I’m a wine producer: a grower and not a scientist. My job is to produce wine and not to undertake research. However, I have the opportunity now to work both in Bordeaux and in South Africa with the grape variety Merlot, and I would like to share with you some of my experience with this grape variety.

Firstly I will present to you some general information about Merlot: its history, its production, and its ampelographic description. Then I will explain how, using the experience obtained in Bordeaux with conditions that greatly favour the Merlot variety, we have been able to make some choices in South Africa.

I. Generalities about Merlot

Merlot originated in France and is the most planted grape variety in the vineyard of Bordeaux, representing 58% of the surface planted in black grapes. The very famous Cabernet Sauvignon occupies 37%. However, the image of the wine from Bordeaux has often been associated with Cabernet Sauvignon, probably because it is the most planted grape variety in the Médoc region. Is it for this reason, perhaps, that Cabernet Sauvignon has a far greater presence in the New World than does Merlot?

Merlot is, however, a wonderful grape variety that is able to produce very good wines, even if it is more capricious than its cousin Cabernet Sauvignon which seems to be well adapted to many different kinds of climate. Being a Frenchman, before talking to you about Merlot, I have to tell you about its history.

A. The History of Merlot in France

The appearance of Merlot in Bordeaux does not seem to have been very long ago, by French standards at least. The first written evidence of its presence dates only from the end of the 18th century, in 1783, in the region of Libourne. Later, a book written in 1855 will say about Merlot that this “variety has been planted for a long time”.

Merlot always produces very highly sugared berries, much enjoyed by birds. The blackbird (called merle in French) gives Merlot its name. In 19th century Bordeaux, there were many grape varieties planted, but most of them were not identified. The Brothers Boucheron had a 1200 -variety ampelographic collection in “the Graves”, and amongst this collection was Merlot.

In order to produce wines of quality and to simplify the plantation of the various grape varieties throughout the vineyards, winegrowers have gradually eliminated those varieties which produced common, or rough wines without any character.

Depending on the region and the soils, some grape varieties have been able to come into prominence. The Phylloxera Crisis accelerated this phenomenon and has defined the main grape varieties that we now know in Bordeaux.

B. Production

Today, the trend in Bordeaux consists in eliminating Malbec and developing Merlot. Merlot represents 58% of the planted area whereas Cabernet Sauvignon only represents 37.3%, Cabernet Franc 13.14%, Malbec 1% and Petit Verdot less than 0.5%. The reason for the increase of Merlot can be explained by its earliness and by the difficulty, in some years, that winegrowers can experience in harvesting mature Cabernet Sauvignon under the climate of Bordeaux.

C. Ampelography

Merlot is an early ripening grape variety. Its budburst, flowering and veraison are very early and it matures earlier than the other major black grapes planted in Bordeaux. Its maturity occurs at nearly the same time as Malbec.

Merlot is very sensitive to external factors. This sensitivity is expressed by its vigour, its yield, its stress symptoms and the quality of its grapes. In general, it is a quite vigorous variety, and has a very fast growth rate in spring. If the climatic conditions are not favourable, Merlot can be very sensitive to flower abortion and its cropping becomes irregular from one year to the next. Likewise, as the budburst is relatively early it is also sensitive to spring frost. This is worsened because it does not produce very many buds to replace the frozen green shoots. Merlot has the reputation to have low sensitivity to Oidium, but is very sensitive to Downy Mildew, even on the clusters in its form of brown rot.

As its skin can be very thin at maturity, Merlot is very sensitive to Botrytis Cinerea assaults. Even if it is quite sensitive to Esca and Eutypa, the damage appears slower than in the case of Cabernet Sauvignon.

Production: areas planted in the world =/- 150,000 ha.
II. External factors

I produce wines made with Merlot both in Pomerol and in Saint-Emilion. Four years ago, I also purchased a vineyard and winery in South Africa, called “Ingwe”, located in the southern part of the appellation Stellenbosch near the town of Somerset West. Why did I make this choice? What I found there was a vineyard that in its entirety (soils and climate) seemed to be particularly adapted for producing high-quality grapes.

We will firstly analyse what the external factors are that Merlot prefers in Bordeaux. Then we will also look at the knowledge, learnt in Bordeaux, which helps us to make some important choices in South Africa.

A. The Climate of Bordeaux compared to that of Somerset West in South Africa

Even if many very good wines are now produced with Merlot all over the world, Bordeaux is still an important reference point. The area of Libourne produces a significant proportion of the wines made with Merlot that have got the richness, the complexity, and the ability to age that are most highly sought after. For this reason we will have a look at the climate of this region.

The average rainfall is about 953 mm. We note that during the summer there can be quite significant rainfalls (from 50 to 60 mm) but most of the rainfall still occurs during winter.

During the harvest month of September, the average rainfall is about 91 mm.

The significance of the rainfall during September can explain partly the difference between vintages in Bordeaux. Generally speaking, these September rains are a real problem for the quality of the wines. The sunshine hours are about 2063 hours, with the maximum of sunshine occurring during the month of vegetative activity. The average temperature is not high during the ripening, at around 20°C during the month of vegetative activity. The average temperature per month is shown in the diagram below.

B. Soils

The climate is, of course, a crucial element for producing good quality wines made with Merlot. However, the climate is not the only element to take into consideration for producing very good wines on a regular basis. The soil, as defined by its chemical and physical composition, its ability for holding water, and its water system, is a crucial element for the production of high quality grapes.

Professor Seguin from the Bordeaux Institute of Oenology (1982) has written: “Surveys conducted in the region of Bordeaux shows that, under this kind of climate, the regulation of vine water supply is an essential factor for producing high quality grapes. An excessive water supply can provoke a deterioration of the quality of the grapes (…); on the opposite side, a deficient water supply is not good for the quality of the grapes”.

In the soils which produce the best growth there are water supply mechanisms of regulation that limit the effect of drying, or of an excess of water, on the vine. In these kinds of soils very good wines can be produced even if the climatic conditions are not favourable.

1. In Bordeaux

We are now going to try to analyse if there are some soils, in Bordeaux, that are more favourable for producing very high quality wines made with Merlot. Why are some soils in Bordeaux able to produce the best results?
Soils in Bordeaux.

**Geological elements**

We can find many very good wines produced on different subsoils: limestone, molasses, clays, or quaternary gravelly sandy alluvial deposits. These kinds of wines all have very different tasting characteristics, but are all very good wines. However, the subsoil is not the only element to take into consideration to explain these quality differences.

**The different soils: texture and structure**

We can find very good wines made from Merlot produced on very diversified soils: clayey-calcareous soils, gravelly-clay soils, sandy-clay soils... The soil is not enough to explain the high quality of some wines.

The example of Pomerol is very interesting. On this very small appellation (less than 800 ha), we can find some sandy-clay soils, some gravelly-clay soils or very clayey soils. The richness of the wine produced depends on these basic elements of the soils. But, even if the wines are more or less concentrated, after having spent a few years in bottle they will all possess the typical characters of the wines coming from Pomerol: truffle aromas, a very velvety mouth feel, creamy tannins. These kinds of soils possess very different water regulation systems that give to the wines produced very different structures, even if they come from the same appellation. This is for these reasons that we have created, in France the “Appellation d’Origine Contrôlée”.

In the wine region of Bordeaux we can find some soils that contain very different proportions of stones (from 0% to more than 50%), of clay (up to 60% in the best growth of Pomerol) and of sand...(Duteau et al.1978).


Saint-Emilion’s vineyard spreads over about 5300 ha whereas the vineyards of Pomerol don’t exceed 800 ha. However, as we are going to see in the following schemes, Saint-Emilion’s and Pomerol’s soils are quite different, but still have the same potential for producing very high quality wines made with Merlot.

Section of soil number 1 is very representative of what we call in Saint-Emilion the “Côte Argilo-Calcaire” (the clayey calcareous slope). This section of soils is composed of a significant quantity of clay associated with silts.

Section of soil number 2 is typical of the calcareous plateau of Saint-Emilion. This kind of soils is rather silty, quite shallow, with a calcareous subsoil. These soils produce some mineral tasting wines with a lot of finesse and wonderful raciness.

The third subsoil in Saint-Emilion, producing high-quality wines is the gravelly clay section near Pomerol. (Section of soil number 3).

Here now are 4 representative sections of soil from Pomerol. They are also obviously all very different.

**Chemical features of the soil**

As well as for the other external factors, we can find in Bordeaux a wide range of soils with different Cation Exchange Capacity, Nitrogen content, organic matter, Phosphorous, and different ratios of K/Mg. This includes vineyards within in the same appellation but in different estates, or in the neighbouring appellation. With time, they will all produce very similar wines.

Therefore, the chemical features of these soils are not sufficient to explain the observed differences in the quality of the wines.

For example, in the best areas of Saint-Emilion, not too far from the village itself, we can find some vines that have a considerably high assimilation of phosphorous and calcium, as shown by petiole analysis.

This will make the difference between the best clayey-calcareous soils of Saint-Emilion’s plateau and the other clayey-calcareous soils of the neighbouring appellation. In Pomerol, the best soils for producing Merlot have a very low assimilation of Calcium and a variable assimilation in phosphorous.

**Water supply of the vine**

All the factors we have been talking about must have an influence on the wine’s character and typicity. But they are still not enough to explain the great differences in wine quality between the different soils that produce the best Merlot.

The water regulation system and the way in which the water is available and may be used by the vine must be crucial. Seguin (1978) noticed that organic acid concentrations in the grape musts are all greater when water supply has been low, but without any deficiency, during the period of ripening. Duteau et al (1981) studied the soils in Saint-Emilion and in Pomerol where Merlot is produced. They noticed that grape quality was decreased as the water supply became too regular, and also when water supply became too low during the critical period.

Seguin (1982) followed the evolution of the ratio ETc/ETd x 100 for the 1979 vintage and noticed: (ETc = potential evapotranspiration, ETd = actual evapotranspiration)
• If ETc/ETd $\times 100 > 45\%$ there wasn’t any differences in the constitution of the grapes.
• If $35\% < ETc/ETd \times 100 < 45\%$ then, the consequence of the decrease in water supply is an amelioration of the quality of the grapes. Even if the sugar concentration is the same, grapes are less acid and contain more polyphenolic components.
• ETc/ETd $\times 100 \geq 35\%$, in fact 35% is a threshold for the 1979 vintage. When ETc/ETd is under this threshold, the quality of the grapes doesn’t increase because water supply becomes deficient and sugar concentration and richness in polyphenolic components decrease, whereas organic acid content remains high.

Sometimes in Bordeaux, just before the harvest, there can be very heavy rains. Depending on the water regulation system of the soils, the vine will not all react the same. Sometimes there will be some burst berries and grey rot.

Soil water system and stress of the vine.

Features of the sandy-gravel soils
These soils have a very low clay proportion and do not have the capacity to hold a lot of water. On the other hand, these soils are very deep and the roots are accustomed to penetrating deep in search of coolness not too far from the water-table. These deep-rooted vines don’t suffer greatly during the period of dryness. They are also not too badly affected with the rains in September. This also shows why the age of the vines is so important: to have deep rooting and thereby good quality.

Features of the compact calcareous soils
In the compact calcareous soils, the roots remain near the surface because the soils are shallow. In Saint-Emilion, the depth of some soils doesn’t exceed 30 or 40 cm. The water reserve that can be used by the vine is therefore low. However, even during the dry summers, water supply of the wine remains at a good level because the calcareous subsoil can supply water to the vine, when it requires it, by capillary action.

Features of the clay and gravely-clay soils
In these kind of soils, as in Pomerol, the clays permit good water regulation. As the vine pumps water from the clay, this water becomes harder and harder to extract, that can thus avoid any excessive water supply.

All these soils are very different. To explain the differences in quality we have to focus on the water regulation system.

Soil water regulation system and stress of the vine
In 1990, Van Leeuwen et al. studied the water regulation system of the vine by measuring the leaf water potential (y) just before the rising sun. The following table gives some leaf water potential examples at veraison and at maturity.

<table>
<thead>
<tr>
<th>Soil with a water-table</th>
<th>Compact limestone</th>
<th>Soil with a clayey subsoil</th>
<th>Gravely soil</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulp Weight / berry</td>
<td>1.15</td>
<td>1.08</td>
<td>1.01</td>
</tr>
<tr>
<td>Reducing sugars</td>
<td>204</td>
<td>222</td>
<td>217</td>
</tr>
<tr>
<td>Total Acidity (meq/l)</td>
<td>68</td>
<td>72</td>
<td>62</td>
</tr>
<tr>
<td>Malic Acidity (meq/l)</td>
<td>23</td>
<td>17</td>
<td>14</td>
</tr>
<tr>
<td>Skin D280 of extract</td>
<td>19.8</td>
<td>22.4</td>
<td>25.2</td>
</tr>
<tr>
<td>Anthocyanins (g/l)</td>
<td>0.554</td>
<td>0.662</td>
<td>0.718</td>
</tr>
</tbody>
</table>

Grape composition at maturity (17/9/90)

Soils and ripening of the grapes.

Vegetative activity of the vine and water regulation system
During the survey, Van Leeuwen noticed that on the soils with a water-table the shoot lengthening was very significant, and the vine stopped its growth very late in the season. In the compact calcareous soils, the vegetative activity of the vine is also significant but it ceases some 10 days earlier. In the gravelly soils, and in the soils with a calcareous subsoil, the growth is very limited and the cessation of vegetative growth occurs even earlier. Van Leeuwen noticed that the correlation between the leaf water potential and the shoot lengthening is significant at the 1% statistical threshold.

Grape maturity
During the ripening of the grapes, there are some differences in the grape composition that can be seen in the following table:

In the soils with a water-table, the berries are large, low in sugar with an intermediate total acidity, but with higher malic acid content. Their skins are low in polyphenolic components and in anthocyanins.

The gravelly soils and the soils with a clayey subsoil give small berries high in sugar, low in total acidity and low in malic acid. The skins possess richness in polyphenolic components and in anthocyanins. The calcareous soils are intermediate.

Van Leeuwen’s conclusions are the following:
• The basic leaf water potential is useful in estimating the energy that the vine will have to consume in order to extract water from the soil, and to understand the water regulation system of the vine.
• A correlation exists between leaf water potential and the growth of the vine, and also between leaf water potential and grape composition.
• The water regulation system, and water availability, can explain both vine behaviour and the oenological quality of the grapes.

As we have just explained, there is not only one type of soil that has the capacity to produce high-quality wines. However, the water regulation system of the soil is a crucial element to be taken into consideration in the production of quality wines.

With this knowledge, we have selected some soils in South Africa.

2. South Africa

In this part of my report, I am not going to detail each South African soil type because of their great variability. Most of them are clay soils derived from granite and sedimentary subsoils. In the Robertson area there are also some very calcareous soils. Vines are also planted on alluvial soils and near rivers.

Ingwe was purchased because of the high quality soils we found there. We made 50 holes with a mechanical shovel in order to observe the different soil horizons. As you can see in the following figure, there is great variability in these soils. This variability gives us the possibility to adapt the soils to particular grape varieties that are best suited to those soils.

It is interesting to note that all these soils have, at depth, a high proportion of clay, and at the surface different proportions of stones that has an important effect on drainage.

The clay at depth, with its water absorption capacity, has the ability to limit water stress. More than that, it can also constitute a water reserve, so that water is pumped from the soil by the vine and is not supplied directly to the surface roots. These two factors were crucial for producing red wines of quality.

C. Rootstock and fertilization

It is obvious that the choice of a rootstock principally depends on the soil composition. Especially with Merlot, this is a crucial choice because the wrong rootstock can provoke flower abortion and give low quality wines.

Due to its great sensitivity to flower abortion, Merlot cannot stand having its roots in water during the spring. In Bordeaux in the soils where a water-table still exists in the spring we have to choose a tolerant rootstock, for example 110-R and was not too vigorous. We have therefore chosen 110-R because the demand from the vine must not be too great.

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D. Density of plantation

1. In Bordeaux

Under the climate of Bordeaux, density of plantation is chosen according to the objectives of production that the winegrower wants to achieve. It has been observed in the Bordeaux region that high density plantation gives the best wines.

In the 1970's many winegrowers in the region of Entre deux Mer decided to pull out every second rows to facilitate mechanisation by tractor and to thereby reduce the costs of production. Immediately, the wine quality decreased. Today the most courageous and ambitious winegrowers in this region are replanting the missing rows, or are completely replanting with a higher density.

In the hotter vineyards, such as in South Africa, the problem is not the same. The vine stock vigour must be associated with water stress control. With the density of plantation chosen, roots must be able to use every millimetre of water reserve. We have to pay attention because the demand from the vine must not be too great.

According to Champagnol (1984), density of plantation has an influence on the physiology of the vine. Firstly, the quality and the depth of the rooting depends on the density of plantation, and secondly, the use of light energy is influenced by the trellising and by the density of plantation.
For the same trellis design, the number and the weight per surface unit are more and more important when density of plantation is high. Thus, Candela and Hidalgo (1969) proved there was a negative correlation between the density of plantation and the development of roots per vine. In this way, the larger number of vines per surface area compensates for the decrease in the number of roots per vine. They also showed that as the competition between vine stocks increases with increased density and the vine roots are forced to develop deeper.

However, if the trellising is adapted to the density of plantation the results are different. Carbonneau and al (1978) showed the importance of the leaf index (leaf surface area per square metre of soil), and of the leaf microclimate on the rooting and water regulation system. They noticed that large and open “Lyre” trained vines have the same root density as the vines grown in narrow rows. This can be explained by the fact that the leaf surface of “Lyre” trained vines can intercept a great deal of solar energy thus provoking a high water demand on the leaves, which in turn involves a root reaction.

Champagnol (1984) explained that high root density would be more beneficial when the soil is not rich. According to Torres, agronomic richness of the soil must be taken into consideration when choosing the density of plantation. In a poor soil, one has to avoid vigorous rootstocks. In a rich soil, we can decrease the plantation density by developing the vine size.

What are the main conclusions of these surveys? These may be seen in the typical densities of plantation used in Bordeaux.

In gravelly soils, such as in the Médoc, where the soils are very deep and stony, the high density of plantation (10,000 vines per hectare) gives very small vine stocks that occupy most of the soil surface area available. Competition between vine stocks for available soil forces the roots into going deeper into moisture and coolness. In Libourne, where the soils have more clay, a 6000 vines per hectare density is sufficient. A higher density would create problems of accumulation of too many leaves, and a consequent degradation of the microclimate.

Clay in the soil permits vines carrying a higher crop load per vine to still have a good ripening.

2. In South Africa

On the other hand, what happens in South Africa?

Most of the vines are large, with a 2.80 metres or more spacing between the rows.

At my estate, I have changed this regime.

The Ingwe vines are planted at 1.80 metres between the rows. Within the rows, the inter-vine spacing depends on the grape variety: 1.10 m for Merlot, 1.20 m for Cabernet Sauvignon, and 1.25 m for Syrah. These spacings give densities ranging from 4450 to 5050 vines per hectare.

Why these distances?

I wanted to produce wines with a lot of finesse, especially with regard to the Merlot’s tannins. I wanted the vine roots to use the maximum of the soil water reserves in order to limit the use of irrigation. For these reasons I have slightly increased the vine density, so roots will use each available square centimetre of soil. This choice was possible because the estate has clay soils.

However, one must be careful because high vine density involves a lot of leaves which results in high water demand that can provoke water stress and consequent use of irrigation.

Am I right? I cannot answer that question yet because the first significant harvest of Merlot will be in 2002. However, the first Syrah and Cabernet Sauvignon grapes harvested were harvested in 2001, and I can tell you they were very good. The wines produced have both the power and the finesse that I was looking for.

E. Irrigation

1. In Bordeaux

Irrigation is forbidden in Bordeaux because the rainfall is sufficient throughout the year. An interesting case in point is the example of the 2000 vintage.

Rainfall during winter (from January to March) was less than usual. On the other hand, some heavy rain during April and May provided adequate water reserves in the soil to commence the vine vegetative activity and to go right through until ripeness. Rainfall was then weak from June to September during the vegetative activity and ripening. The cessation of rain in the middle of July launched veraison and stopped the vegetative growth. After that, rainfall was very low. At the end of the third week of August some water stress appeared in Merlot vines planted on the gravelly soils in Pomerol. Fortunately, however, at the end of August a 26mm rain storm came and filled the water reserve of the soil. The vines were then able to go on ripening without excessive stress, and 2000 became a wonderful vintage.

In the best soils for producing Bordeaux red wines, the water reserve becomes weak just before, and throughout the ripening of the grapes (Van Leeuwen and Seguin, 1994). This small amount of water stress is favourable for producing high quality grapes. If the stress is too great, it can have a very negative effect on the leaf photosynthesis, and on the vegetative activity of the vine.

Water stress occurs when the daily water demand of the vines is greater than that able to be supplied by the soil water reserves. This stress provokes the cessation of vegetative growth. When this occurs, the vine starts saving water. Seguin and al (1994) showed that the best quality grapes, which have the best composition for producing wines of quality, were produced on soils with a very well regulated water supply. This water supply was also at a very low level, not only during ripening, but also right through from berry set to harvest. They found correlation between the compositional characters of the grapes and basic potentials during ripening. This survey was conducted in Saint Emilion on the grape variety Cabernet Franc.

2. In South Africa

Choné and al (2001) proved that moderate water stress at veraison had a very positive effect on the polyphenolic components in the musts, for any grape variety.
They explained that moderate water stress could reduce the vigour, and thus minimise competition between berries ripening and vegetative growth. The berries then attract the majority of the products of photosynthesis. Also, the size of the berries is reduced (by up to 30%) and the ratio of skins to juice in the tank increases. Sugar and polyphenols are higher, the content of malic acid is lower, and maturity occurs earlier. If this moderate water stress on the vine does not occur until the end of ripening, then the effects on the quality of the grape crop are minimal.

They also note that in Bordeaux, the best wines are produced on “terroirs” that typically have early and moderate water stress in every vintage. They state that irrigation must be used to avoid excessive water stress. Van Leeuven (2001) states that soils with a strongly limited water supply can produce Merlot wines with a lack of freshness and heavy aromas of over-maturity.

The conclusions are as follows:

Irrigation must be adapted to each parcel of vineyard and used only when necessary. A little water stress must be maintained.

It is important to ask: Why do we use irrigation? Is it to make the vines produce more grapes, or is it to firstly avoid excessive water stress. Van Leeuven and Choné decided to measure the leaf water potential with the leaf enclosed in a plastic bag (plastic laminated with aluminium) at least one hour before taking the measurement. In this way, the stomata are closed, and the leaf does not transpire. The leaf water potential of this leaf is more accurate and easier to do if, for example, the vine is suffering from water stress, or to measure the residual water in the soil. Moreover, to be accurate, it must be installed at various depths. The problem is that the vine and its roots can develop close to the probes and thereby give erroneous results.

How do we know when irrigation must be used?

We have some very useful tools, such as neutron probes, which we use to study water in the soil. However, these are not enough to know exactly if the vine can easily use the remaining quantity of water, or if there is any water stress.

Choné et al (2001) explained the difficulty for checking the soil water reserve. A tensiometer is not able to detect a lack of water in the soil. Moreover, to be accurate, it must be installed at various depths. The problem is that the vine and its roots can be very deep.

According to the soil texture, and the placement of the neutron probes, their results can be very different. In soil with a water table it is not possible to measure the water used by the vine. After a few years of use, the vine roots can develop close to the probes and thereby give erroneous results.

As the best grapes are produced when the vine suffers from a moderate water stress, they decided not to measure the soil water reserve but the physiological state of the vine instead. Van Leeuven and Choné decided to measure the leaf water potential as an indicator of this.

They advise to measure the stem water potential with the leaf enclosed in a plastic bag (plastic laminated with aluminium) at least one hour before taking the measurement. In this way, the stomata are closed, and the leaf does not transpire. The leaf water potential of this leaf balances with the stem water potential. This measurement is more accurate and easier to do if, for example, the vine is suffering from water stress, or to measure the residual water stress after rain. This a good tool for determining irrigation in a vineyard. Before using this system, some specific data bases must be established concerning each of the “terroir” threshold characteristics favourable to improving the oenological quality of the grapes.

Indeed, both neutron probe readings and measurements of stem water potential give complementary information to measure and to anticipate the water stress of the vine. This is what we have decided to do at my estate in South Africa.
Other researchers have worked on water stress, such as Dry et al (2001). They studied partial rootzone drying system, that is a system in which only a part of the roots suffer from water stress. As I have never used this system, I won’t discuss this any further.

F. Microclimate of the grapes
Microclimate of the grapes is a crucial factor in obtaining high-quality grapes. That is to say grapes without any delay between technological and polyphenolic maturity.

1. Bordeaux
In Bordeaux, there is a maritime climate that leads Merlot to maturity without any excessive water stress. The period of ripening (from veraison to maturity) is quite long in Bordeaux (from 40 to 45 days). Sometimes, however, the climate of Bordeaux is quite capricious in September, especially during the autumn equinox. There can often be heavy rain at this time not favourable for the quality of the crop. For this reason, we must actively promote maturity.

In Bordeaux we customarily thin the leaves to improve the grape microclimate. To avoid over-exposure and sunburn of the berries, we first thin out the leaves exposed to the rising sun. This is carried out just before berry set. A second thinning can then be made just after veraison: it depends on the climate of the year and on the parcels of vineyard concerned.

2. South Africa
In South Africa, the opposite applies. Here, we must not expose the grapes too much to the sun in order to avoid aromatic degradation and the loss of tannin finesse. On the other hand, in my opinion, a big vine canopy on a large trellis system could provoke an excess of shade. Indeed, if some grapes or leaves are never exposed to the sun, it can provoke a delay between skin and pulp maturity.

Carbonneau (1982) showed that herbaceous and rough aromas often appear when leaves are exposed to the sunlight and the grapes remain in the shade. Similarly, I have noticed that under a dense canopy, even after leaf thinning, some leaves can remain in the shade and give herbaceous aromas to the wine. Grapes in the shade are more acid because malic acid concentration is higher. On the other hand, the content in tartaric acid can increase with the temperature increase from improved exposure (Carbonneau et al, 1978).

III. Winemaking
A. Maturity
The optimum skin maturity period for Merlot is very short. For example, one day the seeds may not be mature enough, then three or four days later the grapes can become over-mature resulting in heavy wines with rubber flavours.

How do we find the best period for harvesting?
We all know the different indices that can evaluate the content of polyphenolic components. All of these indices can be very useful even if they are not always easy to measure. Personally speaking however, I still think the best method of determining the quality and maturity of Merlot grapes is tasting. The chemical analyses such as sugar content, total acidity, malic acid, pH, anthocyanins, tannins (and their extractability) are all very useful in coming to a decision. But the appearance of the grapes, the colour of the stems, the berry elasticity, the ease of separating berry from pedicel, the taste of the skin and seeds are, from my point of view, the crucial elements to be taken into consideration.

Moreover, if you are able to really look carefully, after several years experience you will come to know exactly the quality potential of each parcel of vineyard. Of course, it is not always possible to do this in all winery situations, especially if you have to act very quickly and you don’t have time to look thoroughly through all your vineyards. In that case the chemical indices are very important and do permit you to make good wines. However, in order to regularly produce premium wines it is important to observe your vineyards to know the best period for harvesting.

B. Alcoholic fermentations
No standard model exists for conducting alcoholic fermentations. Everything depends on the quality of the grapes and the kind of wine you want to produce.

Cold maceration before alcoholic fermentation gives very good results with the grape variety Merlot. The slow, aqueous extraction of anthocyanins that occurs is very favourable towards colour stability. The very slow extraction of aroma precursors also helps augment fruit characteristics.

Personally, I prefer beginning the alcoholic fermentations at a rather cold temperature. In that way, fermentation can last a long time. I consider that the extraction of polyphenolic components must be effective during the two first thirds of the fermentation, as the alcohol content is not very high at this stage. During the last third of fermentation, the solvent effect of alcohol accelerates the phenomenon of extraction. I prefer then a very long post fermentation maceration, as I really like the effect of a very slow polyphenolic extraction.

To leave the wine macerating under the cap, with the minimum of cap management activity, permits a very regular and slow tannin extraction.

The evolution of the tannins must be followed by a daily tasting. In that way, the maceration can be stopped just at the right time.

However I also know that in Australia many winemakers like to use short skin contact with red grapes, and still get good results.

C. Malolactic fermentation and ageing
The Malolactic fermentation in barrel can, in a young wine, give a mellow wood taste. In Bordeaux today, it is fashionable to age a red wine in barrel on its lees. On one hand lees give to the wine a lot of reductive components such as proteins, polypeptides, amino acids etc that have very good antioxidative components. Their presence ensures a slow oxidative evolution of the polyphenolic components and an efficient protection of aromas specific to the grape variety (François 2000). On the other hand, the lees also give to the wine polysaccharides that decrease the sensation of astringency coming from the tannins.

Camarasa et al (2001) quote Feuillat (2000) who noted that an ageing with lees, accompanied with a stirring of the lees in the barrel, can increase the quantity of anthocyanins combined with tannins and also the quantity of tannins with a colloidal status.

From my point of view, I have noticed that wines aged on their lees are richer, they don’t have a “hole” in the middle of the palate, and the tannins are less sharp and hard. However, if the wine stays with its lees too long, a excessive lees taste can appear and the wine can also lose some colour.

To optimise the ageing on lees, it can be interesting to associate the stirring of the lees in the barrel with the addition of b-glucanase enzymes.
These accelerate the natural process of solubilization of polysaccharides by autolysis of the yeast cell walls. There are not any strict rules about this technique and, for each situation, the ageing must be adapted.

In South Africa, we have to be very careful. The wines produced are high in alcohol and are very rich, so consequently age early. The benefit of ageing with lees in South Africa is to make the tannins more round.

During the maceration, micro-oxygenation can be used to decrease the vegetal taste, when pips aren’t enough mature. It happens sometimes in Bordeaux and in South Africa.

Micro-oxygenation can be used to stabilise the color and to modify the structure of the wine. On some soils that produce some austere and hard wines, the early use of micro-oxygenation can bring some oxygen to accelerate the tannins/anthocyanins combination and decrease the astringency. The use of micro-oxygenation can have dreadful consequences on the quality if it’s not adapted.

Conclusion
Merlot is a capricious grape variety. We have to take care of him as if it was a diva.

Although, this grape variety can produce some premium wines that can age very well, with a lot of fineness, of fruit and velvety tannins. If the wine is a success, the winemaker has the feeling to be recompensed for all its efforts. Although, if the winemaker doesn’t take care, there will be a problem: Merlot can’t stand being left.

Being a Frenchman, my main production experience on Merlot comes from Bordeaux.

Having worked for nearly 2 years in New Zealand, I wanted to produce some Merlot in another state than in France. I found in South Africa ideal soils and climate for producing Merlot. There are some other places in the world but the luck leads me to South Africa. This experience, in the south hemisphere is a very exciting experience for a lot of reasons: human and technical experience of course. I had to choose a “terroir”.

Then, as there wasn’t any culture on the soil, I had to choose the grape varieties, the rootstocks, the density of plantation, the system of irrigation...The knowledge I had learnt in the country of Bordeaux has been so important. Although, as a premium wine must associate harmony and velocity with length in mouth, I have to extract the potentiality of each “terroir” and expressed them the best I can. This is what we are trying to do. Time will tell...

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