South

America, from Guajira (Colombo-Venezuelan) to Cape Horn and the Antarctic where the range is called the “Antartandes”. In the North and the Central Zones of Chile, the Andes’ peaks can reach altitudes as high as 6,000 meters above the sea level. The world’s highest volcano Ojos del Salado, located in the Atacama region, is part of the Andes mountain range and is 6,891 meters above sea level.

The Andes range also acts as a screen preventing both the entrance of the humid winds from Argentina into the Central Valley and the entrance of cooler temperatures from the Pacific Ocean into the western part of the South American continent.

Moreover, the Andes allow for thermal oscillation. Some days there is a difference of 20°C between the day and night in this region. Grapes growing in the Andes accumulate sugar during the day while maintaining the natural acidity during the night. It is allowing for the grapes to have optimum fruit balance and for wine producers to generate high quality wines.

The Intermediate Depression is a basin area located between the Andes range and The Coastal Mountains. It is here where the major part of human settlements, agricultural activity (vineyards), and cattle industry are developed.

The characteristics of this macroform vary according to the different regions of Chile. The depression extends from the pampas and deserts in the north to the basins and valleys (both transversal and longitudinal).

Another geographic unit that influences the climatic and soil conditions of Chile is the Coastal range, which also plays an important role in local viticulture. This smaller mountain ranger begins 20 kilometers south of Arica city (extreme north) and falls steeply to the ocean. The range reappears further south, reaching an altitude of 2000 meters above the sea level. Close to the southern city of Concepción the name of this mountain range changes to Nahuelbuta range.

The Coastal Range's latitudinal extension creates a significant barrier, blocking the cold air masses from the Pacific Ocean and generating a Mediterranean condition eespecially in the Central Zone. The diverse mesoclimates and microclimates of Chile's Central zone are optimal for viticulture.

Additionally, this mountain range is perfect for growing Mediterranean varieties of grapes because of its rolling hills and excellent slate soil in the Maule, Itata, and Bío-Bío regions.

Finally, there are the Coastal Plains which stretch from the Pacific Ocean to the Coastal range. These plains have been created as a result of tectonic plate movement and the transgression (sea rises) and regression (when areas of submerged seafloor are exposed above the sea level) of the sea levels over the years.

The Coastal plains of Northern Chile are limited in size due to the fact that the Coastal mountain range essentially cuts through these lands, creating headland. However, the plains are between 20 and 30 wide in the country's Central Zone. Many economically important Chilean cities are located in this macroform, including Iquique, Valparaíso, Concepción, and Valdivia as well as other ports. There are even some coal deposits located in Chile's coastal plains.

In relation to viticulture, the Coastal Plains are strongly influenced by the Pacific Ocean and have colder climates in comparison with the Central and the North Zone, making the region ideal for grape varieties that require colder temperatures to express their characteristics fully. The same varieties that grow well in the Coastal Plains also flourish in the southern part of Chile with its colder climate.

All this geomorphological information foregrounds the upcoming explanation of how these geographical characteristics shape Chile's diverse climates and soils. This information also helps explain the variability and uniqueness of Chile's current wine valleys.

Chile's territories, especially its macroform reliefs (detailed below), give it enormous potential in terms of its production of unique and highly diversified wines.

Finally, these different macroforms allow winemaking experts to organize Chile's wine territory and determine the "Denomination of Origin" of the different wines according to the following the sectors: **"Andes", "Entrecordilleras" y "Costa."**

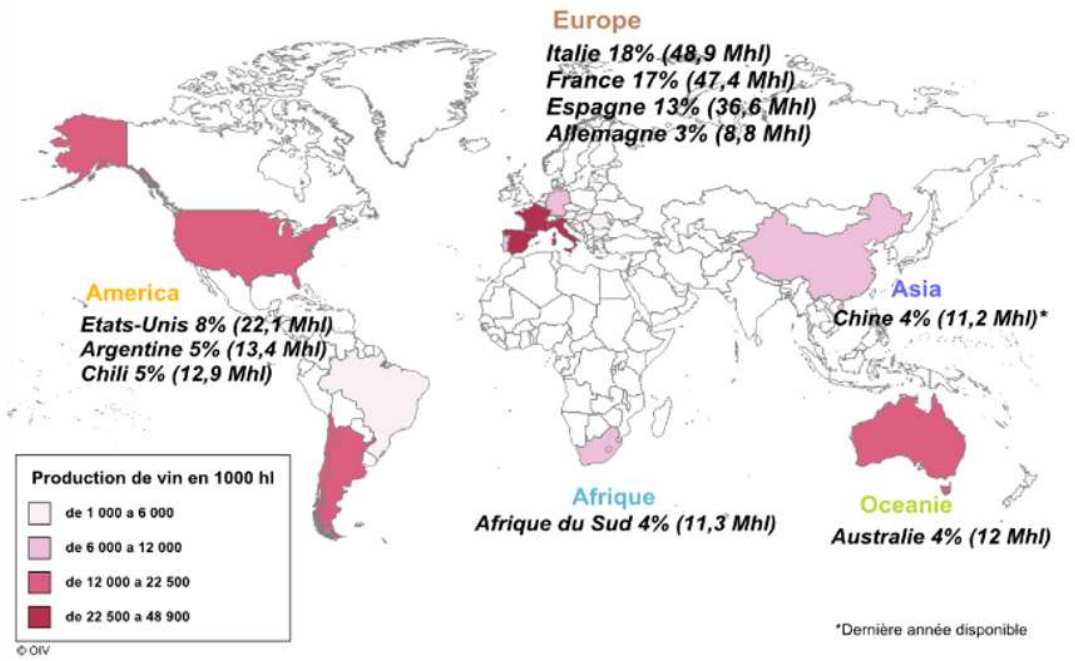
2. STATISTICAL PROFILE

The history of wine in Chile dates back to the arrival of the first Spanish conquerors, the likes of whom introduced the first grapevines to the region around 1540 and 1550. During these first decades of Hispanic settlement, viticulture spread throughout Chile's Central Valley, from the cities of Huasco to Concepción. By the seventeenth and eighteenth centuries, Chile became America's largest producer of grapes and wines. It was not until the mid-nineteenth century that Argentina supplanted Chile and became the most important grape and wine producer. Argentina's Mendoza and San Juan valleys developed substantially at this time.

Currently Chile is considered one of the world's main wine producers and exporters. Wine making is an important economic activity nationally. Chile exported 1.5 billion U.S. dollars' worth of bottled wine in 2015, an increase of approximately 25 million liters in 2014.

According to the current figures of the OIV (International Organization of Vine and Wine) Chile is the world's sixth wine producing country, with 12.9 million hectoliters (mhl). It is also the fourth country in exports and is the largest wine exporter of the New World.

275,7 Mhl la production mondiale de vins en 2015
(hors jus & moûts)



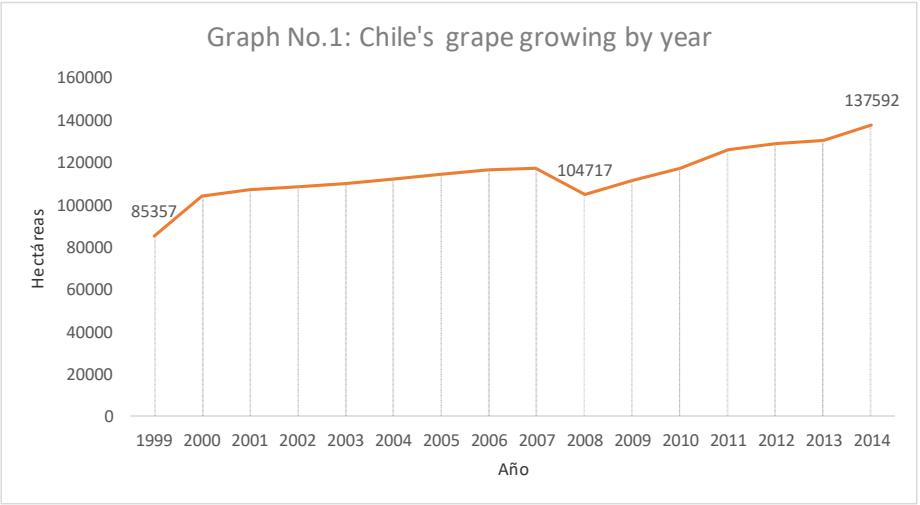
*Dernière année disponible

© OIV

2.1. TOTAL VINE-GROWING AREA

There are 7,573,000 hectares of vineyards (this takes into account vineyards that produce wine grapes and grapes/raisins for consumption OIV 2015). Chile currently contributes to 196,746 hectares of these nearly 8 million hectares; 137,592 hectares of Chile's vineyards are dedicated to producing wine grapes while 50,952 hectares are dedicated to producing grapes/raisins for popular consumption. Another 8,202 hectares are dedicated to producing Pisco (S.A.G. 2014).

The "Servicio agrícola y ganadero" (Agricultural and Cattle Raising Service, S.A.G. 2014) conducts a cadastral survey annually wherein grape producers register the total hectares planted each year in an online system. Using this same information from the cadastral surveys (see Graph No. 1) you can see the evolution of hectares planted exclusively for wine grape production. Over a fifteen-year period, Chile went from planting 85,357 hectares of wine grapes to 137,592 hectares.



Source: Elaboration with SAG (Servicio Agrícola y Ganadero) information

In 1999, there were 62% less hectares dedicated to grapevines than in 2014. Between 1999 and 2014, the number of hectares growing grapevines experienced an average growth rate of 3% annually.

The lull in grape production in 2008 was due to the SAG's change in information collection. Prior to 2008, SAG manually gathered information from growers on uprooted vines, rootstocks, and/or new plantings. Growers submitted written documents about any modifications to their vineyards. In 2008, growers began reporting on the overall hectares they had planted.

The increase in grape production (and hectares dedicated to this) over the years reflects Chile's increasing wine exports and its inclusion of new viticulture zones (see Table No. 1). Chile has diversified its grape supply and expanded its viticultural zoning while the world has increased its overall con-

sumption. In general, the increase in wine consumption worldwide and the prospect of new markets has allowed for producer countries such as Chile to increase their wine production and grape growing.

At the present, United States of America is the main export market destination for Chilean wines, followed by China. In 2015, China's importation of Chilean wines increased by 54% in total volume. In the near future, China could become Chile's main market for wine exportation.

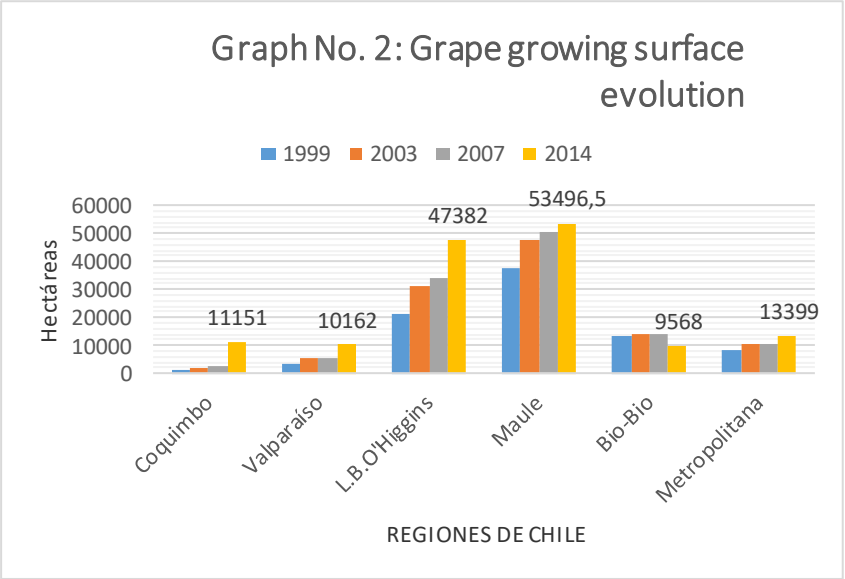
2.2. VINE-GROWING AREA REGION

011

Figura N°5

Chile's best region to grow grapevines and conduct any other agricultural activity is the South-Central zone due mainly to its Mediterranean climate. To understand how the different wine regions are divided and analyze them it is first necessary to recognize that Chile is made up of 15 administrative regions. Chile's different wine regions do not necessarily coincide with these 15 administrative regions.

The main areas planted with vineyards in Chile lie between the Atacama and Araucanía regions. However, there are cadaster surveys that indicate that since 2014 vineyards exist in Tarapacá and the Antofagasta regions in the North. The "Austral Region", south of Malleco, also has expanded into producing wines.



Source: Elaboration with SAG (Servicio Agrícola y Ganadero) information

Despite the fact that wine production has expanded in the country over recent years, (see Graph No. 2) production is still concentrated in Chile's Central-South O'Higgins and Maule regions. Presently 73% of the country's grapevines plantation takes place in this Central-South region; 47,382 hectares in O'Higgins and 53,496 hectares in Maule region.

Santiago's Metropolitan region contributes 9.7% to the country's overall wine production while Coquimbo contributes 8%. Valparaíso contributes 7% and Bío-Bío contributes 6.9% respectively.

2.3. MAIN GRAPE VARIETIES GROWN IN CHILE

European Vines *(Vitis Vinifera)* arrived to the Americas on the second Christopher Columbus voyage to “La Española” island (modern day Haiti and Dominican Republic) via raisin seeds and vine cuttings. The first varieties were probably “Listán prieto” from Canary Islands.

A result of the Spanish conquest, the grape’s fast insertion into the continent was strongly accompanied by a religious conviction to evangelize native cultures. Grapevines played a fundamental role because wine served as the essential element in celebrating the Catholic Eucharist.

Studies of wine suggest that this was the original variety of grape planted and grown in the Americas. This same grape variety would later give way to different creole, Latin American varieties, including but not limited to the “Moscatel de Alejandría”.

“Listán prieto” or “País”, as it is known in Chile, is presumed to have been in existence within Chile’s national territory since the nation began growing wine. This variety is similar, but not identical to others known in the rest of the continent, such as “Criolla Chica” in Argentina; “Negra Corriente” in Peru; “Misionera” in Bolivia; and “Mission” in California. (Pszczólkowsky, 2015)

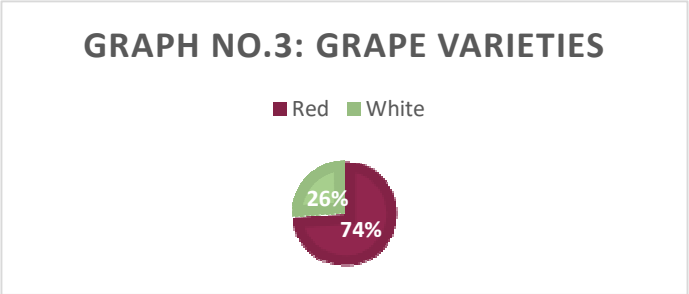
Up until the first half of the nineteenth century the most important grapes for red and white varieties, respectively, were the "Uva del País" (corresponds to the current “País”), the “Moscatel” and the natural crossings between them.

Around 1840, French grape varieties began appearing, primarily thanks to Claudio Gay, who created the “Quinta Normal de Agricultura” in Santiago. In this park, Gay introduced

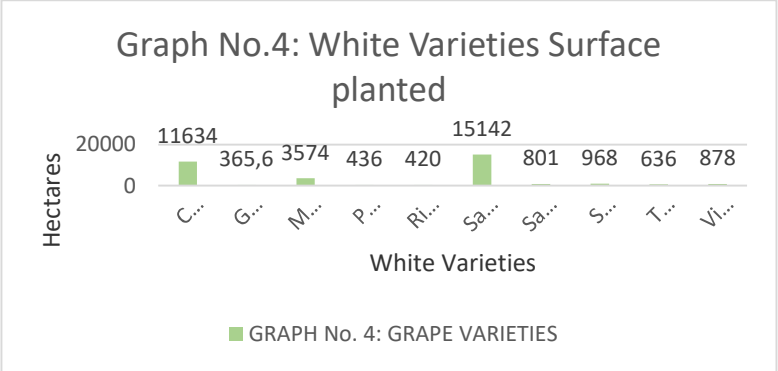
ornamental plants and around to seventy grapevines varieties for vinification and fresh consumption. There were also other wine entrepreneurs, inspired by the French culture, who sought to make wines similar to those made in the prestigious French "*châteaux"* region*.* These wine entrepreneurs imported the main grape varieties from Bordeaux and Burgundy and began producing wines directly inspired by the French.

Silvestre Ochagavía was the most renowned winemaker of that time and he boasted the following red grape varieties on his land in Talagante (Santiago): Cabernet Sauvignon; Malbec; Merlot; Pinot Noir; Sauvignon Vert; Chardonnay; Semillon; y Riesling (Del Pozo, 2014).

Presently in Chile there are seventy-seven wine grapes in production. Most of these are utilized to make blends. However, in recent years' new varieties have appeared. There are noew 28 white varieties, 36 red varieties, and 13 "Pisco" varieties. These new Pisco varieties have been recognized by the Denomination of Origin of Pisco law (Ley 18.455 Decreto N° 521).



26% of the total number of hectares planted in Chile are white varieties (35,841) while 74% are red varieties (101,751).



The most important white variety in terms of wine production is the Sauvignon blanc; 15,142 hectares are planted with this variety. Sauvignon blanc makes up 42% of white wine grapes planted in Chile and 11% of the national wine grape total. The second most important white wine grape variety is Chardonnay with 11,634 hectares planted. Chardonnay was the most important and planted white grape variety until

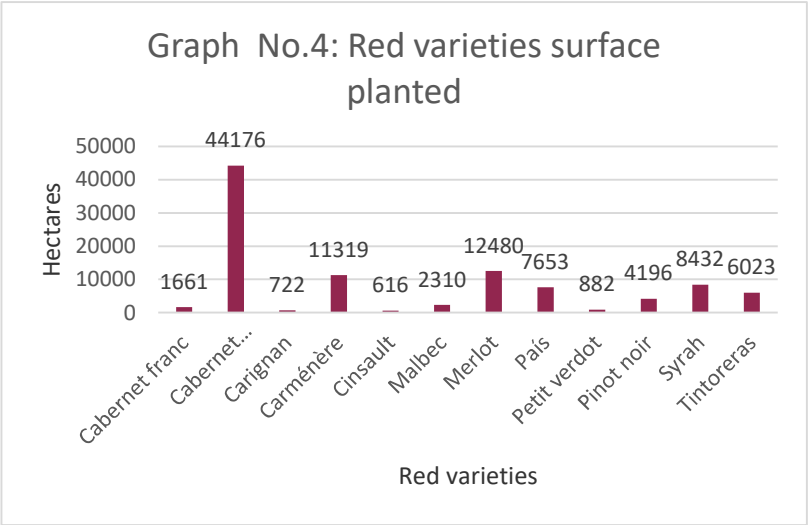
2009 when was supplanted by Sauvignon Blanc in 2010 with 2,444 hectares planted.

Sauvignon Blanc is a widely cultivated around the world with 110,138 hectares planted (OIV, 2014). It is cultivated mainly in France, Austria, Slovakia, Ukraine, Australia and New Zealand where it is considered as an emblematic variety.

The third most planted variety in Chile, and considerably less popular, is the “Moscatel de Alejandría” variety with 3,574 hectares planted within the South American country. Of the other varieties that are present in Graph No. 3, none exceeds 1,000 hectares planted. Collectively, these other varieties represent 5.9% (8,080 hectares) of all wine grapes planted in Chile.

There are some varieties that are not considered in decree 464 (establishes wine-growing zones and determine norms for its use). That is why these varieties produce wines without any Denomination of Origin, instead these wines are labeled: “Wine made with traditional varieties” (Vino elaborado con Cepajes tradicionales). Some of these wine grapes are: Blanca Ovoide, Aligoté; and Trebbiano.

Decree 464 is under constant review so it is possible that these varieties will soon be incorporated into Chilean law.



Undoubtedly the most important red wine variety in Chile is the Cabernet Sauvignon, with 44,176 hectares planted. 32% of Chilean vineyards are planted with this variety and have been since 1997. Merlot is the second most important red wine variety, with 12,480 hectares planted, and making up 9% of Chile's total planted wine grapes. (Graph No.4).

Cabernet Sauvignon is the most planted variety in the world, with near to 300,000 hectares planted. Since Chile has become a wine exporting powerhouse, it has increased its production of Cabernet Sauvignon substantially.

In the early nineteenth century the Carmenere variety was widely grown in Medoc (France), where is known as Grand Vidure, and it contributed to the renown of the region, due

to the quality of their wines. However, practically disappeared due to the crisis of phylloxera in Europe during the last third of the nineteenth century.

It is estimated that was introduced in Chile during the first half of the nineteenth century mixed with other varieties from Bordeaux. Selection work in the vineyard allowed separate it from Merlot variety, with which used to be confused, and like this could cultivate it independently. This error was detected in 1991 by the French ampelographer Claude Valat, who at the beginning thought that was Cabernet Franc variety. Then, in 1994 was correctly identified as Carmenere by the French ampelographer Jean Michel Boursiquot.

The oldest vineyards of this variety, preserved until today, are located in Almahue Valley, a subregion of Rapel Valley and date from 1945.

For about two decades ago this variety has been suggested as the Chilean emblematic variety, due to Chile is the main world Carmenere producer (Pszczólkowsky, 1997).

It is estimated that in the world by 2010 there were 11,360 hectares (0.25%). In Chile, by 2014 there were 10,733 hectares of grapevines between Atacama and Bío-Bío. Since 1997 the vineyard surface has been increasing considerably due to some new valleys discovered and the consolidation of chile as an exporter, specially to USA and China. Additionally, it is estimated that part of the Chilean Merlot vineyard still being Carmenere (Pszczólkowsky, 2015).

2.4. MAIN VARIETIES GROWN BY REGION

In Graph No.1 is possible to notice the vineyard distribution of main varieties planted in Chile by region. The most important varieties in terms of plantation are: Cabernet Sauvignon, Merlot and Carmenere of red varieties. Sauvignon Blanc and Chardonnay in case of white varieties.

As is possible to see in Graph No.5, the main part of total production is situated in the south central area of the country, specifically in O'Higgins, Maule and Metropolitana regions, where the production reach 42,783 hectares, 97% of the national plantation.

O'Higgins region also stands out for being the main producer of Carmenere variety, with 6,247 hectares planted. And Maule region is the main producer of Sauvignon Blanc with 7,424 hectares planted.

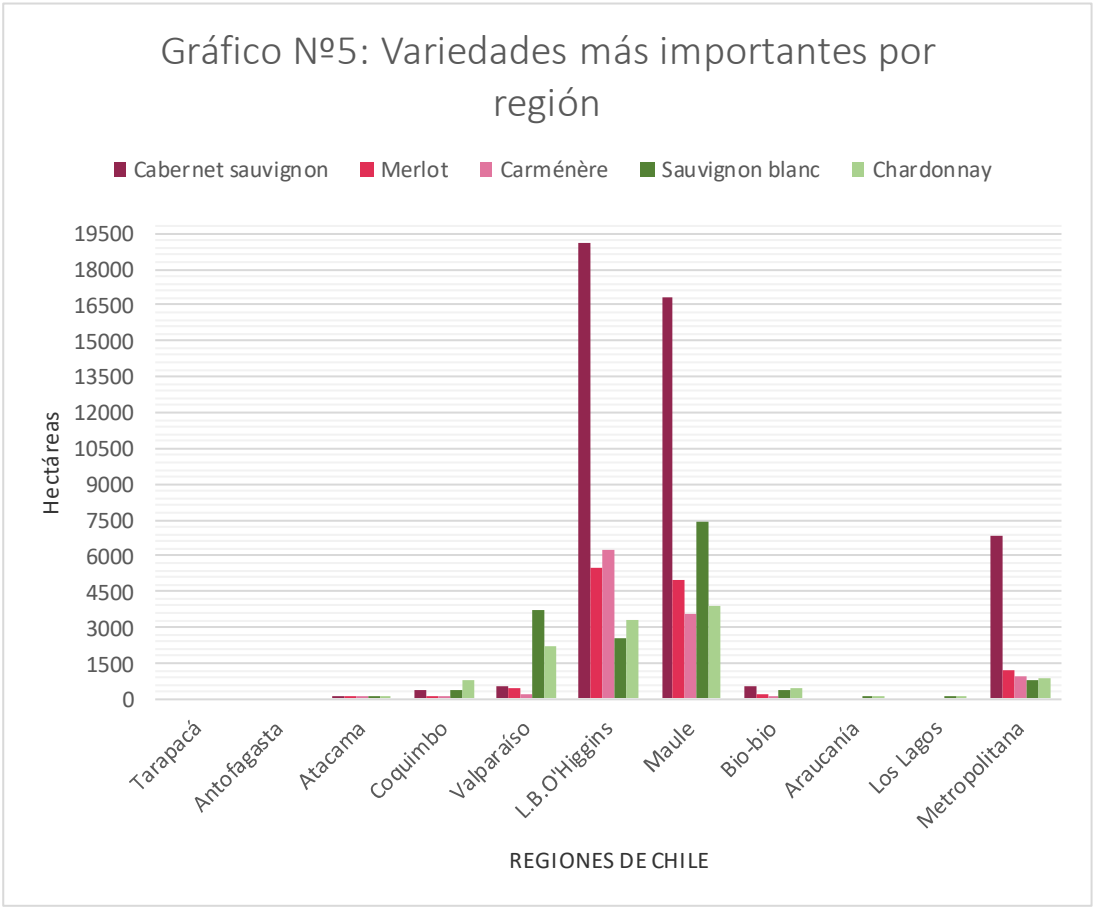
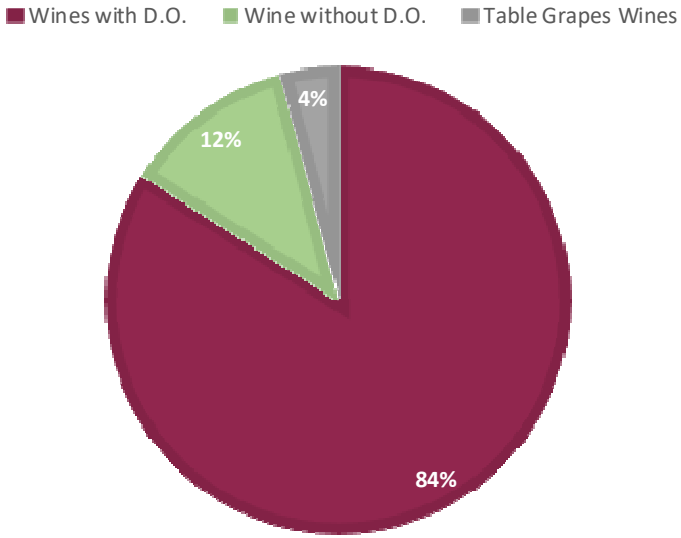


Gráfico Nº5: Variedades más importantes por región
Cabernet sauvignon
Merlot
Carménère
Sauvignon blanc
Chardonnay
Hectáreas
19500
18000
16500
15000
13500
12000
10500
9000
7500
6000
4500
3000
1500
0
Tarapacá
Antofagasta
Atacama
Coquimbo
Valparaíso
L.B.O'Higgins
Maule
Bio-bio
Araucanía
Los Lagos
Metropolitana
REGIONES DE CHILE

2.5. WINE PRODUCTION

According to the Wine production report made by the S.A.G, during 2015 is possible to see 13.1 Mhl (1,309,800,449 liters) of wine, 31% more than 2014, year in which allowing to the report made by O.D.E.P.A. (Office of Agricultural Studies and Policies) the wine production had a decreased around to 23% regarding 2013 due to a strong frost occurred the third week of September, that affected directly the 2014's yield vintage.

GRAPH NO.6: WINE PRODUCTION IN 2015



From the total wine elaborated during 2015, 11Mhl (1,102,813,277 liters) correspond to wines with Denomination of Origin (D.O.) which is equivalent to the 84% of the total wine declared. In this quantity is also included table wines without any variety specification with 12% of participation in the total. 0.5 Mhl (53,299,997 liters) are wines made from table grapes (4%).

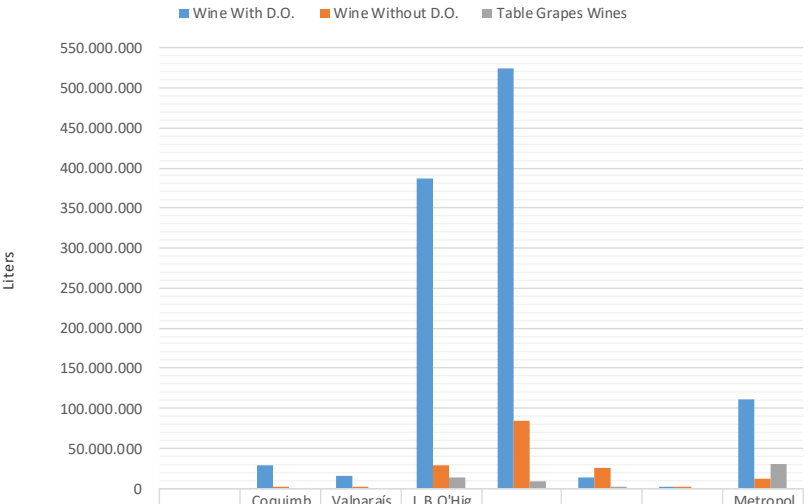
The increase in Wine production with Denomination of Origin has allowed Chile to achieve a better way to compete with the rest of exporters countries. With this system, producer countries can ensure a better quality and more information about the product reaching results as an increase in the average price of wine cases near to US$30 (Wines of Chile, 2015).

Also it is possible to analyze the wine production depending on the legal classification by region. Like this it is possible to distinguish how wine elaboration is distributed across the country.

In Graph No.7, is possible to appreciate the location of Chilean wine production. Maule, O'Higgins and Metropolitana regions are overall the 93% of the wine production and the 48.1% is concentrated in Maule. The main wine production with D.O. is also from Maule with 40.7% of national declared production.

It is important to mention the main table grapes wines elaboration also it is from Metropolitan region.

Graph No.7: Wine production by region

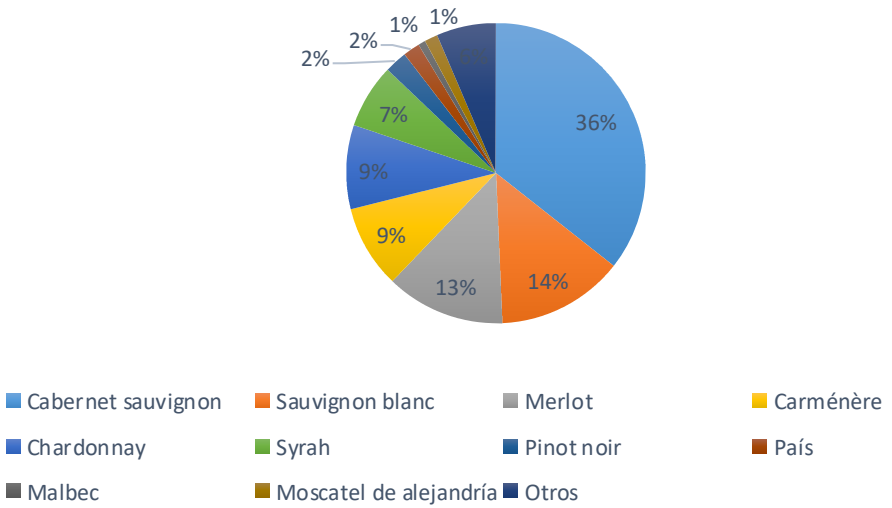


	Atacama	Coquimbo	Valparaíso	L.B.O'Higgins	Maule	Bio-bio	Los Lagos	Metropolitana
Wine With D.O.		29.316.596	15.504.320	387.309.02	524.937.09	13.764.735	22.584	110.453.56
Wine Without D.O.		1.603.768	141.290	28.427.197	84.919.961	25.805.152	1.350	11.355.563
Table Grapes Wines				13.315.445	8.741.606	27.860		31.060.286

REGIONES DE CHILE

72.4% (782,965,980 liters) of wines with D.O production are wines from red varieties. The 27.6% remaining (298,320,701 liters) are wine produced by white varieties (Graph No.8)

Graph No.8:
Wine production with D.O. in 2015

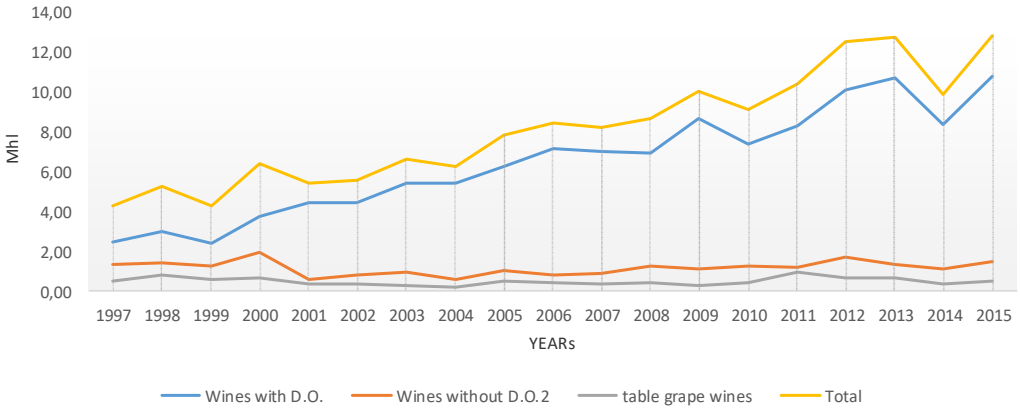


Analyzing the Wine production in terms of varieties, Cabernet Sauvignon reaches 35.4% of the wine production with D.O. Following by Sauvignon Blanc with 13.6%, Merlot with 12.8%, Chardonnay with 9%, Carmenere with 8.9% and Syrah with 6.9% reaffirming the importance of Cabernet Sauvignon and Sauvignon Blanc as the as leading Chilean wine varieties.

In terms of overall figures, it can be noted that in 2015 wine production, including wines with D.O., without D.O., and

table grapes wines reached 13 Mhl (1,309,800,449 liters), exceeding by 31% to 2014 which was 10 Mhl (991,934,707 liters).

Graph No. 9: Wine prodution development between 1997 and 2015



In Graph No.9 is possible to see a past eighteen years' wine production increased due principally to an increase in D.O. wines production that in 1997 was 57.7% of the whole production, and in 2015 was 84%, demonstrating the producer interest and importance in guarantee the origin of their wines, understanding the commercial benefits that this involve.

3. GEOGRAPHICAL CHARACTERIZATION OF CHILEAN GROWING REGIONS

Denomination of origin were created at the end of Middle Ages in Europe. They emerged as an effective solution to the problem of identification, protection, preservation and promotion of agricultural products, such as cheeses, breads, jams, spirits and wines, among others.

According to this, it is important to note: "The Geographical Indication which include Denomination of origin, were born thanks to the custom of designating products with the name of the place of their production. The settlement of people in specific areas, and the supply of raw materials in manufacturing places, led producers to create their brands with the geographical name of the place. And this brand was shared by all manufacturers of a particular product from the same city or region" (Errazuriz, 2010).

Only to clarify the conceptual difference: Denomination of Origin (D.O.) is a specific category of a Geographical Indication (GI) that in general includes a Geographic name or a traditional designation and is used in products which possess specific characteristics due mainly to the geographical production environment. Under the concept of Geographical Indication (GI), Denomination of Origin are located (INAPI, 2015).

According to the international evidence it is possible to conclude that every D.O. consider at least three aspects: A Geographical Indication or legal delimitation, a cultural heritage associated to the product, and a regulatory board allowing monitor, advise and commercially strengthen each D.O.

In Chile, administrative regions were used as the base to create a Geographical System which divides the country into

six growing regions described in the 464 Decree. Simultaneously these regions are divided into seventeen sub regions with eight zones and eighty-two growing areas. It is possible to observe them in Table No.1. This geographical division allows producers to specify from where are the wines that they are elaborating through a Denomination of Origin (D.O.) depending on the Sub region, valley, zone or area. All of this information about the origin of wines can be written in the label beside the variety and the harvest year. According to the discussion above in this case should be named Geographical Indication.

In addition to this information, the producer can add the expression “Estate Bottled Wine” If at least 75% of bottled wine was produced with grapes from the indicated place.

In 2011 the 464 Decree was modified and a new method to classify the origin of utilized wine grapes was incorporated. The new method involves two important Geo-climatic influences present in Chile, such as the Andes Mountains and Pacific Ocean for every growing region. While the climate difference is evident from north to south, there are also, similar difference at the same latitudes. Meso and Microclimates completely diverse due to these two factors. There are also other factors involved in the growing regions differences such as types of soils and the presence of The Coastal Mountains.

It is for this reason that in the same region, the condition in the vineyard can be completely different and since 2011 that producers are allowed to add in addition to the Growing Region, as a complement the following terms: “Andes”, “Between Mountains” and “Coast” depending on the most evident influence present in the vineyard.

This terms can be added in the label only if at least the 85% of the blend components are from the area with the specified influence. The influence that the vineyard has must be declared before S.A.G.

Every zone and its specific influence are distributed by region in the following table:

TABLE NO.2: DENOMINATION OF ORIGIN ACCORDING TO THE GEO-CLIMATIC INFLUENCE.

REGION	ANDES	BETWEEN MOUNTAINS	COAST
ATACAMA REGION			
COQUIMBO REGION	Vicuña	Punitaqui	La Serena
	Paiguano		Ovalle
	Monte Patria		
	Río Hurtado		
	Salamanca		
	Illapel		
ACONCAGUA REGION	Santa María	Hijuelas	Zapallar
			Quillota
	Calle Larga	Panquehue	San Juan (Leyda)
	San Esteban	Catemu	Santo Domingo
			Cartagena
			Algarrobo
		Llaillay	Valle del Marga Marga
		San Felipe	Casablanca
CENTRAL VALLEY REGION	Santiago	Isla de Maipo	Lolol
	Pirque	Talagante	Litueche
	Puente Alto	Melipilla	Paredones

	Buin	Alhué	Pumanque
	Requínoa	María Pinto	Vichuquén
	Rengo	Colina	Empedrado
	Machalí	Calera de Tango	Curepto
		Til til	
		Lampa	
	San Fernando	Rancagua	
	Chimbarongo	Peumo	
		Coltauco	
	Romeral	Nancagua	
	Molina	Santa Cruz	
	San Clemente	Palmilla	
	Colbún	Peralillo	
		Marchigüe	
		La Estrella	
		Rauco	
		Sagrada Familia	
		Talca	
		Pencahue	
		San Rafael	

		San Javier	
		Villa Alegre	
		Parral	
		Retiro	
		Linares	
		Longaví	
		Cauquenes	
SOUTHERN REGION		Chillán	Portezuelo
		Quillón	Coelemu
		Yumbel	
		Mulchén	
		Traigén	
AUSTRAL REGION	Cautín		
	Osorno		

Source: Elaborated with information from 464 Decree. (Establishes growing regions and fix rules for their utilization).

4. THE IMPORTANCE OF CLIMATE AND SOIL IN WINE MAKING

During the wine elaboration process there are multiple factors that affect quality and expression of any variety in the final product. Therefore, the location of the vineyard is essential for the correct adaptation of the plant.

The order in which this climatic and soil conditions interact with the biology of the vine, plays an essential role in the broadest sense of Wine Origin, commonly used to be expressed as *terroir*.

Complementing the natural characteristics that any location can offer, the management of the vineyard is as important factor as the previous factors mentioned to obtain a quality wine and at the same time it is determinant in the expression of each valley.

It is here where is possible to say that there are two vast ways to see the Oenology: The first one is based on respecting as much as possible the natural conditions from where the raw material is obtained to make every wine in the world, Grapes. This implies a strict process of adaptation of varieties, where the viticulturist acts as facilitator of these conditions, but never modifying the annual natural process which every year gives different particularities to the vineyard. Therefore, under this gaze, is inside the winery where the Oenology is interpreted as a minimalist concept in its way to deal with the elaboration process, without further intervention to natural processes. And any type of

VINIFERA

enological product addition follows the same principle and it is done only to strengthen what the vineyard produces.

Secondly, in general terms, there are Enologists although maintaining their conviction in the importance of the vineyard, they believe strongly in the power to change the quality destination of a wine of wine making practices, given mainly by the adverse climatic conditions that in some years can be vastly decisive. Therefore, in this cases the benefits of specific enological practices are valued because could have a big influence at the moment of the elaboration of a high quality wine.

Both of these big concepts can be used even to define roughly the difference between the “Old World”, mostly composed by countries that are characterized by identifying and classifying rigorously the potential of its vineyards, besides protecting the cultural heritage associated with the wine industry. And the “New World” where the technicalization of processes allows winemakers unify concepts such as large-scale production and quality wines.

4.1. THE CLIMATE

In every wine growing region of the world, without any doubt, climate is a determinant factor for the characterization of regions, and precisely is climate one of the most notable qualities of Chile, that although varies considerably thought the country, the territory with more production is the zone that possess warm temperate condition with Mediterranean rainfall, generating in turn, optimal conditions to grapes growing.

The climate is determinant in the Chemical composition of the must, in terms of sugar, acids, phenolic compounds (anthocyanins and tannins) and aromas, among others compounds.

Additionally, climate is the responsible of the moment of budbreak, ripeness temperatures and the moment of harvest in each valley, affecting for example the alcohol content in wines and obligating a correct vineyard management depending on each growing zone.

Vineyards in Chile are located mainly between 27° and 37° South latitude (Since Atacama until Araucanía) with several climatic influences that are reflected in different types of wines. In general terms, Chilean skies present high solar radiation and low rainfall in summer allowing to avoid the appearance of important diseases that affect vineyards in the world.

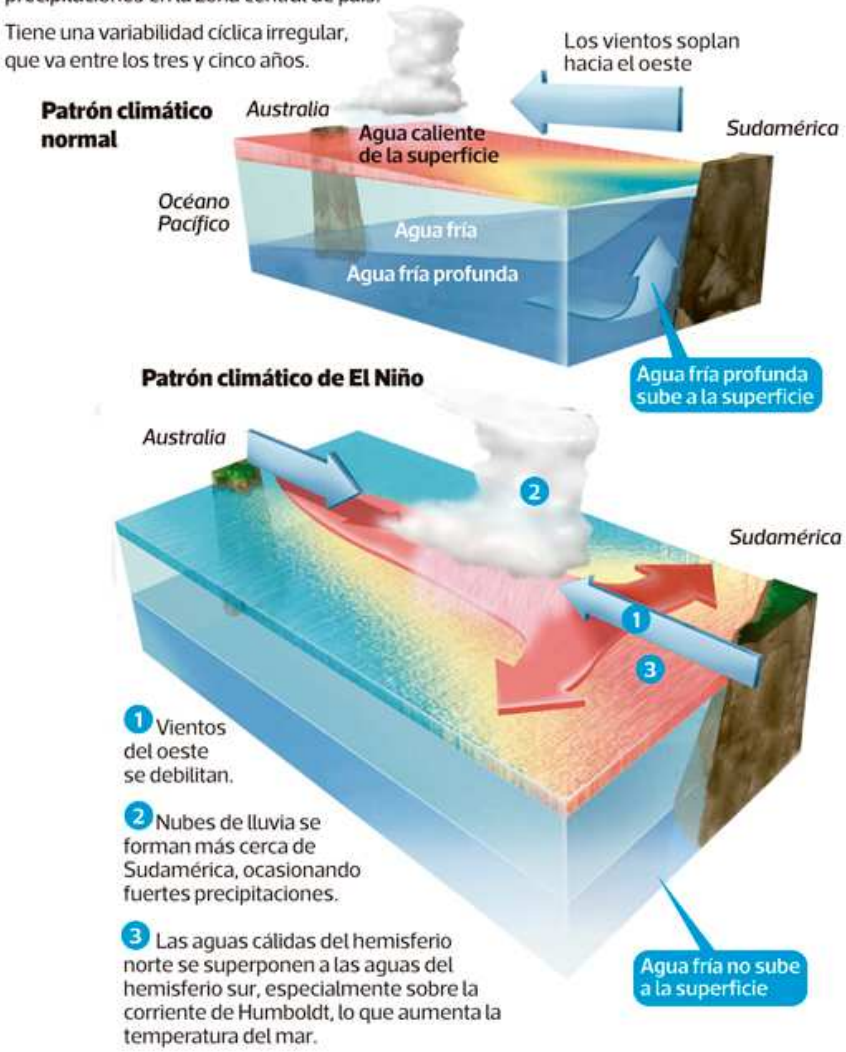
There is also another important cold influence named “Humboldt current” that goes across the south American coast since Magallanes until Galapagos Islands, generating favora-

ble conditions to cold climate wines development. Creating cold environments in Chilean coasts with special conditions for varieties such as Sauvignon Blanc, Chardonnay and Pinot Noir.

Another important phenomenon to be analyzed to understand the local condition, is El Niño-Southern Oscillation (ENSO), this climatic event is developed in the Pacific Ocean, where the Warm Phase of ENSO is known as “El Niño” and It manifested mainly by an increase of Sea Surface Temperature.

And a decrease in trade winds (between 0° and 30° South Latitude) on the east side of the Pacific Ocean. These cyclical conditions turn generate heavy rainfall.

DIAGRAM EXPLAINING THE PHENOMENON ENSO)



The Cold Phase of ENSO is known as “La Niña” It is characterized by colder Sea Surface Temperature than the normal range, intensification of trade winds in the eastern Pacific Ocean and droughts. Therefore, the way this phenomenon manifests itself affects directly the water regime of the vineyard.

4.2. THE SOIL

The type of soil is another factor which affect directly the correct development of grapevines. The soil is firstly the mechanical support of the plant and depends on the composition how influence the plant and grapes, but there are other important aspects of soils that give its properties: Texture, depth, richness, origin and degree of mineralization and also pH, electrical conductivity and cation exchange capacity. Soil besides is the responsible of the plants water status, nutrients delivery, the vegetative growth and fruit development.

All of these make soil an important element for the chemical composition of wine grapes, affecting even the phenolic conformation (color and astringency), nevertheless it is not completely proven.

In this sense it is important to say that some recent researches have indicated the limited influence of Geology and Pedology (study of soil) in quality of wines comparing with the specific location of the vineyard, the year and plants vigor. Rather, would be physical properties of soils and their particular geological behavior which have more influence in quality, given that these characteristics affect directly in wet conditions and soil drainage, therefore, soils act as a natural hydric regulator of plants.

The responsibility of the viticulturist with soil resides in recognize the characteristics of the soil and how this complex system operates. Like this is possible to control the plants vigor according to the climatic conditions and the variety, with the purpose of creating a balance between vegetative and reproductive growth expressed in yield and grapes quality.

In Chile, based on the Soil Map Units identified by Luzio y Alcayaga (1992), is possible to observe ten types of soils, including in general terms: Aridisols soils, in North (low organic content and are sparsely vegetated by drought- or salt-tolerant plants); Vertisols soils, in Central zone (high content of clay minerals that shrink and swell as they change water content); and Ultisols soils in the south of Chile (intensely weathered soils of warm and humid climates).

4.3. PLAGUES AND DISEASES

In Chile Phylloxera does not exist (Insect, native from North America, arrived in Europe in nineteenth century. It destroyed the major part of French and the rest of European vineyards) and fungus diseases are very low comparing with the rest of producer countries.

The main plagues and diseases affecting vines growth in Chile are:

- Chilean false red mite (*Brevipalpus chilensis*)
- Insect from Coleoptera order named "Fruit tree weevil" (*Naupactus Xanthographus*)
- Some nematodes such as *Meloidogine sp* and *Xiphinema sp* in some specific locations.
- *Margarodes vitis*, a hemipteran that attacks root and weakens the vine.
- powdery mildew, the only fungus disease that is commonly found in Chilean vineyards.

Notwithstanding the foregoing, Chile is defined commonly as a "Geographic island" thanks to Andes presence in the east boarder and the Pacific Ocean to the west.

This natural isolation has been key to

pests such as Phylloxera that never have appeared in these latitudes. Additionally, The Mediterranean climate, with warm summers and rainy winters in the main growing region, allows excellent healthy conditions which facilitates the understanding about why Organic Viticulture has been increasing in Chile, more than anywhere else in the world.

5. CHILEAN GROWING REGIONS

5.1. THEORETICAL FRAMEWORK

Firstly, it is necessary to identify the classification systems used to characterize soils and climates through the country. We will see the main wine growing valleys from North to South to observe their characteristics and the different wine expressions according to each valley natural conditions.

To explain specific types of climates Wladimir Köpen classification system will be used. He was born in St. Petersburg and He was geographer, climatologist and botanist. At the beginning of twentieth century presented a method to classify different climates of the world. The parameters to determine the climate of an area are: Temperatures, annual and monthly average rainfall, and seasonality of precipitation.

Köpen divides climates in five principal groups, identified by a first capital letter. Each group is divided in sub groups, and each sub group is divided in types of climates. These climates can be recognized by a symbol with two or three letters.

- The first letter or main letter corresponds to the Climatic Group. Can be accompanied by a second lowercase letter to identify climate particularities.
- The second lowercase letter makes reference to a rainfall characteristic, specifically describes the dry season.
- The third lowercase letter gives information about the annual thermal behavior.
- There are also more lowercase letters utilized to give information about specific characteristics of the climate.

Example: **Mild temperate, fully humid (Cf)**

First letter (C)

- Thermal threshold: The average temperature of the coldest month is less than 18 ° C and superior to -3 ° C.
- Mild temperate climate with seasonal rains and rains throughout the year.

Second letter (f)

- The annual rainfall in centimeters is equal to or less than twice the average annual temperature in Celsius degrees 7°C.

To address the soil topic, it is necessary to see the Soil Taxonomy Orders, which are groups of soils with similar characteristics, and more fully discuss the edaphic areas of Chile, which divide the country into eight soil types according to their characteristics that we will use to describe Chilean wine growing valleys.

Soil Taxonomy Orders:

1. Gelisols
2. Histosols
3. Spodosols
4. Andisols
5. Oxisols
6. Vertisols
7. Ultisols
8. Mollisols
9. Alfisols
10. Inceptisols
11. Entisols

Edaphic zones of Chile (Luzio, 2015)

1. Desert zone soils
2. Arid and Semiarid zone soils
3. Mediterranean Arid zone soils
4. Mediterranean Humid zone soils
5. Humid zone soils
6. “Magallanes” zone soils
7. Antarctic zone soils
8. Isla de Pascua (Easter Island) and Juan Fernandez zone soils

5.2. COQUIMBO REGION

Coquimbo region is located approximately between 29 ° 20' and 32 ° 15' South Latitude. It has an area of 40,580 square kilometers, equivalent to 5.37% of the national territory.

Now it is considered a region with great wine potential, especially thanks to wines obtained from the Elqui and Limarí valleys. Historically, this region is associated with the production of Pisco, distillated wine product of Atacama region and Coquimbo region, protected by a specific D.O. since 1931.

At this latitude desert climate disappear, to enter a semiarid climate allowing the development of more vegetation and generates suitable conditions for viticulture.

5.2.1. ELQUI VALLEY

The Elqui Valley rises at east of Paranao summit at 3,128 meters above sea level, and descends steeply into the Pacific Ocean to the mouth of Elqui River, near La Serena city. There is cultivation from the area of Huanta inland, to the nearest to sea cultivation, 15 km. From the coast. Close to Elqui Valley area are characterized by almost a total absence of the "Cordillera de la Costa".

It is in this place where Sauvignon Blanc has been developed very well with a strong character in nose, pleasant herbaceous and fresh notes. Especially in riverbank areas of Elqui river. Going up the valley to the east, is possible to find plantations associated to colluvial soils resulting from the mountains ranges that border the north and the south of the val-

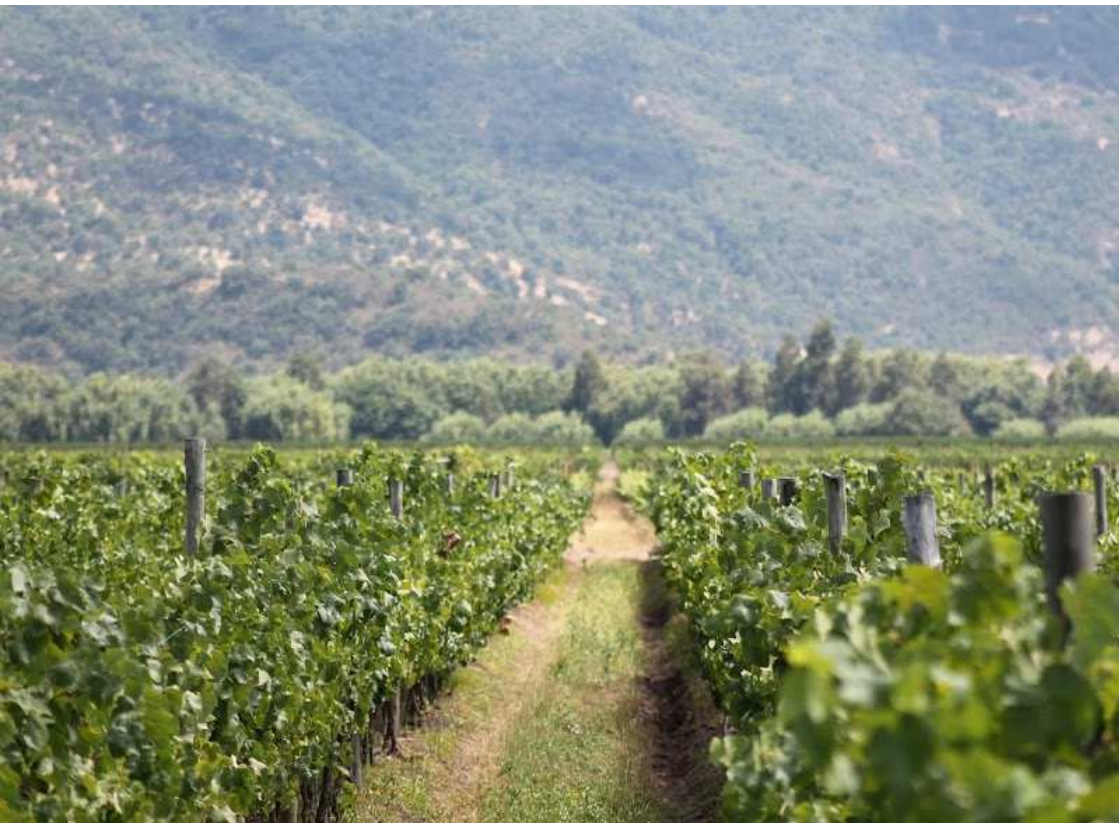
ley. There are vineyards located in alluvial and colluvial locations.

During the last decade the number of planted hectares with *Vitis Vinífera* has exceeded from 1 hectare in 1997 to nearby current 451 hectares.

Its soils have in general, low permeability and are highly stony. They are particularly suitable for demanding grape vines cultivation. Elqui valley possess also a high luminosity and very scarce rainfall, that rarely exceed 120 mm. annually. The thermal oscillation border on 18°C with sunny and warm days most of the year, and cool nights marked by the mountainous breeze that descends and crosses the valley in the evening.

It is a valley with high humidity especially in mornings, which increase the probability of phytosanitary damages as fungus diseases. But at the same time there is an absence of rainfall during the vine growing season. Temperatures have a variation, increasing warms days and also the thermal oscillation.

With these cold climatic condition, the varieties with more quality potential are: Sauvignon blanc; Syrah; Pinot Noir and Chardonnay, which develop a great balance in mouth, soft tannins and spicy aromas.



5.2.2. LIMARÍ VALLEY

It is located south of the Valle del Elqui, in front of the mountain range of the "Cordillera de la Costa", known for the presence of "Valdiviano" forest at its summit, named Fray Jorge. The cold zone is mainly distributed in a strip extending from the shoreline to about 34 kilometers inland. To the east there are warmer areas such as "Punitaqui", also around "Ovalle" city, and inside the valley as "Monte Patria" and "Tulahuén".

Limarí Valley has a similar history and geography than Elqui Valley. This valley has been associated until one decade ago with "Pisco" production, but nowadays surprise with excellent results in mainly white wine production, and some red wines as Syrah.

According to data provided by the S.A.G updated for 2005, in Limarí valley there are about 2,500 hectares, planted with French grape varieties, highlighting Chardonnay, Sauvignon Blanc and Syrah.

The rainfall is mildly more comparing with Elqui valley with 130 mm annually and a prolonged dry season approximately of ten months. The low amount of rainfall makes irrigation absolutely necessary, normally drip irrigation systems.

Limarí extends for about 65 Km. From the east of "Ovalle" city, near Tulahuén town and to the mouth of the river Limarí in the sea.

In the cold area, the development of viticulture goes with Limarí river and vineyards in different river terraces, mainly in the third and fourth terraces. Alluvials soils allows the presences of stones fragments in combination with clay horizons. The characteristics of the zone are directly related

to clay content in the soil, also with two very important and unique in wine-growing regions of Chile variables: firstly, the presence of sodium in the argillic matrix and, secondly, calcium carbonate matrix stones and rocks.

The presence of sodium in clay horizon avoid the water movement through the soil may cause root suffocation. But at the same time, the presence of calcium carbonate among the rocks and stones that form the alluvial profile delivery very positive characteristics to the wines produced in this valley.

Vines that grow on calcareous soils they do it at a controlled rate, bunches and berries are also small which is expressed in wines with good mouthfeel, minerality and freshness given by the natural acidity that cold climates promote. These conditions are perfect for the development of varieties such as Sauvignon Blanc, Pinot Noir, Chardonnay, Riesling, Viognier and Syrah.

In the closest to the Pacific Ocean area the river valley ends, and the Cordillera de la Costa area appears, where granitic soils and marine terraces prevail, which is mainly formed by mollusks and crustaceans, that over the years may form calcareous rocks filled with calcium carbonate, which over the years create "calcareous soils".

During spring the climate is characterized by temperatures that don’t exceed 26 °C, with a difference between day and night about 10-12 ° C. Mornings are often cloudy and after-

noons are clear and windy, these are very favorable conditions for both fruit production quality, and health condition of the plant. During February, temperatures rise sporadically allowing complete maturity of grapes and removes all traces of green flavors that can be reflected in the wines.

5.2.3. CHOAPA VALLEY

Choapa is located south of Coquimbo region, comprises Salamanca and "Illapel" areas. According to the national cadaster of 2014, Choapa valley has 1,632 hectares with vineyard. This includes plantations of Salamanca, "Illapel" and "Combarbalá". 1,492 hectares are destined to Pisco production (91.44%), while only 140 hectares are destined to wine elaboration (8.56%).

6. ACONCAGUA REGION

In this region is possible to find preferentially coastal valleys associated to Cordillera de la Costa soils in its western sectors. This Denomination includes Aconcagua valley, Casablanca valley and San Antonio-Leyda valley.

The main varieties planted in this region are: Chardonnay, Sauvignon Blanc, Pinot Noir, Merlot, Cabernet Sauvignon and Syrah.

6.1.1. ACONCAGUA VALLEY

Since exactly 137 years ago, Errázuriz-Valdivieso family decided to take a risk planting grape vines is this traditional valley, which during three centuries has been eminently wheat producer.

Aconcagua is a transverse valley that runs from the foot of majestic Aconcagua Mount - the highest in America - to its mouth near the Con-Con city. The river has a course of approximately 241 Km., moderately, and 180 mm. of rainfall per year. This valley has a temperate climate with 14.2°C average, the average maximum can reach 30°C, and a daily thermal oscillation in summer.

Day temperatures often reach 30°C, and fluctuate between 15 and 20°C, which is very favorable for sugar accumulation. It is also interesting to mention the high luminosity level of the sector.

Cloudy days are scarce and the number of clear days are between 240 and 300 days a year. Rainfall is concentrated in winter, mainly in July. Between November and April is possible to detect the driest period of the year.

The interaction of the cold currents from the Andes Mountains to the east and the Pacific Ocean to the west create the most renowned are of the Valley: “Panquehue”, warm and airy epicenter located near San Felipe city.

The steep slopes of the hills and landslides, have caused large formations of piedmont on both sides of the valley. Aconcagua River Basin has the taxonomical characteristics of Valparaiso political region and basically correspond to anfisols soils, inceptisols and mollisols soils, mainly colluvial and alluvial origin.

This conditions allow a favorable development of varieties such as Cabernet Sauvignon, Syrah, Petit Verdot, Merlot and Carmenere which can achieve a great aromatic expression based ripe fruits, spicy notes, none herbaceous notes, and complementing very well with an optimum phenological ripeness, producing wines with soft tannins and great color expression.

Currently is possible to note the favorable conditions of “Aconcagua Costa” vineyards, where the Pacific Ocean and Coastal mountain soils have an important influence. These conditions are ideals to grow varieties as Sauvignon Blanc, Chardonnay and Pinot Noir.

Syrah has demonstrated its great plasticity, producing excellent wines both in warm areas and cold areas, coastal wines shows great freshness and fruitiness under cold conditions and a higher concentration of species in warm areas.

6.1.2. CASABLANCA VALLEY

Casablanca is in some way the synthesis of the Chilean wine revolution of the late twentieth century. In ten years, passed from grazing and small vegetable crops area to a thriving agro-industrial development zone, with special emphasis on viticulture.

This valley is pioneer in coastal viticulture and hyper-technological. Currently the area under vineyards exceeds four thousand hectares. Almost equidistant from Santiago and Valparaiso cities, it is located on both sides of Route 68 that connects the cities above. Its climate is mild with hot summers y has an important influence from the Pacific Ocean, which form a morning mist that moistens and re-freshes the sunrises during most of the year. Its rainfall is considerably higher than Aconcagua valley (450 mm. aprox.) and are concentrated between May and October, when the Pacific anticyclone moves to north of the country.

Both its thermal oscillations are moderate temperature range are moderate and its temperatures hardly are lower the 6-8°C or exceed 25 -26°C. adding the oceanic influence, a slow and concentrated grape ripeness is obtained. The in-crease in temperature is proportional to the distance from the Pacific Ocean promoting differences between wines.

Soils are very diverse, ranging from clayey and poor granitic hillsides, to sandy or sandy-loam soils in plains. There are also gravel soils with high organic fluvial deposition allowing an increase in fertility in plains that is reflected in more vig-orous vines and more vegetative development.

In contrast to its predecessors, Casablanca extends latitudi-nally from “Mercedes” city -at the foot of El Mauco hill-, to

“El Quisco” through an inner strip about 15 km with respect to the coastline.

Initially, Casablanca was characterized for its white wines, specifically for its Sauvignon Blanc and Chardonnay. But nowadays is possible to observe successful vineyards of Pinot Noir, Cabernet Franc and Merlot.

Freshness during mornings and evenings and higher temperatures during summer days, create ideal conditions for sugar accumulation and sparkling acidity in mouth. This has led to experiment with new varieties such as Riesling and Gewurztraminer, with excellent results.

6.1.3. SAN ANTONIO-LEYDA VALLEY

Leyda Valley is located near the mouth of Maipo River, southeast San Antonio city. By a prodigy of Hydraulic Engineering, in 1997 a private aqueduct that supplies water to agricultural areas of “Lo Abarca” and “Leyda” was opened. Both are located 4 km from the ocean, deprived of groundwater and only 250 mm. annual rainfall. For this reason, before the viticulture developmente, this area was exclusively for cattle industry and wheat crops.

Soils are mainly granitic, clayey, medium depth and moderate drainage, nearby Maipo river fluvial soils and terraces appear. Each season is moderated by the oceanic influence, although summer is specially hot

This valley has lower much lower than Casablanca, with 14.2°C annual average due to its greater proximity to the Pacific Ocean and height. Because it is located in the rolling hills of the Cordillera de la Costa.

The valley, in its entirety, has about 300 hectares. planted, where the main variety is the Chardonnay, followed by Sauvignon Blanc and Pinot Noir. They produce high quality wines, with good acidity and some pleasant herbaceousnes notes.

An important difference between these two sub-valleys of San Antonio is that while Lo Abarca has diversified its exposures to sunlight, in Leyda, vineyards are planted on the windward, facing the sea.

6.2. CENTRAL REGION

This region starts in Maipo valley and finishes in the Maule Valley, it has a very characteristic topography, with evident presence of the Coast mountains on the west; the Intermediate Depression in the center, where the most production is located; and the Andes Mountains to the east.

The climate of the region is Mild Mediterranean and rainfall increases in southern areas which affects also the geographic conditions of valleys. Nevertheless, are the longitudinal variations that generate the greatest differences. Accordingly, the western slope of the Cordillera de la Costa will present higher rainfall than the Intermediate Depression ("Entre Cordilleras" zone) and they are even more on the western slope of the Andes, at the same latitude. This explains the difference that is possible to see in the same valley and the reason why exist the current denomination: "Andes", "Entre Cordilleras" and "Costa".

Intermediate Depression area near the "Cordillera de la Costa", may have temperatures above 30°C in the warmest month and thermal oscillation of nearly 15 °C in summer. The relative humidity average is between 55% to 60%. At the foothills of the Andes, the summers have slightly lower temperatures and higher relative humidity.

The valleys located in Central region are: Maipo; Rapel (Cachapoal, Colchagua); Curicó and Maule.

6.2.1. MAIPO VALLEY

Origin of Chilean prestige and birthplace of the most important wineries in the country, Maipo is the father of the rest valleys. Here, beside the aged city of Santiago, capital and economic center of Chile, were planted nearly 500 years ago the first European vines, and more than 150 years ago the first aristocratic French varieties. Nowadays is possible to find thousands of grapevines planted reaching 12,000 hectares mainly with Cabernet Sauvignon, Merlot and Syrah.

Due to the transversally of the valley and the varied expression of varieties as Syrah and Cabernet Sauvignon, it began to talk about a new subdivision of the valley taking as a criterion the height of vineyards near the Andes and creating the concept of “Maipo Alto” (High Maipo). where an effect of height is recognized in increased freshness wines, which in addition to stony soils, creates wines with great balance in mouth and high aromatic expression.

The valley, on average has a warm temperate climate with a long dry season, almost 300 days a year bright and dry, and rainfall of around 300 mm, which it gives the classification of semiarid Mediterranean climate. Summers are hot, concentrated rainfall in winter and autumns are dry.

Soils are stony and rich in organic alluvial sediment, with low fertility and medium drainage. In the pied-

mont, the mountainous influence is strong and determined large temperature fluctuations, contrasting what occurs in the middle zone of the current. In the bottom there are sandy soils due to an increase in river flow while arrives at its mouth near Llo-Lleo city.

The best wines of the valley are obtained from alluvial soils in “Pirque” and “Puente Alto” areas, where Cabernet Sauvignon achieves ripen on perfect conditions and its tannins are characterized by their silkiness.

6.2.2. RAPEL VALLEY

Rapel Valley is located 80 km south of Santiago. It is considered ideal for growing red varieties as Cabernet Sauvignon and Carmenere, mainly due to favorable climatic conditions during the ripening process, obtaining wines with great body and concentration.

The most important rivers are “Cachapoal”, “Claro” and “Tinguiririca”, all with a regular flow, fed by tributaries and small estuaries. For this reason, soils are alluvial, deep, and loamy.

The “Cordillera de la Costa” protects this area of the cold Pacific breezes, offering a warm climate with dry summers and annual rainfall can reach 700 mm, concentrated in winter. The maximum temperature in January can reach about 30°C, and the annual average is 14°C. In summer, dominant winds from the south and southwest determine a high thermal oscillation.

6.2.2.1. CACHAPOAL VALLEY

Cachapoal, and Colchagua valley form what it is technically called "Rapel Valley".

Located between Andean foothills in O'Higgins and the Coastal mountains. Cachapoal is one of the main valleys of the Central Zone. Situated 80 kilometers south of the capital, it is also enclosed by the transverse hills of Paine and Pelequén.

Its climate is Mild Mediterranean, slightly more humid than Maipo Valley. Rains border 400 mm. per year and annual thermal oscillation is high, reaching temperatures above 30 °C in summer and below 10 °C in winter.

Soils are fertile and very adaptable, can be alluvial or colluvial, depending on the location with respect to Cachapoal River, they have good drainage and permeability.

They also tend to be medium-depth, on hillsides clay structures are present structures, fine materials and low permeability.
In this valley Carmenere and Cabernet Sauvignon varieties stand out for its fruitiness and concentration of aromas and flavors.

6.2.2.2. COLCHAGUA VALLEY

Colchagua is a native word which means “Place of small lakes”. It was land of Mapuche tribes and then went on to become the southern border of the Inca Empire.

The first pre-Hispanic irrigation works were built by these indigenous peoples, thereby introducing agriculture to the Valley, which will then be used for the vine cultivation by Spanish colonists in 1551.

It is located 150 km south of Santiago, and extends from east to west from the Andes to the Pacific Ocean, in an extension of more than a hundred kilometers. This valley is bounded naturally by the transverse mountain ranges. Its climate is classified as mild Mediterranean with marked seasonality. Average summer temperatures range from 28°C as the highest, to 12.5°C as the minimum, and winter vary between 12°C and 4 °C.

During harvest time, ranging from early March to late April, scarse precipitation occurs, allowing an optimal grape ripeness without phytosanitary risks. The average rainfall is close to 600 mm per year, with rains concentrated between June and September. The rest of the year heavens are clear and rainfall is almost nonexistent.

The general characteristics of each soil depends on its specific location. In the flatlands of the valley there are two types of soil; the lacustrine (characterized by clay-loam textures) and alluvial sedimentation (possessing silty loam textures).

In the piedmont soils are clay-loam and slopes are between 2% and 5%. They are composed of transported materials by water, and falling material from the higher sectors. Soils associated with the “Cordillera de la Costa” are granitic and

are located on slopes close to 8%. Generally, they have a good drainage and is moderately deep.

Colchagua is the most internationally renowned Chilean valley followed by Casablanca and Maipo. It is known for the quality of its wines, tourism and hectares planted.

The main variety planted in Colchagua is Cabernet Sauvignon, representing an important part of the entire vineyards in the valley. It is followed by Merlot and Carmenere variety. Colchagua is precisely the largest area and the main producer of this variety in the world and is here where the best results in terms of quality are obtained. Largely due to the optimal climatic conditions that allow great results after ripening process specially showed in its soft tannins and Carmenere's typical herbaceous notes greatly balanced. Syrah also stands out and regarding white wines, in coastal areas of Marchihue and Paredones Chardonnay and Sauvignon Blanc (since 2009) are produced.

Today, the production of white varieties in the valley has been developing increasingly, highlighting the varieties above.

6.2.3. CURICÓ VALLEY

Curicó is located 250 km south of Santiago, whose importance is due to primarily its great wine tradition and production in quantitative terms of varieties such as Sauvignon Blanc, Merlot, Chardonnay and above all, Cabernet Sauvignon. It is the second valley in production with about 53,000 hectares planted preceded by Maule Valley.

Curicó Valley has a Mediterranean climate, with hot and dry summers with temperatures that can exceed 30 °C. The thermal oscillation is high throughout the year, which benefits the optimal ripening of wine grapes of both white and red varieties. The annual precipitation is 702 mm demonstrating that southern locations present more annual rainfall.

Soils are preferably alluvial and colluvial characterized by their fertility, which enables productive-qualitative balance in varieties produced along the valley.

Currently they stand in terms of quality and innovation sparkling wines which have shown that the valley has optimal conditions for high quality wines elaboration.

7.4.4. MAULE VALLEY

Located in the heart of the Longitudinal Valley in the Maule region, this wine valley is the country's largest, with a little over 38 thousand hectares planted and is the most diverse in terms of climates and soils, ranging from pre Andes, to the rolling hills of the Coastal Dry Land, where the climate varies from Cold Height, to temperate and humid Mediterranean coast weather.

It is composed by three main areas: The Rio Claro valleys, Loncomilla and Tutuvén. Most of the vineyards are concentrated in the northern part of the valleys and also in the southwest of the city of Cauquenes.

Near the coast the weather is dominated by mild temperatures, low rainfall and a maritime cloudiness that occurs throughout the year. The coastal area has a higher relative humidity and lower temperature range than in the rest of the valley. In the intermediate depression, which runs parallel to the Cordillera de la Costa and Cordillera de los Andes, the climate has marked seasons during the year with a warm dry summer and a significant temperature difference between day and night, plus a cold and rainy winter. Near the Andes the climate presents a considerable drop in temperatures and increased rainfall.

The annual rainfall average in the valley is 700 mm and it`s concentrated mostly during the winter. The shortage of rain after winter helps the control of plant vigor and berry size, as well as the maturation of the grapes during the summer.

In this area of the country there is an important colonial legacy system of viticulture, which is starring as the strain varieties like the Creole Paìs, used misnamed until today as everyday wines. In recent years have generated significant

investments of Chilean and foreign vineyards in order to obtain high quality wines and have also rediscovered vineyards located especially in the inland area dry land which possessed a driving system called "head", which It does not require wiring to support the plant. The wines obtained from these grapes stand out for their fruitiness and complexity.

Alluvial soils are rich in nutrients deposited by large flows of rivers in the course of geological time. Most of it corresponds to soil type loam or loam-clay. It´s generally considered as good soil characteristics, young and evolving process.

The surrounding soils which are derivate of coast marine terraces and have a reddish brown color. Coastal soils generally have a higher evolution and lower fertility comparing to the soils into the valley, predominantly granitic rock with clay content in depth. Among the Cordillera de la Costa and the Andes Mountains, the soils are alluvial with mostly moderate development, increased fertility blend of textures from clay, silt and sand and varying depth depending on the area in which it is located. Finally, close to the Andes the areas the soil texture is thicker and is formed by volcanic ashes.

In the Maule Valley also found diversity in the planted varieties, it is where we find the highest concentration of País strain, mainly in the coastal dry land, and variety tinta Carignan also appears as important as other historical variety strain of the valley. Maule is also the birthplace of Carmenere strain, which began to be cultivated as a distinct variety of Merlot since the mid- nineties.

6.5 SOUTHERN REGION

Southern Region extends from the valleys of Bio-Bio to Malleco Valley. This region is marked by a significant increase in annual rainfall, low temperatures and the importance of the presence of soils of volcanic type, which share the influence of alluvial soil delivered by rivers such as the Laja, Mulchén and Bío-Bío.

6.2.4. ITATA VALLEY

It is characterized by the oldest and most traditional growing grapes in Chile, which is done in the intermountain valleys of the Cordillera de la Costa, where landscapes of rolling hills are mixed with vines among the thick forests of pine forest industry and the coastal influence is present in some areas.

The sea influence, given by the low altitude coastal massif, allows less light and a higher humidity in almost the entire length of the valley, which favors the slow ripening of the grapes and the concentration of aromas. This valley probably has the largest thermal oscillations with thresholds above 20 ° C with a rainfall of 1000 mm.

The Itata Valley it is considered as the cradle of heritage wines in Chile. Both banks of the Itata River were planted in the lead with the first vines brought by the Spanish missions, which were used for the production of large-scale colonial wines. These wines, whose origin dates from the late sixteenth century were exported through the various ports and creeks of the region to cities like Valparaiso, Santiago and Coquimbo. Later, during the eighteenth and nineteenth cen-

tury, these wines mainly made from grapes País and Moscatel of Alexandria were exported to major economic centers of America such as Lima; Guayaquil; and San Francisco, in the northern hemisphere.

Some authors have pointed out the need to advance the protection of valuable genetic heritage existing in this valley, where it is still possible to find strains whose age ranges between 200 and 250 years, possibly some of the oldest in the world currently in production.

During the twentieth century, aiming to strengthen and diversify the local wine industry, were introduced some Mediterranean grape varieties such as Cinsalut and Carignan. The first with the aim of increasing the production per hectare and the second to provide greater color intensity, improving the nuances of traditional wines of the area.

Currently stands varieties of País and Moscatel, followed by Cabernet Sauvignon and Chardonnay.

6.2.5. BÍO BÍO VALLEY

Contrasting Itata Valley, the production in Bío-Bío is located mainly inland and pre-cordillera areas, highlighting Mulchén location.

Nevertheless, as Maule region, this valley was used from colonial times for the production of bulk wines, but nowadays it is a promise for aromatics white wines, such as Riesling, Gewurztraminer, Sauvignon Blanc, Moscatel de Alejandria and also with excellent results obtained with Pinot Noir.

Its soils are alluvial with abundant organic material, well drained and inclined to overproduction. The rains are abundant during winter, extending into the autumn as part of a humid Mediterranean climate. From this zone the presence of Pacific Anticyclone it´s no longer observed, allowing formation of clouds, and therefore, low illumination. The thermal oscillation is not a relevant factor, because now it is lower than all its predecessor's valleys, which protecting the vines from rot caused by fungus due to high humidity, the weather can play very favorably in late and concentrated ripe grapes, specials for "late Harvest" wines production. In this sense the wind plays an essential role in drying vines thus avoiding Botrytis cinerea attack.

6.2.6. MALLECO VALLEY

The most prestigious area of Malleco Valley corresponds to "Traiguén" (38 ° 15 ' LS) 650 km south of Santiago, where from 1997, has achieved excellent results with grape varieties as Chardonnay and Pinot Noir, both planted by the winemaker Felipe de Solminihac, a pioneer in this area.

Thanks to the rain shadow caused by the "Cordillera de Nahuelbuta", a microclimate is created allowing the development of viticulture in the Intermediate Depression, which has no transverse mountain ranges.

It has a Marine Mild Winter, from the Coast Cordillera to the west. Towards the Intermediate Depression, more continental characteristics are observed due to its relative remoteness from the sea, causing greater thermal oscillation, with minimum temperatures as 2°C and maximum of 23°C in the warmest month of the year. Rainfall varies between 1,500 and 2,500 mm. As in Bío-Bío valley. Luminosity it is low and the average relative humidity is 50 % to 55 % during the summer. The more southern latitude summers are colder, with higher relative humidity.

The valley is composed of glacial, fluvial and volcanic soils which have given rise to particularly rich soil known as " trumao ".

These conditions force vintners to harvest varieties even two months later than the rest of the country and Chardonnay is the main variety in this valley, with excellent results in terms of acidity and unique aroma profile. Currently, it is possible to find, with equal results, wines made from Pinot Noir.

7. OTHER EMERGING REGIONS

7.1. ATACAMA REGION

While Atacama region comprises an important part of the desert that has the same name, the existence of the transverse valleys of Copiapó and Huasco Rivers allow the presence of agriculture in the heart of the desert itself. Both have a longitudinal orientation from east to west, and although the desert climate, these valleys possess similar characteristics to an oasis.

Its volcanic soils are characterized by the high presence of gravel in small river terraces, and some complementary sediments, they also are superficial soils, which require producers to have to be constantly nurturing the vines and the bedrock where they are usually planted. Currently, the region has 552 viticultural hectares, 435 hectares are used for Pisco production, and 117 hectares for wines (SAG, 2014).

Currently the Province of Copiapó has declared 325 hectares, which are used in Pisco production (69.2%), while only 100 hectares are destined for wine production (30.8%).

At the same time, Huasco Valley, also has excellent irrigation conditions, ventilation and illumination for wine production. In this valley, besides producing grapes for Pisco, it highlights the historical production of so-called “Pajarete Wine " product with D.O. which has the characteristics of a raisin wine and is produced in this area since colonial times, early seventeenth century.

Today, the Huasco Valley has 227 hectares planted, of which 210 hectares. are for the production of Pisco, and 17 for wine, mainly Pajarete. Nevertheless, there are some experi-

mental projects near the mouth of Huasco river where some Sauvignon Blanc and Chardonnay have been planted, expecting excellent results.

Additionally, it should be noted that Copiapó and Huasco valleys have a unique landscape nestled in the heart of the desert, between high snowy mountains and cold winds from the Pacific Ocean. These conditions have allowed the development of naturall organic viticulture, without diseases. Huasco has a rich genetic heritage, mainly marked by conservation of the grape varieties called "Criollas" born in South America after the arrival of the first European grape varieties. Some of these varieties are: País and various types of hybrid Muscat, they now generate a growing interest among specialists in the field.

Surely, these touristic valleys, will gain international renown, the same as their desert wines.

7.2 AUSTRAL REGION

This region includes the territories located south of the Malleco valley (specifically the valley of the Cautín river in the Araucanía) and all areas suitable viticulture, included in the geographic regions of “de los Ríos” (of the rivers) and the region “de los Lagos” (of the lakes), between parallels 37 ° and 45 ° South Latitude, in Chilean Patagonia.

The region has high levels of rainfall, exceeding 2000 mm of water per year with a cool climate and no dry seasons. Due to the mountain ranges of Los Andes and the coastal mountains, rainfall differences can be observed. Higher levels of rain are found towards the west of the ranges. Between the

mountains rainfall decreases and further south in the "Archipielago de Chiloe", cool air winds penetrate from the west causing wine growing to be limited to "meso-climatic areas". The most important area is "Chile Chico", on the river "Lago General Carrera" in chilean patagonia. It is only here where important Chilean experimental vineyards can be found.

Today, a total of 44 hectares are used for wine culture. 15 ha are found in the Cautín Valley and 19 ha. are found in the "Los Lagos" region.

The main white varieties found in this emergent area are Chardonnay, Gewurztraminer, Moscatel de Alejandria, Riesling, and Sauvignon Blanc. The red variety consists of Cinsault and Pinot Noir.

7.3 NORTHERN REGION

As a way to recover the old winemaking traditions of the Norte Grande, various initiatives have emerged during the last decade that seek to reestablish the production of traditional wines in the small oases and ravines of the desert.

Originally linked to the Christian Eucharist, local religious festivities, and trade with the great mining centers of Upper Peru in colonial times, these heritage wines from the extreme north of the country gradually disappeared during the 20th century, as the so-called "Chileanization process", after the Pacific War.

However, after the last years, interesting recovery processes have occurred in vineyards, old wineries and even incorporation of new practices and technologies for cultivation and winemaking in the desert.

In this context, are the wines of the Arica and Parinacota Region (known as the "Pintatani" of the Codpa Valley), the wines of the Pampa del Tamarugal in the Tarapacá Region and the wine "Ayllú" in San Pedro de Atacama, in the Antofagasta Region.

Wines made, mainly, based on Creole grape varieties, with ancestral techniques or some modernized ones. Special mention deserves the discovery of the Tamarugal strain, a mutation discovered by researchers from the Arturo Prat University of Iquique in 2013, originated from an ancestor of the Muscat family, genetically adapted to the geographical environment of the extreme desert.

This variety, the first of 100% indigenous character in Chile, was registered in the SAG in the national case, appearing for the first time in the national register of varieties in 2019. At the same time, it has been registered in the international register of wine varieties of the OIV, as the first indigenous grape variety discovered in Chile.

8. HERITAGE OF CHILEAN WINE

8.1. HERITAGE WINES

Chilean heritage wines are born from historical farming areas of Chile, where varieties such as el Pais, Moscatel de Alejandria (and its derivates), Carignan, Cinsault, and others can be found.

This Patrimonial wines are a heritage from the Hispanic culture, which has created a Wine cultural territory in several regions of the country, creating until today patrimonial wines such as Carignan del Maule and Cinsault de Itata. Both of these wines where brought from the Mediterrean in the beginnings of the XX century.

The need to preserve, protect and promote these wines is important due to its gradually disappearance caused by industrialization. Also, these wines must be protected because they could play an important role representing a patrimonial winemaking in Chile.

8.2. NEW TENDENCIES AND STYLES IN CHILEAN WINES

Chile has experimented a strong industrialization, internationalization and modernization process in the last decades causing a new value for the patrimonial wine. The main focus is in the grape wine considered “criollos” and belonging from historic wine territories such as the Huasco valley in the north or the Maule and Itata region. This movement has generated high interest and collaborations from different researchers of important universities of the country: oenologists, sociologists, architects, journalists and historians. These asociations have created initiatives such as the Carignan club and the “Chanchos deslenguados” (the no tongue pigs) that gathered many small farm producers

whom sell their wines in different cities of the country and internationally.

Other organizations such as the “movimientos de viñateros independientes, MOVI” (independent wine producer’s movement) and “Slow wine”, who have started an intense promotion of organic and biodynamic winery. Another example is “Vinos de garage” (garage wines), small scale winery developed in a family environment.

The main possible tendencies at the moment are: the strengthening of wine production organized through cooperatives (mainly in the Coquimbo and Maule regions) and the marketing models under the so-called system of " Fair Trade " by the premise of fair compensation to all the members.

Finally, it is important to point out that Chile is now going through an important “development” spirit, inspired by the rise in the wine production and a high diversification of winery grapes, styles and region. Chile has developed wines with a “sense of place “causing a significant growth in wine culture.

All the elements explained in this manual explain de main considerations regarding the actual position Chile has as a wine producer.

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Somos especialistas en el desarrollo de asesorías técnicas en materia vitivinícola, orientados a la investigación y desarrollo de nuevos contenidos para el sector, posicionamiento estratégico, conceptualización y desarrollo de productos vitivinícolas y construcción de marca e identidad corporativa para bodegas de vinos.

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