Vintage in New Zealand – Framingham Wines

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“In a world of increase blandness, we remain individual”

Framingham motto

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Resumo

A vinha e o vinho, desde as primeiras explorações marítimas, têm conhecido novos horizontes e novas filosofias. Neste novo mundo fora da Europa verificou-se um grande avanço tecnológico e uma tentativa de afirmação com um terroir distinto ao velho mundo.

A Nova Zelândia, com a chegada dos europeus de diferentes regiões vinícolas, tem conseguido, com um grande sucesso, combinar as diferentes formas de ver a vinha e o vinho, de tal ordem que atualmente é um dos países mais respeitados quando o tema é a vitivinicultura; Marlborough com as suas características ambientais peculiares tem produzido vinhos com identidade, sendo muito ricos a nível aromático e complexidade, principalmente da sua casta rainha, o Sauvignon Blanc.

O estágio realizou-se na empresa vitivinícola Framingham Wines. Esta empresa pertence ao grupo português SOGRAPE. A Framingham desde a construção da sua adega, final dos anos 90 do século passado e inícios dos anos 2000, tem vindo a fazer vinhos de elevada qualidade, com um conceito muito próprio, e que a levou a que, nos últimos anos, se posicionasse entre os melhores produtores de vinho da Nova Zelândia.

O presente relatório de estágio, elaborado para efeitos de dissertação de mestrado, pretende relatar a experiência vivida numa adega durante o período de vindima, um dos períodos mais exigentes de um ano agrícola na cultura da vinha, experiência marcada profundamente pela envolvência social/profissional atípica provocada pela pandemia SARS-CoV-2 (COVID-19).

Palavras Chave: Nova Zelândia, Marlborough, Sauvignon Blanc, vindima

Abstract

Since the first maritime explorations, the culture of vine and everything relates with have known new horizons and new philosophies; in this new world outside Europe there is a great technological advance and an attempt to affirm itself with a distinct terroir to the old world.

With the arrival of Europeans from different wine regions, New Zealand has successfully combined the different ways of seeing vines and wine to such an extent that it is now one of the most respected countries when it comes to winemaking; Marlborough with its environmental characteristics has been producing wines with identity, being very rich in aroma and complexity, mainly from its queen variety, the Sauvignon Blanc.

The winemaking company Framingham Wines, belongs to the Portuguese group SOGRAPE and has been making high quality wines since the construction of its winery in the late 90's and early 2000's, making it one of the best wine producers in New Zealand in recent years with its own concept.

This internship report prepared for the purposes of a master's degree dissertation intends to report the experience in a winery during the vintage period, with all the surrounding environment, mainly in a year in which at a social level was very strange and demanding, caused by the world pandemic, during the most important period of an agricultural year in the culture of the vine.

Key Words: New Zealand, Marlborough, Sauvignon Blanc, Vintage

Resumo Alargado

No panorama geral esta dissertação/relatório de estágio pretende dar ao leitor uma ideia do que são as atividades de uma adega durante o período de vindima, todo o processo de relatar o que aprendi, e vivenciei demonstrou-se um desafio pois defrontei-me com a situação de que se relatasse demais podia começar a divagar e em vez de uma tese faria um tratado, e com a situação de que se relatasse de menos poderia não estar a transmitir, nem se quer as ideias bases da transformação das uvas em vinho.

A vinha e o vinho, desde as primeiras explorações marítimas, têm conhecido novos horizontes e novas filosofias. Neste novo mundo fora da Europa verificou-se um grande avanço tecnológico e uma tentativa de afirmação com um terroir distinto ao velho mundo.

A Nova Zelândia, com a chegada dos europeus de diferentes regiões vinícolas, tem conseguido, com um grande sucesso, combinar as diferentes formas de ver a vinha e o vinho, de tal ordem que atualmente é um dos países mais respeitados quando o tema é a vitivinicultura; Marlborough com as suas características ambientais peculiares tem produzido vinhos com identidade, sendo muito ricos a nível aromático e complexidade, principalmente da sua casta rainha, o Sauvignon Blanc.

Comercialmente o país tem conhecido, ano após ano, um continuo crescimento (representa uma indústria que anualmente consegue exportar vinho no valar de quase dois mil milhões de dólares), vendendo muito bem a marca “Nova Zelândia” enquanto pais. Contudo, é muito importante referir que o facto de Marlborough ser a região mais importante, conseguindo-se transmitir uma ideia de Nova Zelândia-Marlborough-Sauvignon Blanc, fazendo com que estas palavras estejam relacionadas entre si no que toca à comercialização de vinho neozelandês.

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O presente relatório de estágio, elaborado para efeitos de dissertação de mestrado, pretende relatar a experiência vivida numa adega durante o período de vindima, um dos períodos mais exigentes de um ano agrícola na cultura da vinha, experiência marcada profundamente pela envolvência social/profissional atípica provocada pela pandemia SARS-CoV-2 (COVID-19).

Durante a realização do relatório, para além da descrição dos trabalhos realizados numa adega durante o período de vindima, pretendeu-se dar a conhecer ao leitor um pouco da história do setor vinícola da Nova Zelândia e sensibilizar para a potencialidade dos países do novo mundo produção grandes vinhos.

Palavras Chave: Nova Zelândia, Marlborough, Sauvignon Blanc, vindima

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List of Abbreviations

ºC	Celcius Degrees
Hl/Ha	Hectoliters per Hectare
L	Liters
L/Ha	Liters per Hectare
Ltd	Limited
M/hec	Millions of Hectoliters
NZ	New Zealand
OIV	International Organization of Wine and Wine
PN	Pinot Noir
SB	Sauvignon Blanc
Ton/Ha	Ton per Hectare

1. Introduction

1.1. Framework and objectives

This report is the result of my curricular internship in the Marlborough region in New Zealand in order to obtain a master degree in Viticulture and Enology Engineering from the Higher Institute of Agronomy – Lisbon University.

The desire to perform an internship in the southern hemisphere was to get in touch with a different reality than the one I have in Portugal and in this way enrich my knowledge in the field of viticulture and enology in a global panorama.

The Marlborough region in New Zealand has emerged as the most suitable place for my internship as it is the most important region in the country and it is in this region where one of best Sauvignon Blanc in the world is produced (WineSearcher 2020e).

The internship took place at Framingham Wines in the Wairau Valley sub-region, this winery has a high reputation for producing Sauvignon Blanc and Riesling and was considered the best winery in New Zealand in 2018 and 2019 and has played an important role in the recognition of the region (RealReview 2018, 2019).

Of all the goals I could write here, I believe the most important was learn how to work with people from all over the world with different realities/experiences from mine and to develop my knowledge in wine processes (vinification).

1.2. Framingham Wines

Today Framingham Wines belongs to the Portuguese company SOGRAPE, however the beginning of Framingham dates back to 1981 with the establishment of the first vineyard by a Wellington engineer named Rex Brooke-Taylor who took the name Framingham from his homeland in England, as the years went by Framingham wine production began in 1997 but the first wine produced under the name Framingham was a Riesling from 1994 (FraminghamWines 2020a).

One of the bases of the winery's philosophy and of the people who work there is to make wine that they like to drink, so they always try to create aromatic, textured wines with their own expression, without ever being afraid to innovate and introduce new winemaking methods and incorporate new production concepts (FraminghamWines 2020b).

Framingham is located at Marlborough region in the north of the South Island, with vineyards and winery in the Wairau Valley sub-region.

At the helm of winemaking between 2001 and 2019 was Dr. Andrew Hedley, a great lover of the Riesling grape variety and one of the responsible for making the best wines created at Framingham's winery, currently responsible for winemaking is Andrew Brown, the 2020 harvest was his first as responsible, and the future is promising (FraminghamWines 2020a).

Figure 1 - Framingham Wines Logo (adapted from FraminghamWines.com)

1.2.1. Vineyard

Framingham has approximately 17 hectares of vineyard where varieties such as Riesling, Sauvignon Blanc, Pinot Noir, Gewürtraminer, Chardonnay, Pinot Gris, Viogner and Montepulciano are planted; Framingham has also carefully selected grape producers in order to achieve more volume and maintain high quality, all of they are established in the Wairau Valley sub-region (FraminghamWines 2020d).

Framingham's philosophy is to be as sustainable as possible in order to protect and conserve the surrounding environment so that future generations can enjoy the same land; to this end the vineyard is certified organic by BioGro NZ Ltd, and both the vineyard and the winery are accredited as sustainable by the Sustainable Winegrowing New Zealand Program (FraminghamWines 2020d); one example of organic vineyards with the objective of minimizing the use of weed control products and reducing mechanical activities in the soil, is the use of

sheep to control herbaceous plants and minimize tractor crossings between the lines, among other benefits (AWRI 2020).

Figure 2 - Sheep on Framingham Vineyard (author's photo)

A very interesting particularity that I have noticed in the vineyards is the defoliation carried out by them; defoliation is considered as canopy management, being carried out only when the environmental conditions favors it, defoliation can appear as a prevention of diseases such as powdery mildew in the bunches which consequently creates favorable conditions for the appearance of other fungi and bacteria, however if it is possible to carry out defoliation in the vines, there are other positive consequences for the berries, which can improve their quality; one of the positive effects of defoliation when it is carried out during the phenological state pea grain, is the positive influence on the ripeness and quality of the grapes due to good sun exposure, if defoliation is carried out at the wrong time (example: flowering or just before the veraison) can have negative consequences, which can cause production decreases and increase the probability of sunburn (Magalhães 2015a).

Figure 3 - Defoliation carried out in the vineyard (author's photo)

The place where Framingham is located, is prone to the occurrence of frosts that may compromise the well-being of the vine mainly in the spring when new launches are appearing and late frosts may damage the vegetal structure and berries; a frost can be white or black and occurs when the air surface is equal to or less than 0ºC burning the green parts and berries, compromising the quality and quantity of the grapes; to combat this phenomenon I noticed that Framingham's vineyard and that of its neighbors had fans in the middle of the vineyard, in order to homogenize the air allowing the hot air (less dense than the cold) to descend being in constant movement so as not to occur the stagnation of cold air near the vines preventing frost phenomena, a simple method compared to the bonfires traditionally made in Europe (Magalhães 2015b; Abreu 2015).

Figure 4 - Fan on the middle of the vineyard (author's photo)

1.2.2. Winery

The winery can be divided into a white cellar built in 1997 and a red cellar made up of its open tanks built in 2002. The wine bearing the name Framingham is all produced at the Framingham winery, with a winemaking capacity of around 800 tons of grapes every year (FraminghamWines 2020e).

The white wine cellar has 12 fermentation vats of 40 000L and they are located outside. Inside the cellar there are the remaining white wine fermentation and storage vats that range from 5 000L to 20 000L, at the peak of the harvest it is possible to receive up to 100 tons of grapes per day, for this purpose there are three horizontal pneumatic presses so that everything can run smoothly.

In the red wine cellar there are the fermentation tanks, it is in this cellar that the Pinot Noir is processed during the entire winemaking period, only at the end of fermentation and after being pressed, it can go to the barrels or storage tanks.

Framingham's winery has two very interesting features which distinguish it from all the others: the vintage concert which takes place in the winery garden every year a few days before the harvest begins and is a great opportunity for people from other wineries, locals and Framingham interns to socialize and have fun; the winery also has the so-called "Framingham underground" being an open all year round place where people visiting the winery can socialize and see some art and photography exhibitions that may be on display (FraminghamWines 2020c).

Figure 5 - Framingham Garden where the harvest concert takes place (author's photo)

1.3. Organization of the dissertation

In addition to this chapter, this report is divided into 3 more chapters:

- Chapter 2. Literature review
- Chapter 3. Internship work
- Chapter 4. Conclusion

2. Literature review

2.1. Vineyard and Wine in New Zealand

The first vineyards in New Zealand were planted when the first European settlers went to the country and it is recorded that by the year of the signing of the Waitangi Treaty in 1840, the first bottles of wine had already been bottled. However, throughout the 19th century, multiple problems such as powdery mildew, phylloxera and prohibitionists have greatly affected wine production in the country (NZWine 2020b).

At the turn of the century, the panorama of wine is different compared to the 19th century; in general, production prospered throughout the 20's and 30's and during the Second World War; due to a tax on imported wine, there was an influence of the wine industry on the economy, following the trend of previous years (NZWine 2020b)

During the 20th century the vineyard was mostly planted on the north island, and in 1973 a company from Auckland decided to invest in Wairau Valley. The turning point to what is the reality of wine industry in New Zealand today occurred during the 60's, 70's and 80's, of the last century with the Sauvignon Blanc taking on an important role (NZWine 2020b), with the quality of the wine gradually improving, obtaining rich white wines that are aromatically and with tropical fruit (NZWine 2020f).

New Zealand currently has approximately 39,000 hectares of vineyards in 2019, an increase of 1.6% compared to 2018; regarding the quantity produced, the country was able to produce 3 M/hec, in 2019 a fall of 1% compared to 2018 (OIV 2019). In New Zealand the quantities per hectare are impressive, achieving a value of approximately 11 Ton/Ha (NZWine 2020a); compared to countries like Portugal last year (2019) had an area of approximately 192 743 hectares and only produces 6 526 562 hectoliters, if we do the count this will give, a mere 33.86 Hl/Ha, passing to liters are 3386 L/Ha (IVV 2020b).

It is not only in the vineyard and its production that New Zealand manages to surprise, it is also in the values of its exports, due to strong investment and marketing capacity, NZ exports much of what it produces, exported in 2020 286 million liters of the 329 million that it produced, is an impressive 87% of production, which is equivalent to almost 2 billion New Zealand dollars (1.1 billion euros) in 2020 (NZWine 2020a). In the fallowing figure it is possible to see the impact of the exportations in NZ wine industry.

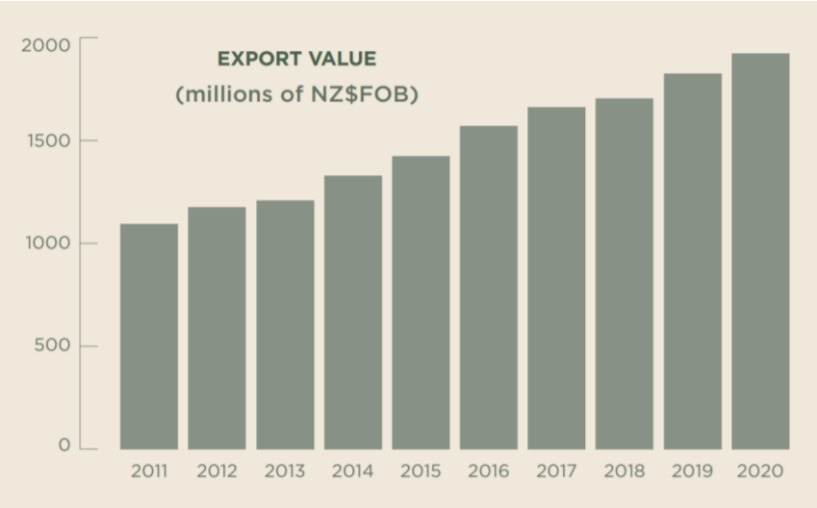

Figure 6 - Evaluation of the export value (adapted form nzwine.com)

The country is divided into fourteen wine regions nine on the north island and five on the south island, with Marlborough being the most important in the country because of the vineyard area here and the high reputation of Marlborough wines.

2.2. Marlborough

The Marlborough wine region is located at the northern tip of New Zealand's southern island, to the north is the Cook Strait which separates the two islands, and to the east, the region is bathed by the Pacific Ocean and thus suffers a major maritime influence.

Marlborough, due to the quality of its wines since the 80's, has been playing the main role among the wine regions of NZ, and currently has a vineyard area of 27.808 hectares, which is equivalent to almost 2/3 of the entire vineyard area of New Zealand. Of the 27.808 hectares, approximately 22,000 hectares are planted with the Sauvignon Blanc, so it is possible to see the enormous weight of this variety in the general panorama of wines from this region and the country (NZWine 2020a).

The region is divided into three sub-regions, the Wairau Valley, the Southern Valley and the Awatere Valley, as Framingham is located in the Wairau Valley sub-region, it will be this sub-region that I will emphasize most throughout the dissertation (WineMarlborough 2020).

Figure 7 - Areas of each variety in Marlborough (adapted from nzwine.com)

2.2.1. Climate and Soil

The climate in Marlborough is typically dry, with frequent droughts during the summer, in winter the mountains of the region are covered with snow, but snow rarely occurs in the valleys where the vines are planted, however ice is susceptible in the valleys; the climate is predominantly continental, with hot and cool summers and cold winters, due to its proximity to the sea, the coastal areas suffer a great maritime influence, and the climate is much more moderate compared to inland areas (NIWA 2020b).

With regard to the wind, it can be seen that in practically the whole region the prevailing winds are from the northwest, but to the east of the region there is a tendency for the wind to turn to the northeast or southeast (NIWA 2020b).

On the ground it is possible to observe the impact of the western sun (sunset) has, it is only necessary to observe the vegetation, comparing the vegetation in the mountains of Richmond with trees and everything to the north of the region and Whiter Hills with just same dry grass to the south of the River Wairau, it is a simple observation that I saw however can tell a lot.

Marlborough is one of the New Zealand regions with the highest annual sunshine of 2475 hours and a rainfall of 650mm at Blenheim station (NIWA 2020a); a simple comparison of one wine region in Portugal to Marlborough in terms of climate is the region of Lisbon, because the annual rainfall is between 600 - 700 mm and in terms of hours of sunlight the city of Lisbon registers an impressive 2799 (325 hours more) (IVV 2020a; Sapo 2020), the difference in hours between these two regions is justified comparing the proximity of Lisbon (latitude: 38) to the equator than Marlborough (latitude: - 41).

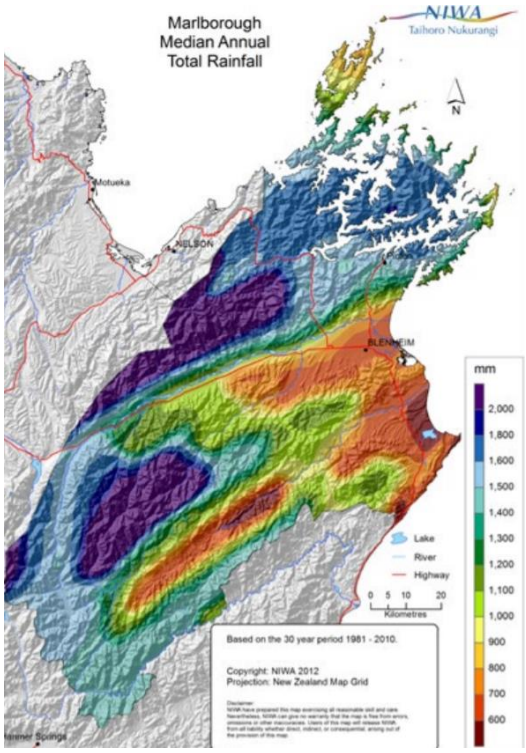

Figure 8 - Marlborough Median Annual Total Rainfall (adapted from niwa.co.nz)

An analysis of the image of the annual rainfall in Marlborough (left map), it can be seen that there are large differences from northwest to southeast of the region, on the west where the mountains are located, the Richmond Hills, have their buffer influence; in the mountains the rainfall is around 2000 mm, while in the southeast of the mountain range the rainfall is around 600-700 mm in the valleys of Wairau (where the city of Blenheim is located) and Awatere, where the vast majority of vineyards are planted.

In map on the right side are the average annual temperatures, it is possible to verify that in the south the region has a much colder temperature than in the north, it is also that in the north - northeast that the valleys of Awatere and Wairau are located, with an average temperature of 12 - 13 ºC, these temperatures allow a good balance of the phenolic compounds in the berries, and allow to make the defoliation already spoken in subchapter 1.2.1 without great sunburning events.

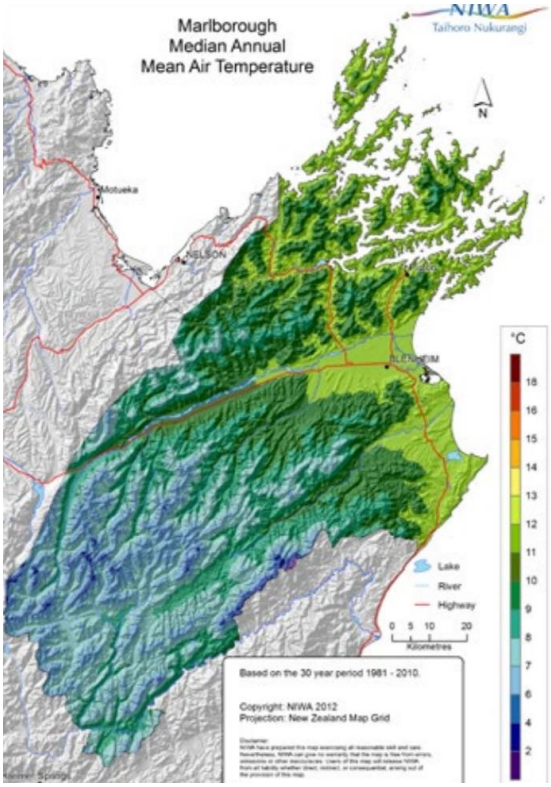

Figure 9 - Marlborough Median Annual Mean Air Temperature (adapted from niwa.co.nz)

The two climatic factors described above are some of the most important factors to make great white wines in this wine region, namely from Sauvignon Blanc.

The soil is ancient and glacial, with excellent drainage; the long water systems of the Wairau and Awatere rivers have deposited clays and sands over the years on deep, stony gravel. The soil that is most found in the vicinity of the Wairau river is a mixture of gravel and clay, which support water retention; however, in the Awatere river valley, the soil is more fragmented with a mixture of gravel and sands (NZWine 2020c; WineMarlborough 2020).

2.2.2. Sub-region of Wairau Valley

The Wairau Valley sub-region is responsible for 45 percent of the vines of Marlborough, the soil is characterized by different types of profiles who helps to get different styles of wine however in general speaking they are stony and fast drying, several watercourses cross the valley being Wairau River the main river flowing into the Pacific Ocean in general it is colder and dryer in the interior, and the coastal area suffers a high influence of the sea breeze. The wines from this region have a high intensity and body characteristic of the fruit (WineSearcher 2020a; NZWine 2020c). The figure below is very good to understand where the sub-regions are located in the Marlborough region.

Figure 10 - Map of Marlborough sub-region (adapted from nzwine.com)

2.2.3. Grapes Varieties

Sauvignon Blanc:

Origin: France

History: The first mention of this variety appeared in 1710, being very much associated with the Loire valley, it is believed to have appeared in the Bordeaux region in the southeast of France from where it left to the whole world; it was in 1975 that the first Sauvignon Blanc vines started to be planted in the Marlborough region, over the years the region has become the flagship of this grape variety in the country establishing a high and robust reputation throughout the world; due to the high number of wineries making the same variety, different techniques have emerged in the vineyard and winemaking with the aim of doing something different and the results are incredible (GermanWines 2020c; WineSearcher 2020e; NZWine 2020g).

Characteristics of New Zealand/Marlborough: It can be said that of the three sub-regions of Marlborough, there are two that can be clearly distinguished giving rise to markedly different wines, the Awatere Valley being the most herbaceous and mineral, while the Wairau Valley wines give rise to more tropical and mature wines; however, in general the wines have herbaceous, green pepper and passion fruit aromas, this is due to the style of wine that the Marlborough winemakers tend to print on the wine, reinforcing an idea that there is a distinct geographical region for the vinification of great Sauvignon Blanc (NZWine 2020g; Parr et al. 2007).

General Enological Characteristics: It is possible to say that Sauvignon Blanc is a versatile grape variety, being able to adapt to different technologies in the vineyard and winery, but the variety has a tendency to follow a characteristic aromatic pattern, presenting basic aromatic descriptors such as green pepper, herbs, asparagus, it can be a variety with a high tropicality and there are aromas of passion fruit and guava, this is due to the richness in volatile thiols (ex: 4-mercapto-4-methylpentan-2-one and 3-mercaptohexan1-ol), these compounds being responsible for the aromas of tropical fruits; the region also has a high influence on the style of wine, not only due to the different climatic factors that can be found in the world, but also due to the mentalities that each region employs in the winemaking style, with clear differences between the wines from New Zealand and France (Baiano et al. 2012; Coetzee and Toit. 2012; Green et al. 2011). There is a discussion about the minerality of the variety, however it requires further study, because it is something very subjective that can vary from region to region and from taster to taster (Parr et al. 2016).

Curiosities: In New Zealand Sauvignon Blanc is affectionately called "Savvy" (WineSearcher 2020e); in France, where the variety originates, Sauvignon Blanc can be known as Blanc Fumé, due to the characteristic "gunflint" aroma of the region of the Loire Valley - Centre, in this region there is the sub-region Pouilly-Fumé (VinVigne 2020; WineSearcher 2020c).

Figure 11 - Sauvignon Blanc (author's photo)

Riesling:

Origin: Germany

History: The first records of Riesling date back to the Middle Ages, and the first documents to mention the name Riesling date from 1435; by the action of the clergy the variety spread through the different German regions over the centuries and it was in the regions of river valleys (like the river valleys of Mossel and Rhine (WineSearcher 2020d) that the variety found its perfect place to give its best potential. When German immigrants started to go to the Americas and Oceania, they took the Riesling with them and that is one of the reasons why we have Riesling all over the world (GermanWines 2020a).

Characteristics of New Zealand/Marlborough: The largest area of Riesling in New Zealand is on the South Island, representing over 90% of the entire vineyard area of this variety, this concentration on the South Island, is due to the climatic conditions of the island, being very important the hours of sunlight, cool nights and dry autumns. In Marlborough the Riesling has 234 hectares planted, out of the country's total of 569 hectares, this is due to the conditions here, giving rise to linear wines, with a strong aromatic component, producing dry or off-dry wines as in the case of late harvests; the wines have an intense aroma of lime, lemon and spices (NZWine 2020e).

General enological characteristics: Aromatically the Riesling is a very rich grape variety, presenting fruity descriptors (such as white and yellow fruit), minerality, vegetables, among other aromatic compounds, while linalool tends to be less beneficial for the typicality of the Riesling; the yeast used in fermentation is an oenological factor that influences the aromatic style of the wine and it is important to make a choice for the type of wine, there may be changes in some compounds such as higher alcohols and acetate esters (Schüttler et al. 2015; Kanter et al. 2020). An interesting aromatic component over the Riesling is the petrol aroma, this aroma is meant to develop as the wine ages (Magalhães 2015c), this aroma is caused by 1,1,6-Trimethyl-1,2-dihydronaphthalene (TDN), the aroma can be detected or not depending on the taster's capacities and existing concentrations of this component in the wine, but it is known that warmer climates tend to develop a more pronounced petrol aroma than in colder climates, and the consumer accepts this aroma more in aged wines than in new ones (Zieglera el al. 2019).

Curiosities: In the United States the Riesling can be known as "Johannisberg Riesling", this is due to the Johannisberg vine in Rheingau, being the oldest vineyard of Riesling (GermanWines 2020a).

Figure 12 - Riesling (author's photo)

Pinot Noir:

Origin: France

History: Pinot Noir is a very old variety, there are records from the middle ages, however it is believed that the variety has existed for at least 2000 years, this being one of the causes for so many mutations, by the hand of travelers who were discovering new worlds, Pinot Noir has expanded all around the world being one of the most disperse varieties in the world and most appreciated (GermanWines 2020b; WineSearcher 2020b)

Characteristics of New Zealand/Marlborough: In New Zealand Pinot Noir is mostly planted on the South Island with Marlborough and Central Otago being the most important regions; due to the wide variety of soils and climates in the country, the variety tends to reveal itself in different ways, however, a Pinot is still easily differentiated from the other red varieties. In Marlborough it tends to reveal itself as an elegant wine with a predominance of red fruit aromas such as raspberry and cherry, presenting a linear structure and with good tannins, one of the most famous characteristics of the wine is the reduced color (NZWine 2020d).

General enological characteristics:

The elaboration of a Pinot grapes as in all other grape varieties begins in the vineyard, and in the technical options taken from its plantation as the location, the clone or clones used, among other factors, until the moment the grape is picked. This variety presents certain particular vinification challenges in order to obtain the best style of wine that can be extracted from the grapes, since it is a variety with a delicate flavor, light color and low ageing potential; in order to obtain a good Pinot, winemakers have been using certain vinification technologies suitable for Pinot, from long pellicular contact with the aim of extracting all possible phenolic compounds to enrich the wine aromatically and increase its potential as a ageing wine (despite production difficulties, a Pinot when well made develops well in the bottle), it is known for instance that micro oxygenation reduces the amount of anthocyanins (the phenolic compound responsible for the wine's color), so if the winemaker want to obtain a wine with a nice color, he must avoid contact with oxygen and create an inert environment (Grainger et al. 2021; Sirén et al. 2015; Sparrow et al. 2020).

Curiosities: In Germany de Pinot Noir is called Spätburgunder and it’s the combination of the German words spat meaning late and burgundy meaning Burgundy (region of France) (GermanWines 2020b).

Figure 13 - Pinot Noir (author's photo)

3. Internship work

3.0. Building a team

I decided to do a chapter called “Building a Team” in my dissertation, because I believe it was a very important moment for everything during the harvest to go smoothly and it is something I don't hear much about in Portugal.

The team consisted of seven trainees (reduced to six due to the coronavirus) from five different nationalities, so with a different way of thinking among all and different ways of working, this period of forming the team was fundamental so that everyone knew what they could count on, to work in unison in the future.

I believe that the process of forming the team lasted one week, just the first week before the harvest period itself (it seems little time but it is enough time), and it was a week that we were instructed that the winemaker and the assistant winemaker wanted things to be done, for example washing vats, working with the machines (receiving bin, presses, etc.), carrying out the license for forklift, among other things so that no one would be dependent on anything; New Zealand has a lot of care for safety at work so a lot of information was received about safety at work.

Due to the lockdown that New Zealand made due to the pandemic, I was working the night shift (during almost the entire harvest) with my German coworker, it was exceptional because I believe we made an excellent team, and as the winery had to work for 24 hours for seven days a week I had the opportunity to follow the whole winemaking process, from picking to storage.

3.1. White wine vinification

The great majority of white wines are made in “open spout”, that is, fermentation occurs only in the must separate from the skins and stems, however, it is possible to perform a pre-fermentative maceration in white wines in order to give some intensity and longevity to the wine, otherwise, if we don’t do a pre-fermentative maceration, it is possible that not enough compounds are extracted in order to give color, intensity and aroma, everything depends on the wine the winemaker has in mind and the type of grapes available.

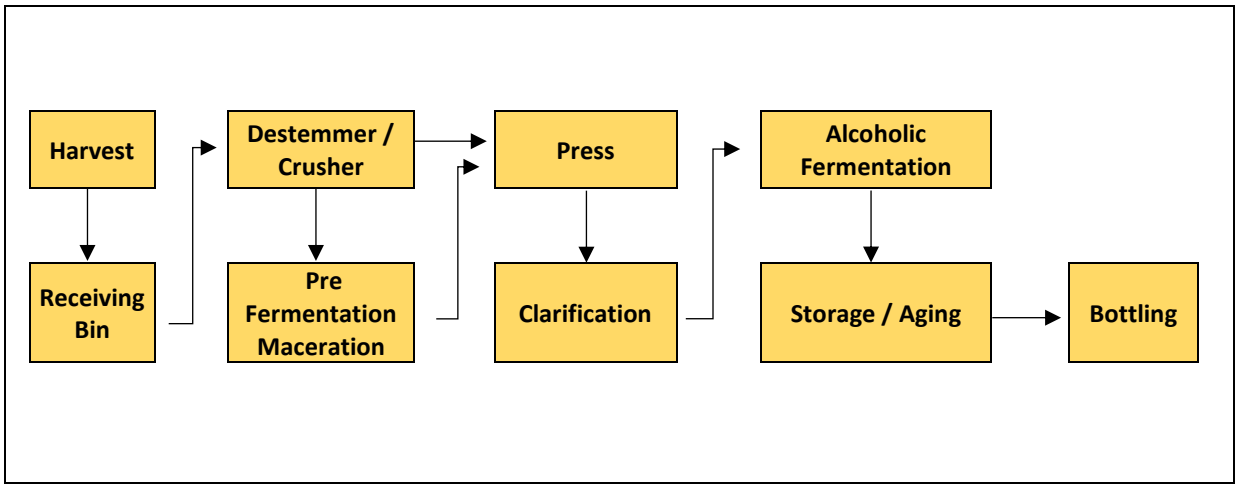

Figure 14 - Simple scheme of a white wine vinification

3.1.1. Reception and Maceration

The vast majority of the grapes were machine harvested, with a pre-selection of the grapes before entering the receiving bin of the machine, and removal of any dirt that might come with the grapes, such as stems and leaves (the aim was to get the grapes to the winery as clean as possible) however, in the winery we still made the berries pass through a destemmer/crusher in order to remove any impurities that the grape still had, this work is done by the destemmer, the crusher served to crush the berries and help in the release of compounds from the skin to the must in order to try to enrich the must; then everything (the crushed berries) went to the press where it was pressed during a certain cycle, to later fill a tank that was at a reduced temperature, thermal shock to reduce the probability of microbiological problems and prevent any spontaneous fermentation and with dry ice inside in order to intertie the environment to prevent any unwanted oxidation in the wine. In order to have a greater pelicular contact, in some cases pre-fermentative maceration is normally done inside the press in order to give the wine more structure and aromas and it's in the skins where are located most of the aromas and not in the sub-epidermic layers, nowadays, due to the mechanical harvesting, there is already a slight pre-fermentation maceration in the bins of the machine and in the trailers that transport the grapes to the winery.

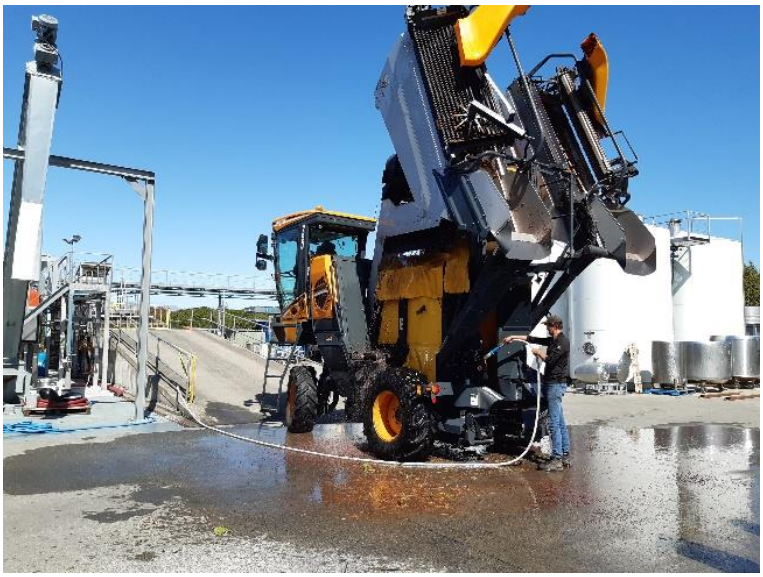

Figure 15 - Harvest machine with selection rolls in the receiving bin (author's photo)

Figure 16 - Destemmer/Crusher where it's possible to see the destemmer drum and below the Crusher (author's photo)

3.1.2. Clarification

The purpose of clarification is as the word indicates the clarification of must to increase the stability of the wine (for example to prevent some protein problem), to facilitate filtration and to

improve clarity; after the pressing of the grapes to obtain grape must, the must is presented with many solid particles in suspension, for this there are several methods of clarification such as centrifugation, flotation or static decantation. The method I used was static decantation using bentonite to speed up the process at a reduced and controlled temperature, in the natural state there are two types of bentonite, according to the interchangeable cation, or they are sodium or calcium bentonite; in their essence bentonite fixes some unstable proteins (adsorption) facilitating their elimination, but it is necessary to know that bentonite is not a selective fining agent, that is, it has the capacity to adsorb proteins, but also have the capacity to fix the coloring matter of the must, and can cause a undesirable change in the color.

At the end of the clarification process the must is clarified, a good percentage of the suspended matter is deposited at the bottom of the tank (lees), as soon as this process was over, the clarified must is transferred for the first time, separated from the lees which were then to be filtered through a plate filter or a cylindrical filter and then the filtered must is sent to its own fermentation tank, without the filtered must being mixed with the clarified must. In the image below it is possible to see the end of the racking, where the lees deposited at the bottom of the tank and still with a little of must on top of the lees.

Figure 17 - Racking after lees sedimentation (author's photo)

3.1.3. Fermentation

After the clarification process comes the fermentation phase, the fermentation consists in the transformation of the wine's sugars into alcohol with the aid of *Saccharomyces Cerevisae* yeasts or not (natural fermentation); as the fermentation is a reaction with the release of energy (exothermic) the temperature inside the tank rises, however it is known that if the temperature during fermentation is between 15 - 20ºC it is possible to make more aromatic wines, so the fermentation temperature during this process was controlled by a cooling system developed for this work, the temperature control during the fermentation also allows to have greater control over fermentation.

In order to have different styles of wine, different strains of yeast are used in order to achieve in the future a good marriage between the different wines created, in order to have more complexity and different aromas it is also possible to ferment in barrels, a fermentation in barrels with thin lees, helps to give to the wine different aromas with more unctuosity, and give more structure.

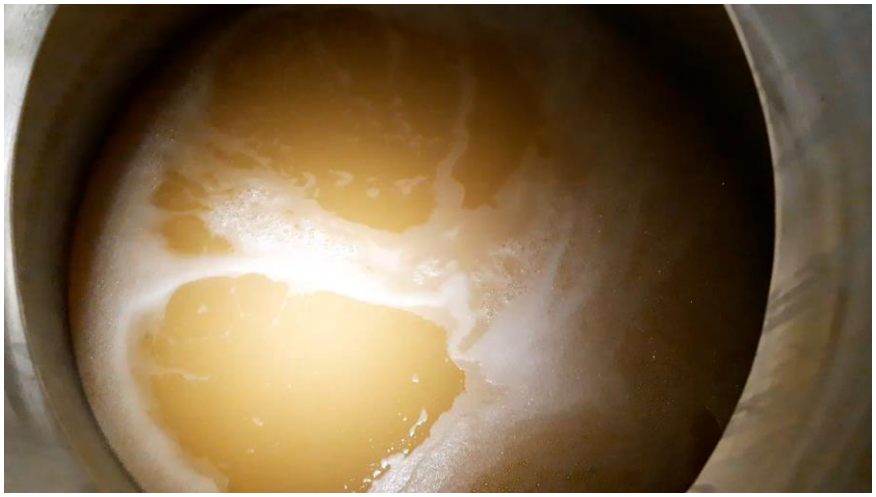

Figure 18 - View from the top of a vat during fermentation (author's photo)

3.1.4. Storage

When the fermentation is over, a second transfer is made, in order to separate the wine from the solid parts that may exist in the wine, such as the case of dead yeasts. After the wine is

transferred to the storage tanks or aging barrels, it is then evaluated by the winemaker in order to proceed with the blending of the wine to meet the wine that was projected at the beginning of the whole process.

Normally when a white wine ages in wood, it is because the fermentation took place in barrels in order to have contact with wood and thin lees, a technique usually known as "batonnage", in a white wine ageing in barrels, there will be phenomena of extraction of wood compounds, oxirreduction by the presence of lees and transformation of wood compounds caused by yeast with compounds incorporation in the wine.

3.2. Red wine vinification

The red wine that I had the pleasure to help to make was all Pinot Noir variety, this variety presents itself as a variety with little natural color, it requires a prolonged maceration in order to get all the possible and desirable components out of the grape skin, this maceration is performed in open red fermentation tanks; after the maceration comes the fermentation, and only after the fermentation comes the pressing of the masses in order to get the all the liquid out of the masses to be later stored.

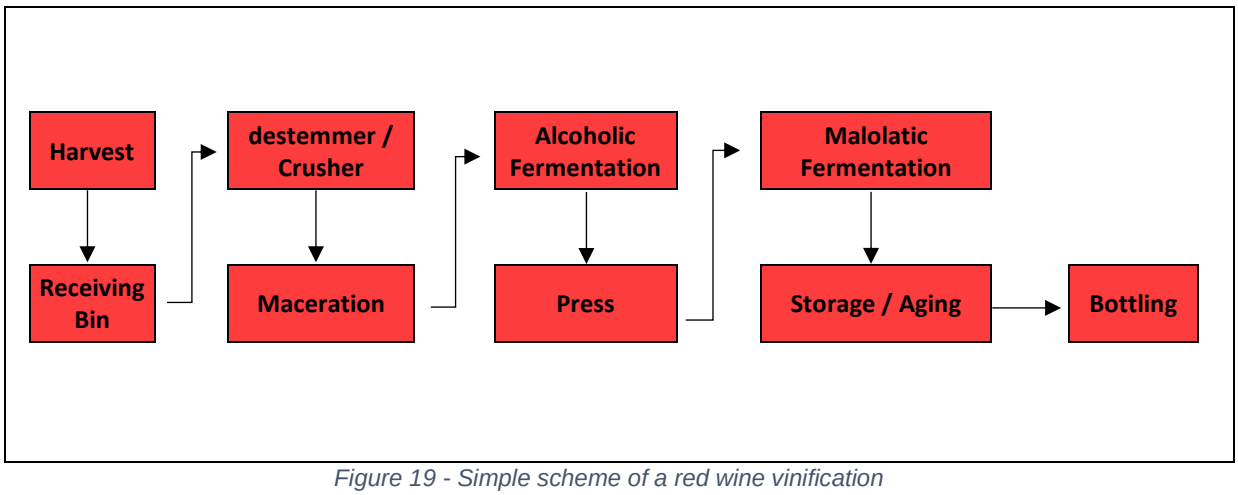

Figure 19 - Simple scheme of a red wine vinification

3.2.1. Reception and Maceration

The Pinot Noir harvest was manual, that is, the fruit arrive to the winery with the whole bunches intact, as wanted most tanks to be filled only with berries (in some tanks we can also put some

bunches without destemming), the bunches were destemmed by a destemmer/crusher, the destemmer separates the berries from the stem when the bunches enter the drum of the destemmer, after destemmed the berries pass through the crusher (it is not something linear, not all berries are crushed after destemming) in order to allow a slight break from the berries to facilitate the extraction of aromas and color from the grape skin.

Figure 20 - Grapes inside the bin barely reach the winery, manual harvest intact bunch (author' photo)

After destemming comes the cold maceration, the maceration has as objective the biggest possible extraction of color and aromas from the skin, as the PN is a variety with little color, the maceration can take 3 to 4 days; during the maceration it is done pump overs so as not to dry the solid part of the must at the surface, in these pump overs it is used dry ice to prevent any oxidation and maintain a reducing environment.

Figure 21 - Pump over during maceration (author's photo)

3.2.2. Fermentation

With the end of the maceration it's time to inoculate the tank, the fermentation in the red wines is done in open tanks to during the fermentation be possible to do punching down manually or using pumps in order to the masses at the surface go down and do not dry out at the surface preventing any microbiological problems and making the solid particles (masses) more evenly distributed, the fermentation occurs at a controlled temperature, but higher than in white wines taking place between 25 - 29ºC; having the temperature controlled is very important for success, because we have more control over the fermentation not allowing the temperature to rise uncontrollably (during fermentation there is the release of energy) allowing the fermentation to last longer and extract more color, aromas and tannins for the wine.

Figure 22 - Punching down during fermentation (author's photo)

During the vintage there was carbonic maceration in one tank, this type of vinification allows to have very aromatic wines, light and with the aim of being consumed young without great potential for aging, in its essence this process consists of placing the bunches intact inside the tank and then saturate the environment with carbon dioxide, this will make the fermentation happens on its own without the addition of yeast being considered an intracellular fermentation, then the mass is pressed and the fermentation ends when everything is already pressed.

3.2.3. Pressing and Storage

When the fermentation is over, the time comes to press the mass, this process is carried out by the following method, before opening the door, we open the valve to let out all the wine we can, after the liquid part is removed it is time to open the door to remove the mass and be pressed, in the mass there is still much liquid that needs to be extracted.

After the alcoholic fermentation and everything pressed, it's time to do the malolactic fermentation, this fermentation may occur naturally or be induced by the winemaker using lactic bacteria, which transform malic acid into lactic acid, this fermentation aims to lower the acidity of the wine, giving more stability and preventing microbiological problems.

After everything has been pressed, fermented and so long, the wine is sent to storage tanks or aging barrels in order to have the greatest diversity of wine styles for later making the blend.

Figure 23 - Bleed a fermented tank to be able to press the masses (author's photo)

Figure 24 -Inside a tank after bleeding, by the mark in the top it's possible to see where it was before (author's photo)

There are multiple phenomena that take place inside a barrel in order to age a red wine with quality, among which, extraction of wood compounds, reactions between the extracted compounds and the compounds of the wine, reactions of oxidation due to gaseous burrows (a barrel is not a close system); several factors of the wood have a big influence on the type of wine that can come from this type of aging, such as the geographical origin of the wood, the botanical origin of the wood, being the oak wood more used (there are different varieties of oak), the cooperage print a own style to the barrel, this involves aspects such as the dryness of the wood and type of toast. The two most evident aspects of a red wine aged in wood are its color, changing from a red-garnet color at the beginning, characteristic of wines to a red-brown color during ageing and being associated to the reduction of anthocyanins, caused by different reactions such as precipitation with condensed tannins. Another characteristic of wines aged in barrels is their evolution in phenolic compounds boosted by oxidation reactions, with the transformation of compounds originating from the wine and the incorporation of compounds from wood such as phenolic and furanic aldehydes.

Figure 25 - Filling Barrics with red wine (author's photo)

3.3. Rosé wine vinification

The rosé wine, is made with red grapes with a short maceration of the must with the skins in order to have a fresher and lighter wine, can be made in various ways such as open spout, this method is the most traditional, it consists in filling a tank with red grapes like we do to a obtain a red wine, however, fermentation does not occur in contact with the skins, that is, after the tank is full and the desired color is obtained (short maceration), the liquid must is removed and then the liquid is fermented separated from the skins, obtaining rosé wine; or we can make a press rosé, this style of winemaking goes very much in parallel with the winemaking of a white wine where all the grapes go into the press and there is not a maceration but a pressing of the berries and skin to extract color and phenolic compounds, this second method is what I did; the variety chosen to make the rosé wine was Montepulciano.

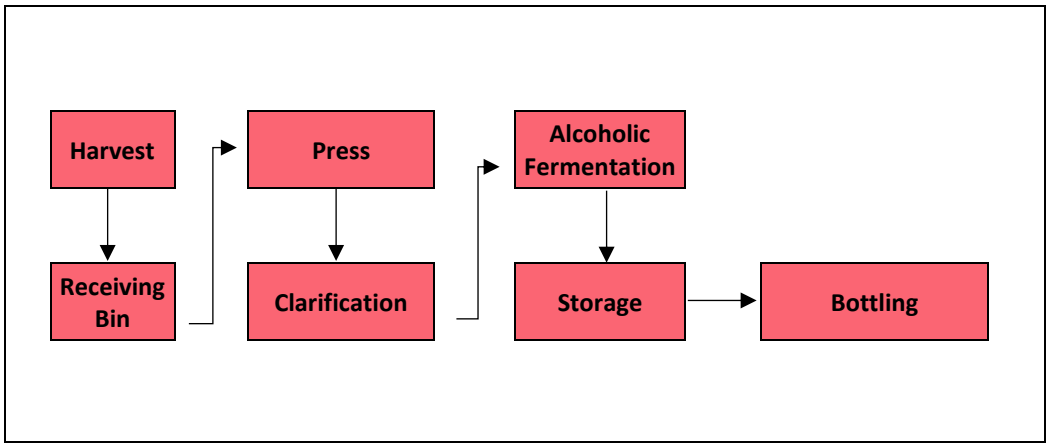

Figure 26 - Simple scheme of a rosé wine vinification

3.3.1. Reception and pressing

The harvest was manual, the whole bunches arrive at the winery, then the press is filled with the grapes and the press is put to work in the desired cycle, at the beginning of pressing the color of the must is practically non-existent or very light due to the fact that the variety is not dyeing, however, as the pressing continues, it starts to extract more color because the press start to press more and more the grape skin of the berries and it is in the grape skin where are the most of the color and aroma (phenolic compounds).

Figure 27 - Must during the pressing of the grapes (author's photo)

3.3.2. Clarification and Fermentation

After pressing, the wine goes to the receiving tank where it is clarified, the clarification is important to have a balanced and fresh wine, after clarification the wine is transferred to a fermentation tank where it is inoculated and left to ferment at a low and control temperature, it is important to keep in mind that the temperature will positively or negatively influence fermentation, that is, the lower the temperature slower the fermentation but richer on aromatic compounds and the higher the temperature, faster fermentation but less aromatic compounds the wine will end up having.

3.3.3. Storage

With the end of the fermentation, the second transfer is made to a tank where the wine is stored and then the blend is made to meet the wine winemaker have in mind. A rosé wine is made to be drunk young and fresh and does not have the capacity to age (it lacks all the structure that can only be obtained with a long pelicular maceration proper to certain red wines), so the wine after fermentation will not remain in the storage tank for a long period of time.

3.4. Late harvest vinification

There are a number of characteristics to make a quality wine in the late harvest style, among which, the grape must be dehydrated and in a state of over ripeness this is due to the fact that the harvest of these grapes is not at the same time as the other white grapes, but later, this style of wine should also needs to be attacked by the fungus *Botrytis Cinerea*, which is considered a noble rot, essential for certain wines such as Sauternes in France and Trockenbeerenauslese in Germany. At Framingham late harvest wine is done with Riesling grapes from previously selected lines capable of producing this wine.

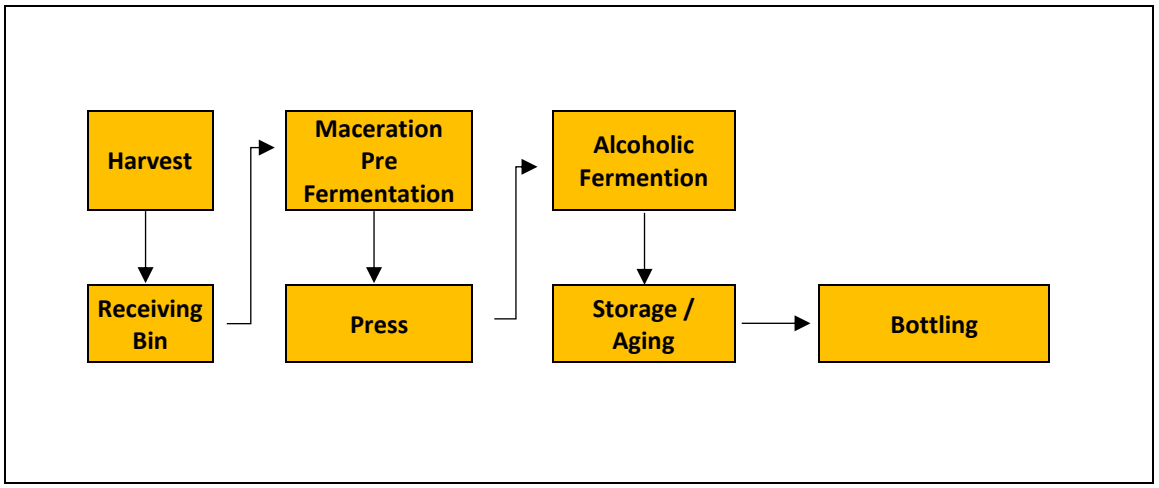

Figure 28 - Simple scheme of a late harvest wine vinification

3.4.1. Noble Rot – *Botrytis Cinerea*

For the Botrytis fungus to develop, there must be a series of climatic conditions to favor the development of this fungus without ever passing from a desired noble rot, to an unwanted grey rot capable of ruining the grape harvest, these environmental conditions are: there must be a high humidity in the air (over 90%) with a temperature not exceeding 20ºC for 3 to 4 days followed by a dry period for approximately 10 to 11 days, these are the conditions considered ideal to have noble rot in the grapes.

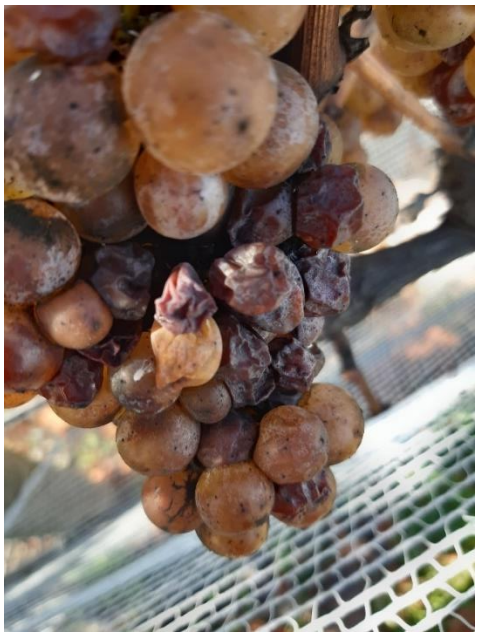

Figure 29 - Bunch with some berries attacked by botrytis (author's photo)

3.4.2. Reception and treading

To make a late harvest, the harvest has to be done by hand, because it is necessary to select the bunches or part of the bunches attacked by noble rot, the grapes when they arrive at the winery are processed, first the grapes are stepped inside the bins and it's made a pre-fermentative maceration essential to extract important aromas from the skins, maceration is done at reduced temperature with the aid of dry ice which helps to reduce the temperature and to inert the environment preventing oxidative problems, when the pre maceration is over it is time to press.

Figure 30 - Selected grapes harvest attacked by botrytis (author's photo)

3.4.3. Pressing and Fermentation

The pressing of grapes from late harvest has to be done with great care and attention to the detail because one does not want to have very violent actions with the must putting at risk its balance, after pressing it is time to ferment, fermentation can be induced or not letting nature do its work, of course a spontaneous fermentation carries its risks, however it is a great way to do something different and it is always a great surprise the final result, the fermentation can

take place inside stainless steel tanks or in wooden vats, everything depends on wine options and the wine the winemaker want.

Figure 31 - Inside a press just after pressing (author's photo)

3.4.4. Storage

After fermentation wine is obtained, it will be aged for the period necessary to obtain the desired style of wine with the characteristics closest to that idealized.

Botrytized wines tend to be aged in barrels or in the bottle, depending on the region and the intended final wine. In a botrytized wine, the aromas present come from many factors such as grape variety, fermentation, type of barrel and level of oxidation, however the most important and most impacting aromas are those caused by noble rot, were this not the main cause for obtaining this wine style.

4.Conclusion and Future Work

4.1 Conclusion

Looking back, I believe that the main objects of my internship during the harvest in New Zealand were fulfilled, from the interaction with people with more experience than me and with different knowledge, on winemaking was a great opportunity to work with foreign grape varieties in different wine styles.

The fact that I had a vintage in New Zealand allowed me to expand my horizons and start seeing this "New World" of wines with other eyes (in a producing country like Portugal there is not much room for foreign wines, except for some very specific wine styles), the socio-economic impact caused by the wine industry in New Zealand, and particularly in Marlborough, makes it possible to say that it is an industry that is imposing itself more and better every year, since there are always concerns about the future and a good capacity to adapt, a good example is to see how people respect and protect the environment.

Specifically, the harvest at Framingham Wines, one of the most prestigious wineries in New Zealand, gave me a reality that I was pleased to embrace and adapt to, and I was able to enrich my knowledge in the winemaking area, and grow personally due to having worked with people from the most different backgrounds.

In terms of vinification this vintage was really enriching, it allowed me to work directly with the raw material in all the different phases of the process, and in four wine styles, the availability of people is something to be praised, whenever an issue appear there was no barrier, and they were very enlightening having an enormous patience.

4.2 Future Work

Even though the 2020 harvest in New Zealand has made me grow a lot in wine industry, the search for knowledge cannot stop and I believe that it is necessary to go in search of that same knowledge, a friend once told me: every time I think I know more about wines I realize I know less, and he have some reason, there are hundreds of wineries, and each one with a different philosophy of seeing and making wine, a certain detail is enough to make a different wine of the same grape variety on the some region.

To conclude, I believe my future will lead me to make more harvests outside Portugal, whether in Europe or across the ocean, with the clear goal of learning different things and having another capacity to observe what surrounds me developing my critical spirit.

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