TERROIR—THE FOOTPRINT OF GREAT WINES

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No great wine without the total commitment of the winegrower...

“Attaining the purest expression of terroir, such should be the perpetual pursuit of the winegrower in his daily efforts. Every act counts. From the vine, where the grape, interpreter of the soil’s subtleties, is born, through to the winery where the fruit is slowly transformed, the hand of the winegrower along with the tradition and spirit that inspire him are decisive. This passion follows through to the cellar by the bottling of unfiltered wines. This high quality approach preserves the finest constituents of a wine, all these good elements that will allow the wine to develop its noble structure and its multiple aromas. Whatever the cru or the vintage may be, the ambition of the winegrower would be to stimulate the wine lover’s pleasure. Step for step, detail for detail, he should commit himself fully in order to preserve the soul of the wine. There can be no great wine without the total commitment of the winegrower.”

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*(source: WOSA)*

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ABSTRACT

In any discussion of a role-playing factor as important as that of terroir in the wine industry, it is first and foremost important to understand the concept of terroir historically, as it was perceived as long ago as Roman Times, and even before. In order to support the present day perceptions of terroir, and the importance thereof, one has to determine the role it has played since then, to modern times.

The factors that determine a great terroir are dealt with in some detail. The diversity of terroirs, and also the similarities that exist between various terroirs, in the different wine regions of the world are described. It is evident that the component elements of terroir only differ in the weight ascribed to the respective terroir factors in the different countries. From soil as the dominant consideration in Old World wine countries to climate as the accepted determining factor in certain New World wine regions, it soon became clear that all the natural elements play a role, and that the interdependence on, and interaction between them are the ultimate determining factors that need to be considered with great care before human intervention can be introduced, in the quest to produce a great wine.

The marriage of the vine with the terroir calls for careful matching of not only the individual characteristics of each, separately, but the conscious decision to bring about the ideal marriage that will deliver the grape that will bring forth the expressiveness of the terroir in any wine of distinction. Hence the human factor has been dealt with in some detail, to show the extent to which human intervention contributes to the production of a great wine.

The fact that demarcation has been introduced around the concept of terroir confirms the role that terroir plays to lend authenticity to the concept thereof.

One is forced to come to the conclusion that for a great wine to be produced the demarcation of the smallest homogeneous agricultural unit plays a determining role, i.e. from this terroir unit a great wine is produced consistently, year after year, with such distinctive characteristics that the wine and the terroir become inseparable: they are totally interdependent of one another, to the extent that one will not know the one without recognising the other.
Chapter 1

INTRODUCTION AND OBJECTIVES

1.1 Introduction
Terroir is the greatest determining factor of all great wines. It deals with the quality and typicity of an agricultural product in relation to its origin. In the context of this thesis, terroir is treated as the composite of natural factors: the soil, the climate and the topography of a particular agricultural unit, and the interaction between them that yields a great wine with a uniqueness of its own.

The second factor that needs to be considered in the concept of terroir is the role of human intervention. The various natural elements of terroir play either a direct or indirect role in the production of a great wine, depending on the site, but the human role has, through the ages, determined what actually happens in that particular vineyard. In the modern world of wine viticultural practices have played a more predominant role. This has raised the question of the extent to which the intervention can be tolerated before the natural factors of terroir are diluted. This is where the “concept of terroir” needs to be clearly defined in order for it to lend authenticity to a great wine.

Much emphasis is placed on the role of soil in the production of a great wine in the Old World and the winegrower receives very little recognition. However, these age-old traditions of viticulture practices are, by definition, the human hand that has been applied in these vineyards to these soils. Through empirical learning, and matching the most suitable variety to site, human intervention has clearly played a role in these vineyards, but has nonetheless allowed the natural components of terroir to be expressed in their wines. In France, which has some of the most distinctive terroirs, the vineyard site is much more important than the grape variety or the wine producer/winemaker.

It is this that is causing the big debate in the New World of Wine. All winegrowers want to produce “great wines”, but they do not have the time, nor want to take the time, to go through the empirical learning process of the Old World. The majority today still believe that by applying the best viticultural management practices and wine technology they will produce great wines. These practices have certainly improved the overall quality of their wines but it has also homogenised wines, and left many without any distinguishing
characteristics or expressiveness showing terroir imprint. Fortunately, the quest for quality has driven producers to search for new sites, which encompasses not only soil, but also climate and aspect, which in itself is admission that site does play a role in the concept of terroir.

Currently producers of wine worldwide, are challenged by shrinking markets due to over production and a worldwide reduction in wine consumption per capita. Thus winemakers have to use other ways to differentiate and distinguish their products in the market place. This is a very positive development, as winegrowers now have to diversify and bring uniqueness to their wines through introducing their natural environments, which would be difficult if not impossible to be duplicated by any other agricultural site. This “uniqueness” which comes through the expression of the particular site needs to be protected in order to give it authenticity. Hence there is the necessity for viticultural zoning and the demarcation thereof.

The role played by terroir over the ages has nearly gone full circle: from dominant, to denial, to limited acknowledgement as a role-playing factor and contributor to the creation of a great wine.

In South Africa, with its unique biodiversity of landscapes offering so many divergent terroir aspects, the role of terroir is all the more important. It is therefore necessary that given terroirs be designated into zones with homogeneous terroir units so as to define boundaries around vineyard sites with distinctive characteristics. It is also necessary that these designations be demarcated so as to give intrinsic value to our terroirs.

1.2 Objectives

The objectives of this study are to determine the nature of the relationship between terroir, the vine, and the wine, to illustrate the interdependence between them, and then to explain the extent to which human interaction with each one of these influences the “footprint” of a great wine.

It is a contribution to the understanding of terroir, the expression thereof, the application thereof, and the acceptance thereof in the wine industry.
1.3 Layout of thesis

This thesis comprises seven main chapters, besides the introduction and conclusions to the study, namely:

- The concepts related to terroir, including the history of terroir
- Factors that determine a great terroir
- Terroir and viticultural zoning
- Terroir and the human factor
- A perspective of terroir around the world
- Terroir in the South African wine industry
- The marketing of terroir.
Chapter 2

THE CONCEPTS OF TERROIR

The concept of terroir as defined by modern day winegrowers and other experts

“Terroir is a composite of many physical factors…as well as more intangible cultural factors. Matt Kramer once very poetically defined terroir as “somewhere-ness,” and this I think is the nub of the issue. I believe that “somewhereness” is absolutely linked to beauty, that beauty reposes in the particulars…”

(Grahm, 2006).

Terroir is the French word used to describe the total natural environment of any agricultural site. It is the combined effect of soil, slope orientation to the sun and elevation (topography), plus every nuance of climate including rainfall, wind velocity, frequency of fog, cumulative hours of sunshine, average maximum and minimum temperature on a vineyard site, and hence on the character and quality of the grapes grown there. Each vineyard site has its own unique terroir, which is reflected in its wines more or less consistently from year to year, and to some degree regardless of variations in methods of viticulture and winemaking. There is no single word in English that means quite the same thing, but in essence the notion of terroir is that all its components are natural and that they cannot be significantly influenced by management, yet terroir is much more than this. In the past decade terroir has become the “buzz” word and often the distinctiveness and quality of wines are described with reference only to the qualities of the natural environment in which they are cultivated. The concept of terroir has to be understood as an interdependent relationship between the natural environment, the vine, the variety, the plant physiology and its molecular cell biology.

2.1 The concept of terroir as defined in the Old World of Wine

Although the word terroir is on everyone’s lips throughout the world of wine, the true concept is not always easily grasped; different people understand it differently. In order to comprehend the definition of terroir it is useful to consider how some wine experts and winegrowers describe their understanding thereof. Andrew Jefford, in his book The New France, (Jefford, 2002), translates the word terroir as “placeness”. He suggests that wines derived from the place on earth where they are cultivated and influenced by that
specific environment is terroir, and that the essence of terroir is the fact that “a vine cannot move. It is rooted to its spot on earth. It makes its grapes from water and minerals absorbed through the roots as they rummage some ten or fifteen metres down into the soil and subsoil, and from the light which fills the sky above it” (Jefford, 2002).

“The very French notion of terroir looks at all the natural conditions which influence the biology of the wine stock and the composition of the grape itself. The terroir is the coming together of the climate, the soil and the landscape. It is the combination of an infinite number of factors: of sunlight, slope and drainage to name but a few. All these factors react with each other to form, in each part of the vineyard, what French wine grosser call a terroir” (Pratts, 2003).

According to Wilson (1998), Gerard Seguin, a Bordeaux enologist, said in 1986 “quality terroirs are where the habitat permits complete but slow maturation of the grapes with a certain regularity of product from vintage to vintage”.

“The French contend that great wines come from certain severely limited environments, i.e. the terroir. This terroir pinpoints the geographical location of a vineyard with a specific climate, soil, and exposure” (Wilson, 1998).

“Character is determined by terroir; quality is largely determined by man” (Sichel, 2003).

2.2 The concept of terroir as defined in the New World of Wine

“I have a minimalist approach. It relies on an innate faith in the choice of an area; in the choice of a variety; and in the choice of a management technique in the vineyard to get the maximum expression of quality. That faith then carries through to the processing of the grapes. From my viewpoint if you put all the ingredients, all the building blocks in place the resultant wine will share the quality parameters that all good wines of the world share. The personalities will be different, but they will share the fundamentals of quality, which are vitality, strength and intensity of flavour, length of flavour, subtlety, and reproducible uniqueness” (Croser, 2003).
According to Carey (2001): “A terroir can be defined as a complex of natural factors being expressed through the final product and must therefore be studied in two steps, namely, the identification of relatively homogenous natural terroir units followed by their ecophysiological characterisation”.

Dr. A.C. Kelly, pioneer vigneron in Australia, paraphrased the terroir approach of the 19th century in his 1867 treatise, Wine Growing in Australia: “In the great diversity of soil and climate to be found in Australia, there is little doubt that every variety cultivated in Europe would somewhere find a suitable location in which to develop its most valued qualities” (Kelly, 2005).

According to Jeff Sincott, winemaker, Amisfield, Central Otago, New Zealand: “Our understanding of terroir is that wine is the embodiment of a vineyard’s site, climate, the cultivar and the culture of those that work within it” (Sincott, 2004).

Randall Grahm, USA vigneron, has the following to say about terroir: “The sense of belongingness, of coming from somewhere, is very much connected to the idea of soulfullness in a wine” (Jefford, 2002).

### 2.3 The history behind the concept of terroir

**In Ancient Times**

“The peoples of the Mediterranean began to emerge from barbarism when they learnt to cultivate the olive and the wine”

- Thucydides, Greek historian, 5th century BC (History-of-wine, 2004).

The custom for wines to bear the name of their region or town of origin dates back to Greek and Roman antiquity. During the second dynasty in ancient Egypt, circa 2650 B.C., the idea of terroir reached its most advanced stage for that period. “It became a custom to include, in addition to the royal vintage year on the jars, place names that were often indicated in ovals on the seals. These appellation names represented walled precincts or estates where the wines were produced and became the standard by which all other wines in the Egyptian kingdom were measured” (Pott, 2000).
The golden century of Roman wines known as the Opimian, named after the consul Opimius, commenced in 121 B.C. The greatest crus of Roman Italy were those of Falernian, a Campanian wine that had three separate Grand crus: Gaurian at the top of the hill, Faustian on the slope (considered the best quality), and Falernian proper, at the bottom of the slope (Pott, 2000).

The Emperor Domitian, in 92 A.D., when faced with the threat of being flooded by easy, profitable wines, issued a decree that prohibited any new planting of vines in Italy and ordered the destruction of half the vineyards in the provinces of the Empire (Rigaux, 2006). At that time the great vineyards of Burgundy were just beginning to flourish in Beaune and Nuit St. George.

The first drafts of a definition for terroir were provided by Latin agronomists. This definition was based on their experience of growing wine in Pagus Arebrignus, the present day Burgundy. It was at this time, in the first century, that the Latin agronomist, Columella, started to think about the most appropriate grape variety for producing a great wine. He gave a very clear description of his thoughts on this: “The smallest and best of these three varieties is recognized by its leaves, which are much rounder than the leaves of the first two. This variety has certain advantages, because it withstands drought and can stand the cold without difficulty, provided it is not too humid. In certain places, it produces wines which preserve well, and it is the only one fertile enough to do justice to the poorest soils” (Rigaux, 2006).

In 1395, Philippe le Hardi, Duc de Bourgogne, instructed his subjects to uproot the Gamay grape variety. By 1441, following on from the almost total destruction of the Gamay in the region of the Côte d’Or, the opportunity arose to establish Pinot noir as the noble variety of the region and limit its planting primarily to the Côtes (Pott, 2000). This was how Pinot noir became part of Burgundy; the taste thereof has been influenced by this fact ever since, and has become the benchmark for all other Pinot noir wines around the world. The Burgundy terroir and Pinot noir became one.

The Middle Ages
In the “Middle Ages, when the monks of Burgundy began to delineate and codify the region’s vineyards” MacNeil (2002), terroir became the focus of viticulture. Once they
realised that certain sites give rise to wines with distinctive flavours, they began to record their impressions, over centuries, by studiously comparing vineyards plot by plot, and the wines made there from. “Burgundy’s hierarchical classification of vineyards into Village Cru, Premier Cru and Grand Cru were the result of this massive viticultural experiment” (MacNeil, 2002). This was the beginning of great wines from a great terroir, with a uniqueness of character that still dominates the style of all regions.

The 18th Century
Despite a brief decline of the wine industry during the 17th century, better methods of production supported the wine industry into the 18th century. During the 18th century political relations between England and France were strained and hence the English had to source their wines from other countries. They turned to Portugal, Holland and Dutch South Africa in the early 19th century. Once the Cape was colonised it provided a steady supply of wine, so much so that Lord Nelson, the then British commander of the Napoleonic wars, referred to it as an “immense tavern”. The wine was considered to be of high quality, and exports were enjoyed around the world (Wine Timeline, 2004). The South African wine history dates back more than 300 years which today lends an elegance of the Old World blended with the accessible fruit-driven styles of the New World (WOSA, 2005).

History illustrates that classification of vineyards, i.e. demarcation in today’s terms, was largely based on an empirical learning of the location, the variety and tradition of viticulture and winemaking. New World wine countries have become interested in the philosophy of terroir in an effort to produce great wines from quality terroirs, but without going through the empirical learning process. They are therefore looking to viticultural zoning and its methodologies to demarcate terroirs that will produce great wines within a relative short span of time.

2.4 The merging of the Old World and New World terroir concepts
Many of the above references refer mainly to the natural environment of the vine and the many associated physical factors, and not the intangible, e.g. our relationship with the earth and other cultural factors, how we use terroir and how we express it in our wines. Human intervention is an important factor in the concept of terroir, as it allows for the definition of terroir to become the winegrowers’ own, because the relationship with terroir
is uniquely their own and reflects the human/cultural factors. It also allows the New World winegrower to define terroir as he chooses, which then defines “his personalised” relationship with the concept of terroir. A great terroir wine can only be produced when there is a seamless link between the winegrower and his vines, and a connection strong enough to him, as would allow him to ignore competitions and the mass production market.

Randall Grahm, winemaker of Bonny Doon Vineyards in Santa Cruz, in an article entitled ‘The soul of wine’, relates how, in a tasting of a line up of wines, one wine stood out as it seemed to have a very different order of qualities. This wine with its stony resoluteness made him feel like “one shaking the hand of a mountain”. He believes that, without terroir, winemaking is a hollow game, and he poses the question: “Is terroir dead?” This is his answer: “All of a sudden that is the question. Maybe, because we are experiencing the pain of its absence. We are sensing its loss” (MacNeil, 2002).

Often the characteristics of a wine are associated with the soil type or the mapped geology of the specific area, and then this basis is used as a valid explanation for the style and the quality of the wine, but there is still a lot more to it. What is not brought into this very simplistic approach is the complex relationship of the eco-physiology of the grape variety and the resultant wine, including the empirical learning required to understand the environment in which the vine develops.

### 2.5 The six facets of terroir

Prof. Moran, in a recent keynote address, discussed the meaning of the word terroir by distinguishing six different approaches to it (Moran, 2006, as taken from Vaudour’s study, 2002). He used a Venn-like diagram (Figure 1) to represent the six facets or elements of terroir. (Vaudour used four.) He points out that even with six components, no single diagram can depict the intricate interactions among the various concepts of the word. Nevertheless, with all the meanings attributed to the word terroir, it is necessary to consider the various components of the concept of terroir as illustrated by him.
Fig. 1  The six facets of terroir, as proposed by Moran (2006).

2.6 Summary
In New World countries like South Africa, Chile, Argentina and America, each with its own respective huge bio-diversity of topographies, climates and temperatures, and all playing an important role in their perception of terroirs, it therefore stands to determine the weighted importance ascribed to these factors by these countries, as opposed to Old World countries that put great emphasis on the role of the soil of a specific site and how it influences the vine.
Chapter 3

THE FACTORS THAT DETERMINE A GREAT TERROIR

“All terroirs are not born equal and France, because of its long wine-growing history, offers starker examples of this than any other wine-producing country in the world” (Jefford, 2002).

3.1 Environmental influences
There are two schools of thought about the effects of the environment on wine quality. Those who do not believe in the concept of terroir hold the belief that wine is made in the cellar. In contrast, the true terroir advocate accepts and embraces the concept of terroir as the defining reality of a great wine. This is not to say that a terroir advocate does not value the influence of the human factor, but acknowledges foremost the role that is played by the constant natural influencing factors in terms of soil, climate and landscape on wine quality.

In order to get the best results from their terroir an in depth study is required to obtain the optimal balance between terroir, grape variety and best viticultural practices. They understand that the effect of soil, climate and topography are inseparable, and that it is the combination of all the natural factors that represents the concept of terroir. This complex combination can vary greatly from one site to another, and without bringing the most suitable grape variety/ies to the specific site (accentuating the characteristics for which the variety is known) there would be no point in pursuing the concept of terroir. The determining factors of wine character and wine quality are therefore the optimum combination of terroir unit with grape variety.

3.2 Location
The world’s best wines today are those that most accurately commute their distinctive characteristics of their terroir. This has everything to do with a particular geographical winemaking environment that stamps the wine originating therefrom with character, for the wine to possess a sense of place.
A great terroir is one that will elevate a particular site above that of a neighbouring one. It will ripen its grapes optimally and consistently, and its wines will tend to be more balanced more often than those of a neighbouring terroir. But most of all it will have a quality of expressiveness, or distinctiveness, that will provoke a cognitive sense in the consumer, whether or not the consumer has ever tasted the wine before. A great terroir site has the ability to successfully adapt to a variety of climatic changes, and yet yield the same quality product year after year.

3.3 The Natural factors

The following natural influences on terroir dominate the quality and distinctiveness of wine, wherever it is grown:

- geology
- soil
- climate
- topography (aspect, altitude, terrain morphology), and
- the complex relationship and interdependence that exist between the above factors.

Thus, indirectly, because all terroirs differ and because certain grape varieties are better matched to their terroir than others, these components contributing to the terroir will each have an influence on wine quality and wine style (Carey, 2001).

3.3.1 Geology

There exists a direct relationship between geology and soil and therefore between geology and wine. John Wooldridge, senior soil scientist at ARC Infruitec-Nietvoorbij, reasons that geology creates a certain set of wine-affecting factors such as the “shape of the landform, its topographic highs and lows, and the orientation of those features relative to the sun and prevailing winds; even the present latitude and longitude, and thus the broad climate experienced by that landform” (Wooldridge, 2000). He further states that the result is a slow evolving geological process, but it certainly creates a strong link between geology, vine and the wine. This constant factor of geology, present in the definition of terroir, is substantiated by Hancock (1999), further confirming that terroir includes the effects of the underlying geological material with its physical and chemical soil characteristics, and variation in landscape. Certain aspects of geology have a direct effect on vine performance and have therefore a practical significance in
viticultural practices. These aspects include climate, nutrients, soil texture, landscape form, changes in sea level, and geological structures, e.g. mountains and coastal plains.

- “ancient climates which through their effects on past weathering and transport, and long-term soil development also affects present day vine performance” (Wooldridge, 2000).

- Nutrients. Potassium (K), which increases the pH of grape juice with increased K availability. The following example serves as an illustration. Research on the soil on the flanks of the Paarl granite showed that it is capable of releasing K from mineral grains. However, sometimes when these soils have developed \textit{in situ} they do not have the ability to protect this K, or even K that is applied as fertiliser, against excessive and rapid uptake or against loss through leaching. This means that the K availability is erratic in these soils; it ranges between an excess and a deficiency. In contrast, shale-derived soils and some alluvial soils, mainly sandstone-derived soils that have a natural low K content, may have a far better K buffer capacity (Wooldridge, 2000).

- Soil texture. Soil texture is related to rock type through soil parent material composition, and therefore to geology, which has an indirect effect on physical soil characteristics such as drainage, compaction, water holding capacity, temperature, organic matter content and aeration, all of which affect vine performance (Wooldridge, 2000).

- Form (morphology) of the landscape. Geological events in ancient times formed modern topography and thereby created the potential for vine cultivation. A good example is the Ceres earthquake of 1969 that resulted in changed drainage patterns of the area causing damage to vineyards and irrigation equipment (Wooldridge, 2000).

- Sea level changes. “About 1.8 million years ago the sea level around Cape Town ranged from more than 100 metres below, to 60 or more metres above the present level”. Since then many changes have taken place (Wooldridge, 2000).

- Mountains and coastal plains. The Elgin fruit and wine producing area is a good example of where structural geological considerations affect both the climate and the suitability of soils for vineyards and winemaking. Elgin’s altitude and its proximity to the coast results in a relatively cool, maritime climate, suitable for the planting of wine grapes. From previous experience gained with apple and pear orchards, it is suggested that “future vineyards be planted in those areas where
Bokkeveld shale is preserved in down-folds in the surrounding older, and more resilient, Table Mountain sandstone highlands" (Wooldridge, 2000).

The South African coastal regions have a geology that is older and more complex than most of the French winegrowing areas (D. Saayman, personal communication, 2005). It also influences the bio-diversity of the South African winelands conferring a sense of uniqueness to it. The abovementioned geological features have an indirect influence on terroir and, in terms of wine style and quality, it is part of the “terroir expressiveness”, and can therefore be marketed as an authentic experience to the consumer.

3.3.2 Soil
Soil has a definite effect on wine character and quality. According to Carey (2001), the soil quality influences the composition of grapes and their quality through:

- chemical composition and soil pH
- soil colour
- soil temperature
- soil texture and structure
- soil depth
- soil water status.

The important features of soil are depth, the water-holding capacity, the drainage and the nutrient holding capacity. However, many soil scientists agree that the most important soil characteristic is the amount of moisture that the soil can store and the control of the supply thereof to the vine (Lanz, 2004). Due to the important role that the water regulating properties of soil plays in terroir it is dealt with under its own heading in this chapter. The wine-producing region of Bordeaux is used for illustrative purposes (3.3.2.2).

3.3.2.1 The role of the water supply
In France, great emphasis is placed on the role of the soil and its interactions with other elements of the environment in the concept of terroir. Governing the water supply to the vine is especially important. The French scientist Gerard Seguin conducted a survey of the classified vineyards and their soils in Bordeaux and found evidence of the important link between these soils and how they regulate the water supply to the vine (Robinson, 1999).
The water holding capacity or regulation thereof is primarily dependent on the texture and stone content of the soil. In turn, the amount of clay is the most important aspect of the texture of the soil and it is this physical property of the soil that plays such a significant role in determining wine quality (Lanz, 2004).

3.3.2.2 Water supply in the soils of Bordeaux

Jancis Robinson, author of the *Oxford Companion to Wine*, Robinson (1999), describes the Bordeaux region’s best terroirs, based on the studies of Dr. Gerard Sequin of Bordeaux University. These soils cover a wide range of diverse soil textures, from heavy clays and calcareous brown soils, to sandy loams and sands over clay, to deep gravelly sands.

“Two unifying themes did, however, emerge among the top crus. First, none of their soils was very fertile, but then none of the vines showed mineral element deficiencies either. Second, their soils regulated water supply to the vines in such a way that it was nearly always just moderately sufficient, without extremes in either direction. Drainage was always excellent, so that both water-logging and sudden increases in water supply to the vines were avoided no matter how much the rainfall. In the case of clay soils, this depended on their fairly high organic matter and/or calcium contents, so that they maintained friability and an open pore structure through which the water could move readily” (Robinson, 1999).

“At the same time the capacity to store soil water within a soil depth accessible to the vine roots was great enough to ensure supply through prolonged rainfall deficits. This might be achieved either by great soil depth and a deep, sparse root system, in the case of sandy soils with little water storage capacity per unit volume; or a lesser depth in heavier soils, combined with a capacity of the clay and organic matter to hold some of the water tightly enough that it is only slowly available to the roots. The deep gravelly sands of the Medoc exemplified the former situation, and the heavy clays of Pomerol the latter. This explained why the best terroirs maintain their wine quality notably better in poor seasons than the rest, a consistency which has always been one of the most striking features of the Bordeaux classed growths” (Robinson, 1999).
A wine region like Bordeaux illustrates that the vineyard site, with its primary emphasis on soil and water status, plays an important role in the concept of terroir in the Old World of wine. However, because of the great bio-diversity of topographies and climate in conjunction with the chosen variety and viticultural practices in countries like South Africa, Chile, Argentina and America, it is debatable if this accepted Old World concept, plays an equally significant role.

In South Africa, soils are highly varied and due to huge differences in topography and geology, this impacts greatly on the meso-climate and vine performance. These same factors also contribute to large soil variations over remarkably short distances – greater than in most other places on earth (WOSA, 2004). This diversity is an opportunity to winegrowers in South Africa to get to know their soils in depth, so as to produce prime quality wines from varieties that are well matched to their terroir. It is also important that studies on the influence of soils and climate on wine quality be done on a scientific basis in order to demarcate wine wards and homogenous terroir units (Saayman, 1977).

Other soil characteristics like colour, temperature and chemical composition also affect the growth pattern of the vine, wine character and quality. Deep soils, if without chemical or physical restraints, results in a well developed deep root system, protected against climatic extremes which contributes to product consistency vintage after vintage (Carey, 2001).

3.3.3 Climate
Climate is determined by regional influences like oceans, prevailing winds, sea breezes, rainfall, temperature, humidity, sunshine and topography. Climate comprises three categories, i.e. macroclimate, mesoclimate and microclimate. The macroclimate is the climate of the region contributing to temperature variances. Mountainous regions create different topographies, resulting in a variety of mesoclimates, which have an effect on the climatic elements surrounding the vineyard (Carey, 2001). It is these elements that will affect the wine style, but that will also ensure that the grapes will survive and ripen. The microclimate is within and immediately surrounding the vine canopy. Analysing the elements of the climate will assist in identifying and characterising new areas for vineyard development and optimum site selection. An important factor to observe here is that the most suitable variety for any terroir is one that matches the length of the
growing season so that maturation will occur during the cool period of the season, but it will be warm enough that the berries can uninterruptedly accumulate the soluble solids and develop their flavour. According to Saayman (1977) there is a belief in South Africa that “red wines produced in the Coastal Region from where the vines 'can see the sea' have superior qualities and are distinguishable from wines produced further inland”.

3.3.3.1 Temperature
Oceans temper and modify minimum and maximum temperatures, resulting in the reduction of both the diurnal temperature range and the contrast between minimum and maximum temperatures (Gladstones, 1992). As such, temperature is one of the most important parameters affecting the grapevine. The effects of temperature on grapes include the following:

- High temperatures result in higher sugar contents, up to a temperature threshold.
- The malate content is lower.
- The tartrate content is little affected.
- The potassium content increases, affecting the wine pH.
- The effect of night temperatures on anthocyanin synthesis is partially dependent on the contrast between day and night temperatures.
- The optimum mean temperature for pigment formation is in the region of 20-22°C (similar to phenolics).
- A mean temperature range of 20-22°C in the month of ripening is optimal for physiological ripening in grapes and for the synthesis of colour, flavour and aroma compounds (Gladstones, 1992).

3.3.3.2 Relative humidity
Relative humidity has the following effects on grapes:

- It affects the photosynthetic rate when the soil water supply is limited.
- Low relative humidity values and high temperatures result in high berry pH values, which reduce the growth and yield per unit water transpired.
- High relative humidity values can stimulate diseases (Gladstones, 1992).

In any arid climate relative humidity in conjunction with temperature is an important
factor as strong evaporative demand can cause water stress in the vine Carey, (2001) which can lead to leaf loss and collapse of the vine metabolism.

### 3.3.3.3 Wind effects

Wind has the following effects on grapes:

- New growth is affected by strong winds during spring and early summer, which can injure young bunches and result in a reduction in fruit set.
- The closure of stomata in the leaves, resulting in the inhibition of photosynthesis, can be caused by moderate winds.
- Excessive temperatures and relative humidity are prevented in high canopies by air circulation.
- Strong winds can inhibit vigorous growth resulting in limited vegetative growth of the vine, but at the same time enhance quality due to restriction of yield (Carey, Archer & Saayman, 2002).

Coastal sites have the benefit of dry land winds at night and moist sea breezes in the afternoon (Gladstones, 1992). Sea breezes lower the maximum temperature, reduce stress on the vine and regulate the evening temperature to a slower decreasing rate. This renders a longer period for optimal photosynthesis and physiological ripening.

Saayman (2005), reported that during a presentation by Bonnardot at the Bacchus conference in Bourgogne in 2005, that she pointed out, that “the 34º of latitude, which characterises the southern viticultural areas of South Africa, stretches over a much shorter distance from the east to the west coast than the same degree of latitude in South America and Australia, thereby implying that the surrounding and cooling maritime effects are generally more prominent in South Africa, than in comparative regions in Australia and South America” thus highlighting the importance of the sea influence as a climatic quality factor.

The advantage of the cooling maritime effects contributes to a cool growing climate as compared to Australia and South America. South Africa should position itself in the marketplace as a grower of distinctive wines in a cool climate.
3.3.4 Topography

Topography is closely linked to geology, and has a strong interaction with the environment, its climate and soil. Topography consists of the aspect, altitude, terrain and morphology (Saayman, 2002), and thus the elevation as well as the rate of elevation over distance defines topography (Shultz cited in Carey, 2001). The quality of grapes is greatly influenced by the difference in the temperature (both above and below ground), which in turn is affected by the topography (Gladstones, 1992). The effect of topography on climate can be indirect due to soil drainage, wind exposure, cold air filtering and the intensity of the sun’s rays on the land (Carey, 2001).

The meso-climate in the vineyard is mostly affected by the altitude, the aspect and inclination of the slope on which the vineyard is planted. An increase in altitude mostly results in a decrease in temperature of about 1°C for every 100 m increase for dry air (but lower for air with higher humidity), (Preston-Whyte & Tyson, 1988 as cited in Carey, 2001). The slope aspect affects the temperature, because of its exposure to sunlight, wind and rainfall at the foot of the slope and therefore at higher altitudes the climate can differ dramatically from one slope and aspect to another due to higher interception of light and direct radiation (Schultz, 1997 cited in Carey, 2001).

In South Africa the vineyards of the Cape are planted on a varied terrain of altitudes, from a low 50 m above sea level to over 600 m in the mountains (WOSA, 2004). These locations offer many different meso-climates and soils in which to grow a range of various cultivars. The opportunity to plant vines at higher altitudes benefiting from cooler temperatures and better drainage contributes to various styles of wine from the same cultivar. The southern and eastern slopes are preferred for varieties like Sauvignon blanc and Pinot noir to capture aromas rendered by cooler sites. Northern and western sites are normally chosen for tougher red wine varieties due to the fact that they have a higher interception of light and are thus warmer. The choice of the grape variety on a specific site is mainly due to the temperature of that site (WOSA, 2004).

All of the abovementioned climatic parameters are affected by the topography of the region which have an important effect on wine quality and character. It is therefore crucial that climatic factors are studied in conjunction with soil type in determining a specific site for the chosen variety for the production of quality wine.
3.4 Mechanisms within the natural environment for terroir expression

Many of the greatest and most complex wines are made by people who believe that terroir is critical to the quality of the wines they produce. Thus scientists are tasked with the job to find answers to questions posed by New World winemakers who want to achieve better quality for their wines. These questions focus on:

- Do soils affect wine quality?
- Is this relationship with soil direct or indirect?
- Is there a scientific explanation for the effects of terroir?

It is common knowledge that vines grown in different soils taste different, but one has to find a scientific basis for the explanation for the effects of terroir. Thus it is necessary to define, measure and assess environmental factors, and seek reasons based on quantified parameters. This is an extremely important factor in the concept of terroir and viticultural zoning as it lends credibility for the ‘unconverted’ and assists those who wish to demarcate or strive for higher quality to understand and better utilise the effects of terroir. In order to try and find answers to these questions within a scientific framework, the mechanisms of terroir will be discussed under the following specific subheadings.

3.4.1 Plant physiology and minerality in wines

The complex structure and chemistry of the vine is dependent for its growth on water, sunlight, air, and a mixture of trace elements and nutrients. The roots take up water and dissolved mineral ions from the soil and the sky above it. It is often thought that minerals taken up by the vine registers as minerality in the wines. Saayman, in Goode, (2003), a South African viticultural expert and extension specialist, confirms this to be untrue, but suggests that “minerality appears to be more, because of the absence of fruitiness”.

Dr. Richard Smart in Goode, (2003), also points out that it is not possible for the vine to translocate flavour molecules from the soil to the grapes, and hence to the wines. The current conclusion is that it cannot be reliably claimed scientifically that there is any link between the soil mineral composition and the flavour of wines. However, as far as an effect on wine quality, two minerals do play a role in South African vineyards, according to Saayman (2002). These are nitrogen and potassium, providing there are no other deficiencies. Excessive nitrogen can result in unbalanced wines with green unripe tannins, while too little assimilable nitrogen and potassium can cause stuck fermentation.
3.4.2 Adaptation of the vine to the environment

Vines rooted to their spot adapt their growth form to best suit the local conditions. This also extends to their reproductive strategies (Goode, 2003). The vine records everything: if the growing conditions are good then the vines opt for vegetative growth whereas if the conditions are bad they go into fruit production. The winegrower wants the vine to produce ripe fruit and this means a balance must be reached to supply just enough moisture and nutrients so that it does not suffer from water or mineral deficiencies. Viticultural interventions aim at encouraging the vine to partition nutrients to the grapes so that they can ripen properly, rather than the vine growing more leaves and stems, i.e. vegetative growth. Different approaches are pursued in zoning studies and therefore the traditional and New World wine producing countries have different concerns. The vine ecophysiology and ultimate fruit and wine composition are affected by the environment and viticultural practices, but it is important to recognize that different terroirs will change the criteria. Case studies by Conradie et al. (2002) from ARC Infruitec-Nietvoorbij, Stellenbosch, have shown that Cabernet Sauvignon and Sauvignon blanc wine styles are affected by both the climate and the soil type. With a precisely scheduled irrigation, the effect of soil type was reduced, but not eliminated.

3.4.3 Root growth

Root growth is determined by the development of the plant and the availability and distribution of mineral nutrients in the soil. When the roots sense where the nutrients are they will send out lateral shoots on a preferential basis. In essence this means that where there are low levels of nutrients in the upper layers of the soil the roots will grow down to a greater depth, which is likely to improve the regularity of water supply to the vine. Although it is claimed that deep roots express terroir better, because of the underlying geology, there is as yet no scientific proof for this (Goode, 2003). However, soils with a well-developed root system, provided they are deep soils without chemical or physical restraints, offer a high degree of buffering against climatic extremes (Saayman - personal communication, 2006).

3.4.4 The effect of the chemical and physical properties of the soil

Soils differ in their chemical and physical properties, but it is mainly the physical properties of soils that determine vine quality in the sense that they dictate drainage, soil temperature, water supply and water reserves to the vine (Saayman, 1992).
Prof Hans Schultz, in his keynote address at the 2004 Joint International Conference on Viticultural Zoning, summarises the role of the physical properties of the soil as follows: “The spatial variability in soil type and depth and water holding capacity is very high in many viticultural regions of the world. Differences in rooting depths and water extraction profiles and their seasonal dynamics add additional variability and it is extremely difficult to deduce direct causal relationships between these factors and fruit composition, even within small units of climatic zones, and much less so over larger climatic trans-sects” (Schultz, 2004).

Saayman (1992) found that there is an indirect influence of nutrition on the vine quality as nutrient availability affects the specific growth pattern of the vine, and this in turn causes a specific canopy architecture and therefore ripening pattern. He concludes: “The plant performance therefore modifies the vineyard climate creating a specific microclimate in the bunch zone, and in this way it can greatly determine the character of the wine.”

More recent research by Prof. Brian Forde, Lancaster University, has shown that patterns of gene expression in plants are altered by the presence and absence of various nutrients. Currently there are studies underway in grape molecular biology that will contribute to our understanding of the mechanisms of terroir on wine taste. Once these genes of the proteins that influence wine taste are identified then the effects of different components of terroir on specific biochemical pathways can be identified and tested (Goode, 2003).

3.4.5 Canopy architecture
Canopy management is the manipulation of the canopy microclimate of the vine which is effected by the choice of trellis system as well as several canopy management techniques. Canopy management techniques, e.g. trimming, shoot thinning, leaf removal and shoot positioning, improve the exposure of leaves and fruit to the sun to achieve a better yield, grape composition and wine quality (Smart & Robinson, 1992). Another management technique is the choice of trellis system (Fig. 2), which affects the canopy shape, size and density (Smart and Robinson, 1992). It is a highly relevant mechanism for terroir expression and is discussed in the book of Alain Carbonneau and Giovanni
Cargnello, *Architectures de la Vigne et Systemes de Conduite*, (in Carbonneau, 2004), illustrating the 50 basic forms or architecture models (Fig 2), and 250 related precise training systems. “This is the result of a general classification based on morphological descriptors of the vine structure” (Carbonneau, 2004). Experiments on Shiraz vines grown in France and which were trellised on three different system, namely, vertical trellis, truncated lyre or lyre volume, produced wines “rich in structure and colour; with aromas of mature red fruits or jam, and very often liquorice” (Carbonneau, 2004). More importantly, these wines had other distinguishing characteristics, showing the effect of the canopy architecture over planting density. The results were consistent over three vintages and each trellis method showed dominant, but different, aromas, colour intensity and density.

**3.4.6 Physiochemical state of grapes**

It is important that grapes are always harvested in a physiochemical state that guarantees optimal quality of the product for which they are intended. Therefore the definition of fruit maturity and its role in expressing terroir should be one of the primary aims when applying long-term cultivation practices as well as the selection of the terroir. In South Africa, in an endeavour to find factors that can be linked to a particular grape and wine style that would display the integrated effect of the growth environment, Hunter (ARC Infruitec-Nietvoorbij) carried out collaborative research while monitoring the morphological and physiological parameters in the canopy and grapes (Hunter, 2004). The objectives of the study were to determine the importance of different seasonal growth phases for grape and wine quality and, furthermore, determine grape parameters and ratios of selected chemical constituents of grapes at different levels of ripeness that would indicate an optimal harvesting time as well as different styles of wines. These parameters would enable producers to manipulate and judge optimal grape and wine quality associated with a particular style.

Research carried out by both M. Nadal from the Facultat d'Enologia de Tarragona, Spain, and Dr Gerard Barbeau from the INRA's Angers Centre, France, has resulted in a novel methodology to determine fruit maturity using a non-destructive firmness test. This method gives an accurate determination of mid-veraison status in both the red and white wine grapes (Cabernet franc and Chenin blanc). High correlations between berry firmness and both sugar and malic acid concentrations in juice were determined
Fig.2  50 Basic forms of canopy architecture models
Fig. 2 50 Basic forms of canopy architecture models
immediately after the start of veraison. This methodology is under further development to enable *in situ* measurements (Barbeau, 2004; Nadal, 2004).

### 3.5 Key elements for terroir expression

The natural factors lay down the parameters of a terroir. What follows are the key elements that are required to encapsulate the expressiveness of a terroir in high quality grapes to produce a wine with distinctive qualities (Van Leeuwen, 2006):

- To “achieve high terroir expression, optimal performance of the grape varieties should match local climatic conditions, so as to obtain full ripeness at the end of the season
- Terroir wines are produced from grapes sourced from the same site
- Terroir expression is obtained when ripening takes place in cool conditions, at the end of the season. Grapes should not ripen too early in the season, because quick fruit ripening in warm conditions limits aroma synthesis
- This does not mean that terroir wines can only be produced in very cool climates, because cool ripening conditions can also be obtained by matching late ripening varieties to warm climates
- In great terroirs for red wines, the vines meet moderate to severe constraints (limiting water and/or nitrogen uptake)
- When constraint is severe, high quality red wines can only be obtained when production is low
- In terroir for white wines, the vine need little to moderate constraints. Nitrogen deficiency and severe water stress can reduce aroma potential eg. in Sauvignon blanc”.

### 3.6 Mechanization and terroir

Progress in technology is leading to an increase in the interaction between mechanization and vineyard operations. Currently the use of machinery is primarily linked to the availability of manual labour. For example, in large vineyards in under populated areas of South Australia, machinery is used on a larger scale than in areas
where there is an abundance of low-pay workers, for example in Argentinia. In the latter case the use of mechanical harvesting is not economically viable. Intrieri & Poni (1998) carried out studies on how mechanization interacts with terroir, as related to pruning and harvesting.

The main factors that necessitate mechanization are the increasing cost of manual labour and lower wine prices in the marketplace. Mechanization clearly interacts with many of the key factors under the broader term of terroir, namely vineyard location, planting density and training system.

Thus the following functions can be carried out mechanically:

- harvesting
- winter pruning
- summer pruning, which includes shoot trimming and leaf removal.

Research in this field is ongoing, because it is believed that the interaction of vineyard mechanization and terroir will strengthen, within the parameters of grape quality and vine balance. This will force the “traditional concept of terroir to deal more directly with the mechanization of vineyard operations” (Intrieri & Poni, 1998).

3.7 Viticultural factors that influence terroir

The viticultural contribution to the wine making process is finally receiving recognition. Although the importance of viticulture follows that of the natural influences of terroir in the determination of the wine quality, it is here where the human factor plays a definitive role through proper management decisions that are consistently maintained in the cultivation of the vine, affecting the vines’ health, the wine character and style, and the resultant quality of the final product.

3.7.1 Choice of terroir

The wine producing regions of South Africa are fortunate to have such wide ranging and complex combinations of topography, soils and climates. The Cape, with its mild Mediterranean climate, influenced by the proximity to the sea and the sea breezes drifting across its mountainous terrain, is – viticulturally speaking – ideal for growing good grapes, with rarely a bad vintage. Here we find three major soil types, granite, shale and sandstone derived soils from the "most ancient rocks in the Cape region, inter
alia the so called Malmesbury Group shale, formed in the Precambrian, between one billion and 600 million years ago” (Fanet, 2004). Valley floors and riverside soils are sandy or alluvial, and fairly deep. The latter are marked by a dark brown, almost blackish colour, and are rich in nutrients and organic matter. The reddish and yellowish brown soils are associated with granitic hills, and are highly regarded (Saayman, 2003). It is this diversity that determines the application of long- and short-term viticultural practices, e.g. choice of scion cultivars, site selection for varietals, vineyard block boundaries, row direction, vine spacing and trellising systems (Archer, 2001).

Prof. E. Archer, viticulturist, Lusan Holdings, states that “the variation in soil types especially is responsible for a broad spectrum of wine styles, which in fact is the forte of South African wines: We are much better equipped than most other wine countries to satisfy the wide ranging preferences of the total, inclusive wine market” (Archer, 2001). This gives us an inherent advantage in the market place, and which should be actively exploited.

3.7.2 Varietal selection
Market trends dictate that producers look toward varietal selection for diversity as well as producing best quality wines from varieties better matched to their site. Wine producers want to add complexity to their basic Bordeaux classics, with the addition of more specialist Medoc varieties such as Malbec and Petit Verdot. The Rhône varieties, Mourvèdre, Grenache and the white Viognier are joining Shiraz, which is especially suited to South Africa’s warmer and drier conditions. Italian varieties such as Sangiovese and Nebbiolo are being experimented with, the latter at higher altitudes and in cooler climates (Toerien, 2003). Current terroir research has generated sufficient information on which to scientifically base the selection of rootstocks, scions and clones for any terrain in matching vine varieties to soils and meso-climates in order to achieve best results. Large-scale experimentation with rootstocks is taking place to establish which planting material is particularly suited to which conditions. This is coordinated by the Vine Improvement Board. With careful clone selection, producers are able to give more complex and delicate aromas provided by specific clones: Sauvignon blanc from the Loire, Sémillon from Australia, and Chardonnay from both Burgundy and California. This in itself has made a huge contribution to the improvement of wine quality in recent years in South Africa (Charles Visser, personal communication, 2006).
According to Law (2004) “The French view the grape as only a vehicle to express the place and in most appellations consider varietal wines as their lesser quality wines”. There are many wines across the world that express their origins regardless of the grape variety used, e.g. Alsace (Rieslings), Rheinpfaltz (Chardonnays) and Tuscany (Cabernet/Merlot blends), just to mention a few. Although the grape variety has become the standard bearer in the New World of wine, it is still essential that the producer matches the most suitable site to the variety. South Africa is blessed with a wide range of climates suitable for viticulture, and a wide range of wine styles is being made. The challenge to industry now is how best to match the different grape varieties (and clones) with the most appropriate sites. Terroir is omni-present in the world of wine, but to get the “expression” of terroir into the wine takes an understanding of the site matched to the most suitable variety, and that could take more than one generation to achieve.

3.7.2.1 Requirements to match variety to site

There are several factors that influence the choice of site for a specific variety, and all these influences need to be carefully considered when making the choice for the optimal variety. The grape has varietal characteristics, but then there are also site characteristics. Both these characteristics need to be considered in deciding which variety to match to any specific site.

- Planting environment: This includes the ripening cycle, ripening time (early, mid or late), susceptibility to mildew and other fungal diseases; berry size, bunch size, vigour and fruitfulness. All these characteristics must fit in with the planting environment so that the vine is in total harmony with its “environment”/habitat.
- Dry land conditions: The time of ripening, sensitivity to temperature extremes and sensitivity to water stress are critical factors that influence the choice of the matching grape variety.
- Aspect: Slope direction can influence the choice of grape variety due to temperature which in South Africa varies between the warmer northern, north-western aspects compared to the cooler southern, south-eastern aspects.
- The natural influences of soil type, depth and water retention abilities; climate, temperature and radiation, rainfall and wind.
3.7.2.2 Mediterranean varieties


There are many good reasons why South African wine producers should consider the planting of Mediterranean varieties on a much larger scale. The most important consideration is however from a marketing perspective, as there is no point in planting these varieties if they cannot result in sales to a consumer market. In the consideration of Mediterranean varieties by South African producers it is crucial that the focus is on producing grapes that can yield wines of distinctiveness and character, and of a quality that can compete with the best in the world. Most importantly, producers would be able to create their own unique “terroir imprint” using these varieties in an innovative way.

3.7.3 Viticultural expertise

Viticultural expertise gained over the past few decades has taken serious growers in search for cooler mesoclimate areas required for slow ripening of fruit for concentrated flavour. This has also resulted in the opening up of new areas, such as the Uilkraals River Valley, south east of Hermanus; the Kogelberg plateau in Elgin; and the Darling Hills, along the West Coast (Archer, 2001). In these wine-producing areas the mean February temperature is considerably cooler (between 19,0°C and 20,9°C) than that of the Coastal Region. Therefore these areas are classified as cool, making them suitable for the production of high quality wines. The establishment of vineyards in these areas has been rapid, and it is felt that these wines will enhance the general wine quality and style spectrum offered by South Africa.

3.7.4 Rootstock selection

The choice of rootstock is dictated by the soil found at a specific site. Soil varies from high potential reddish and yellowish brown granitic soils to low potential duplex soils
consisting of coarse, bleached sand on wet clay (Saayman, 2003). Statistics show that there is an increasing demand for grafted vines as well as Mediterranean varieties well suited to some of the hotter regions which were previously overlooked (C. Visser, 2006-KWV-Vititec, personal communication).

Advanced technology is available to producers to determine the most suitable rootstock for their specific conditions, with the assistance of an Internet decision-making model through ARC Infruitec-Nietvoorbij (Winetech, 2001). The uniqueness of the model lies therein that it takes into account a number of factors such as the tolerance of the rootstock to phylloxera, phytophthora, drought or flooding, as well as the soil’s physical and/or chemical conditions, and then identifies the most suitable rootstock for a chosen set of criteria. Furthermore, it also contains general information (enhanced with colour photographs) per rootstock. This new decision-making model also incorporates information about the most important wine grape cultivars that are cultivated in South Africa, the budding times thereof, as well as flowering time, harvesting time, cluster characteristics and resistance to diseases. The most attractive feature of the system is that the producer can make his own selection to plan, manage and optimise a wine grape production unit.

3.7.5 Clone selection

Clone selection within a variety is a useful method to better match it with a specific terroir site to achieve homogeneity in a vineyard block and to improve quality. Excellent and ongoing research is being done to supply vines free from viruses, through heat treatment, followed by measured virus indexing as well as careful clone selection (Vine and Wine Research Institute, 2004).

All of these are initiatives from producers trying to use the bio-diversity available to them and to increase the quality of their wines.

3.7.6 Changes in farm planning

“It is vital to the future of the wine industry that future vineyards be assessed and mapped according to all their “terroir” characteristics before vines are planted” (Viljoen, 2001). In a recent vineyard planning seminar, the ideal vineyard was described by Francois Viljoen of Vinpro as conforming to the following: “being terroir specific, having
the correct rootstock and scion material for the terroir concerned been used, managed for a uniform and balanced canopy, balanced growth and crop load and yield, and showing uniformity in grape quality and character. Consistency, year on year, with even ripening, maximum quality, with the minimum inputs, is the ideal” (Viljoen, 2001).

Until fairly recently the planting of vineyards still occurred in a rather haphazard and unplanned fashion, but wine producers and winemakers are now approaching it on a more scientific basis. Each site is analysed before new plantings take place. The soil types are carefully charted and used to plan and then plant each vineyard block for uniformity, to select the correct rootstock, apply the correct soil preparation procedures, implement the correct soil surface management techniques, as well as to take decisions about vine spacing and trellis systems. Due to the diversity of the topography and soil landscapes it may even be necessary to make use of different inter-vine distances in the same row for new plantings or make use of more than one rootstock in the same block. The aim is to achieve uniformity into the block and create homogeneous vineyard blocks. “Blocks that are laid out according to terroir units, regardless of the size and shape of that block (within reason) is what made a block of soil unique and special” (Viljoen, 2001). This approach is the basis for the identification of “natural terroir units” for the vines and, from that, the production of terroir specific wines.

The main aim of homogenous vineyard blocks is to have environmentally friendly vineyards so that chemical control can be restricted to the minimum. Furthermore, it brings consistency into the block for pest management; vineyard restructuring operations, grape harvest quality management, and address the issue of terroir sustainability. It also facilitates wine style changes in the short term to accommodate market demands (Vaudour, 2004).

3.7.7 Vineyard management

Many changes are taking place in both the long- and short-term vineyard management practices. The main purpose of these changes is to be able to make adjustments to specific vineyard block management practices to produce grapes for specific wine styles. Provided the correct clones were planted in the first place, producers are using these practices to emphasize specific aromas in their grapes and to improve complexity. “This
is achieved by using more than one clone of a cultivar, or by blending wines from various sites, or by doing both” (Archer, 2001).

Together with scientific soil analysis, growers use equipment such as neutron probes to monitor soil water content. Drip irrigation is preferred over spray irrigation, and it is carefully used, depending on the vine stress levels, particularly over a hot period (Toerien, 2003).

Canopy management is considered integral to the development of good quality fruit and the creation of specific varietal characteristics that would ultimately affect wine style. Therefore growers bring in consultants or hire viticulturists to ensure that grapes are harvested at optimal fruit ripeness.

Most South African vineyards are trellised as it gives the grower better control; fruit is exposed to sunlight for optimum ripening or berries are hidden from excessive heat. Winter pruning is a very effective way to control the yield, and thinning of bunches during the growing season can be done to curb yield and concentrate fruit aromas. Simultaneously, it facilitates aeration of the vines, giving it a cooler microclimate, and prevents diseases (Toerien, 2003).

3.7.8 Yield and quality
Yield is an important factor of quality in all wine producing countries and the limit thereof depends on the climate and the grape variety. In warmer climates the yield is generally higher compared to in cooler climes. Results of a comparison made by Ross (1999) between California and Bordeaux showed that California is 25% to 30% warmer in its premium growing regions than France. The warmer conditions, longer days of sun exposure, and generally stable conditions in California are conducive to vegetative growth, while in France vegetative growth is more naturally controlled, because of the cooler weather. The vigour of the grape varies with variety, clone, rootstock and soil, and it needs to be in balance with an appropriate crop level otherwise it will produce wines of poor quality. This is controlled through suitable pruning.

Most South African producers make use of either a viticulturist or a specialised consultant to ensure optimum maturity of grapes, adequate sugar levels in conjunction
with ripe tannins, and the favourable development of the flavour and aroma compounds to get more terroir expressiveness in their wines.
Chapter 4

THE CONCEPT OF TERROIR AND THE PRACTICE OF VITICULTURAL ZONING

“Terroir isn’t as simple as New World versus Old. It’s true that, in the past, the classic European regions have focused on terroir, with wines labelled by where they come from, while the New World focused on grape variety. Now these distinctions are becoming a little blurred, with New World wine makers paying more attention to the characteristics of different wine regions at the high end, while the Old World are beginning to turn out more commercial wines labelled by grape variety at the bottom end” (Goode, 2004:b).

Worldwide, the needs of the ever-expanding international wine market are changing, and thus in every vineyard in the world it is necessary to consider terroir or its structured manifestation in viticultural zoning, as it is referred to in the New World of Wine. Viticultural zoning is seen as being responsive to the needs of the ever-expanding international wine market and aims to demarcate registered designations of origin or protected geographical indications. It also aims to segment the vineyard area into homogenous units, which has important considerations from the viewpoint of pest and disease control, grape quality, and site selection for new vineyards. By demarcating registered designations terroirs are protected, which in turn reassures consumers and high prices can be maintained (Vaudour, 2004).

In countries like France, Italy and Germany the concept of terroir is fundamental and is used by the winegrowers as their frame of reference in terms of what happens in the vineyard. Their wine laws are built around the concepts of appellations, which lend official sanction to the idea that a combination of certain vineyard sites and grape varieties creates unique wines that express their geographical origins in a true form (Vaudour, 2004).

4.1 Viticultural zoning versus Terroir

The definition of terroir has already been addressed. In this regard, a crucial aspect that is not always acknowledged is the importance of the human and traditional aspects of know-how that have been passed down through history, memory and experience over generations. It is this subjective linkage between terroir and human tradition that makes it difficult to rationalize, and by using the term “viticultural zoning” it enables a vineyard to
characterise itself albeit within very basic parameters, with or without the human facets of the concept of terroir. In her keynote address at the Joint International Viticultural Zoning Conference, 2004 (Cape Town), Prof E Vaudour of the Institut National Agronomique, Paris-Grignon, defined zoning as such: “viticultural zoning mainly refers to terroir, which can be defined as a spatial and temporal entity that is characterized by homogenous or dominant features for grape and/or wine, soil landscape and climate, at a given scale-duration level, within a territory founded on social, historical experience and crop technical choices.” (Vaudour, 2004)

Although the term viticultural zoning is easier to define, the New World tends to oversimplify the concept of terroir by placing the emphasis on climate (a natural element of terroir) and gives little attention to the element of soil and its complex interaction with the grapes. It is often argued that terroir only brings in the element of soil as opposed to climate. This is incorrect, as the concept of terroir is scientifically based on the more simple to more complex elements of terroir, which encompass “the viticultural agroecosystem, the winegrowing agroecosystem or the historical and sociological winegrowing ecosystem” (Vaudour, 2003 cited in Vaudour 2004).

Through viticultural zoning, conceptual boundaries can be defined so as to characterise an exceptional patch of land or winegrowing space.

**4.2 The aim of viticultural zoning**

The most obvious aim of zoning is to improve wine quality and to demarcate
- registered designations of origin
- Appellations of origin
- protected geographical indications.

It therefore requires the geographical area to be divided into “homogenous units that are similar in the management of pest control, grape harvest quality, vineyard restructuring operations, site selection for new vineyards and reparcelation” (Vaudour, 2004).

Most zonings are based on the following:
1. Locating the best suitable sites for variety selection, based on the suitability of the vine or rootstock to that specific area (Vaudour, 2004).
2. Locating the best suitable sites for obtaining the best acid and sugar levels at harvesting and to establish the capability of the vines’ temporal space. This is done through capability maps, which are often used in precision viticulture (Vaudour, 2004).

3. Locating the best terroir for making fine wines by defining an area from best to worst. This is based on “the threshold definitions on varied quantitative environmental/ecophysiological criteria” (Vaudour, 2004). Sotes et al. (1994) cited in Vaudour, (2004), provide an example of this type of zoning where fourteen (14) environmental criteria were taken into consideration.

4. The site selection of new vineyards encompasses all the zoning aims namely:
   - all the environmental aspects
   - the best choice of suitable plant material
   - training modes and viticultural skills, which cannot be based on previous know-how or observation.

   The “Appellation d’Origine Contrôlée” (AOC) demarcations are based on historical customs, geology and geographical boundaries formed by the natural waterways, the topography of the land, the road network, climatic influences and socio-political considerations. Previously demarcated designations of origin do not necessarily support the zoning aims, as they may not substantiate the technical management of the vine production area. It is this lack of the use of previously recorded viticultural data to determine new sites compared to age-old traditional viticultural regions renowned for their fine wines that brings demarcation into question. There are however certain countries, e.g. Australia, that are trying to bridge the divide of zoning by using the same varieties and skills of their European counterparts for similar environmental conditions. These comparative environmental conditions are called “homoclimes”, first referred to by Dry and Smart (1988) cited in Vaudour (2004), as the “homoclime approach.”

5. Viticultural zoning also aims to facilitate the management of the various wine production levels

6. Terroir sustainability.
4.3 Methodologies applied in viticultural zoning
The methodology used to identify terroirs is an operation that has to be handled with utmost care as the main difficulties in dealing with the identification lie in the “large scale temporal and spatial variation of the various components of the terroir system, the large number of variables involved, and the complexity of the chain of factors determining the quality and the character of wines” (Riou, Morlat & Asselin, 1995, cited in Bonnardot & Carey, 2004). Whatever criteria are selected for viticultural zoning of terroir, they must relate to the grapevine physiology, be compatible to the spatial variability, and be able to be applied practically in the field (Bonnardot & Carey, 2004).

The methodology varies widely and is based on the following criteria:

- environmental variables, including climate, i.e. rainfall and air temperature, soil temperature, direction and intensity of dominant winds
- geomorphology/topography, i.e. slope aspect, exposition, insolation and landscape form
- geology and soil, i.e. mineralogy, compaction, granulometry, soil water reserve, depth and colour (Bonnardot & Carey, 2004).
- The adaptation of various cultivars, i.e. the influence of the environment on the functioning of the grapevine should be reflected in the wine characteristics and vinification on a microscale or semi-commercial scale (Bonnardot & Carey, 2004).

4.3.1 Geographic information systems (GIS)
“Winemakers have a desire to understand how the properties of their vineyards affect their wine, and make use of techniques such as precision viticulture to identify the natural variation in the sites they work with. They then allow this scientific understanding of the role of the environment to guide how they work, often with good effect” (Goode, 2004:a).

In most of the countries where viticultural zoning is applied the full range of environmental, landscape and viticultural variables is integrated in a geographic information system (GIS). This approach allows the spatial and statistical analysis of all variables and then the selection of main variables for terroir quantification. In Canada, Tony Shaw (Brock University, Canada) used this methodology to construct a composite index based on several key environmental variables. This index was mapped for several
of Ontario's wine regions and used to determine sub-appellation boundaries (Shaw, 2004). A comprehensive study covering all the vineyards in the Umpqua Valley of Oregon (USA) was also carried out using the same methodology as in the Canadian study. This involved scoring each topographic and climatic variable in order to obtain a composite score, which was then mapped across this valley. This research provided the Umpqua Valley growers with baseline knowledge of the region's grapegrowing potential in relation to topography, soil, land use, and climate, thus providing them with a useful tool for enhancing the site selection process (Scaglione, 2004).

4.3.2 Multispectral remote sensing
Multispectral remote sensing is mostly used for precision vineyard management and segmented grape harvesting. A.E. Strever (Stellenbosch University, RSA) studied its use as a terroir research tool. This study enabled the identification of homogenous environmental units with specific viticultural and oenological potential (Strever, 2004).

4.3.3 Atmospheric modelling
In South Africa, atmospheric modelling on the scale of mesoclimate was used by Dr. V. Bonnardot and Dr V. Carey of Stellenbosch University (Bonnardot, 2004). Preliminary results identified locations near Stellenbosch according to the thermal stresses for specific days as well as their potential to meet the climatic requirements for optimum physiological performance of the vine.

4.3.4 The multicriteria climatic classification system (MCC)
Carbonneau & Tonietto (1998) cited in Tonietto (2004), developed this basis of assessment of the climatic potential for winegrape production in the tropical regions of Brazil. They revealed the possibility of using the tropical winter period for grape production, which conceivably might be of interest to the tropical regions of Australia. The MMC is also being used as a zoning tool in a collective effort of the Ibero-American Program of Science and Technology for Development, involving a number of South American countries along with Spain and Portugal (Tonietto, 2004).

4.3.5 Cartography
This tool is used to facilitate vineyard management and wine production, while augmenting the traceability of the final product. The improvement of wine quality and
typicity through the use of cartography (viticultural atlases) was introduced by Etienne Goulet and colleagues from the INRA’s Angers Centre. “The objective is to optimise the adaptation of the planting material and the cultural practices to the terroir conditions and, therefore, to improve the quality and typicity of the wine produced”. (Goulet, Rioux & Barbeau, 2004)

4.3.6 Soil electric resistivity

Soil electric resistivity is one of the more remarkable technological advances in precision viticulture and terroir research. It has been “tested for the last two years by the Experimental Unit on Grapevine and Vine, INRA, Angers, France, to study the water supply to the vine under different terroir conditions” (Goulet & Barbeau, 2004). A measurement of the soil electric resistivity is used to study grapevine behaviour (specifically the root activity) and spatial land distribution. Soil electric resistivity varies according to soil texture, structure and moisture content. The measurements are processed by specialised software that visualises the variation in soil texture or moisture in two or three dimensions. This technique allows monitoring of the effect of rain or drought in real time, and also visually shows the effect of vineyard soil management, and even of rootstock, on the water supply to the vine (Goulet & Barbeau, 2004).
Chapter 5

THE HUMAN ROLE—GREAT TERROIR AND A GREAT WINE

“An old saying goes that the best sign of quality for a farm product, including wine, is the farmer’s footprint in the field. If the farmer pays close attention to his crop, then it’s bound to be better” UC DAVIS saying- (Gordon, 2006).

The concept of terroir is central to philosophical and commercial differences between Old World and New World approaches to wine. Considering the history of terroir in the Old World of Wine it is impossible to separate culture from terroir or from the integrity of people and their connection to their land. The winegrower considers himself the custodian of the land and thus terroir becomes part of his being.

Jacques Fanet, in his book Great Wine Terroirs, (Fanet, 2004) states that “Nature provides the raw material, in this case the soil, but only people know how to turn it into something exceptional.” He proceeds to point out that all the great French Grand Crus, from the gravel mounds (Graves) of the Medoc, the large cobbles of Châteauneuf-du-Pape, or the limestone slopes of the Côte de Nuits, owe their renown to generations of winegrowers. He describes these winegrowers as the custodians of the land that learnt to plant the appropriate varietals and had the skills to produce wines that fully express the many nuances of terroir.

Most definitions of terroir rule out human intervention as part of the equation. It is a fact that soil, slope and climate are all part of a vineyard's terroir, but what about the winemaker? There is no word for winemaker in French (nor in Spanish, Italian or German). The word the French use is “vigneron”, meaning vine grower. This illustrates the deeply ingrained European belief that wine is made by nature (the natural factors of terroir), not by man (MacNeil, 2001). Therefore, for purposes of this thesis, the word “winegrower” is used to describe the functions of wine producer and winemaker.

During a debate amongst academics at the Terroir 2006 Conference (University of Davis, California) on the importance of the vineyard vs. the vintner, the argument came up against the “ancient concept” of terroir, namely that location is the key element of wine quality (Gordon, 2006). Though acknowledgement was given to the determining
role of the natural factors in terroir, their were different opinions on the human role in terroir. “It was only some, not all, who added people to the equation” (Hampson, 2006).

At the same conference on terroir the keynote speaker Warren Moran, professor emeritus of geography at the University of Auckland, New Zealand, who also teaches in Burgundy and Bordeaux, declared: “Terroir is much broader than the wine industry defines it.” According to him “the whole idea of terroir is a social construction” noting that centuries ago winegrowers in Europe formed self-protection societies encompassing the vineyards of their village so that if one grower was disabled or died the others would pitch in and complete the harvest for that grower’s family. He concluded with this statement: “Really it’s the people who have learned to understand and make the most of their environment” (Moran, 2006).

German professor Hans Schultz of the Research Institute at Geisenheim uses Germany’s fabled terroirs on the banks of the Rhine and the Mosel rivers to illustrate that these terroirs are virtually manmade. Their owners have radically manipulated revered vineyards over the centuries, since the ancient Romans first brought in grapevines. In 1909 these same steep Rheingau vineyards were terraced, while today the severe slope runs straight down to the river. He explains that “…the terraces changed the airflow and the ground temperature, decreased the slopes to help prevent erosion and encourage water absorption during rains. This is a real terroir that makes great, long-lived Riesling wines, yet humans have clearly and radically manipulated it” (Schultz, 2006).

The role that the winegrower plays in the management of his terroir to produce a unique wine from a great terroir is concisely summed up in this statement from Kirk Wille’s Riesling Report on Alsace: “In the human time frame, geology remains fairly constant, and climate oscillates slowly around a relatively stable baseline. It is the human factor that is constantly changing, often from generation to generation and great terroirs will always assert themselves, but it is the human factor that will change the manner of expression” (Wille, 2001).

Paul Draper, previous Decanter Man of the Year and part owner of The Ridge in Santa Cruz, produces wine from 38 Single vineyard sites and where wine has been made from certain of these sites for the last 44 years, has the following to say on this subject:
“Terroir is discovered, developed and guided into wine by man. Quality and expression will vary with the will and intent of the individual who has temporary custody of a terroir at any point in time. It is not about grand crus and premier crus, first growths or fifth growths rather let the quality, style and consistency of the end product when released speak for itself” (Draper, 2006).

5.1 The Gimblett Gravels case study

One of the best illustrations of the role of human intervention is being applied in the terroir of Gimblett Gravels in Hawke’s Bay to best express their terroir in the quality of their wines. Generally speaking, the Hawke’s Bay region is climatically too cool for making red wines from the Bordeaux red varieties and Syrah. The cause of this is the influence of the sea, which is less than 15 km away from most of the vineyards, and which generates a cool sea breeze from about lunchtime on most summer days (Smith, 1996).

The soils in the Gimblett Gravels are essentially pure gravel beds with lenses of sand, silt and clay at various depths. “This soil type affects the air temperature, because its gravelly soils warm up early in the spring, dry out rapidly and act as a big thermal blanket under the vines of the Gimblett Gravels. Warm soil temperatures have a direct impact on hormonal triggers in the vine during ripening. This thermal blanket also releases heat in the evening to the surrounding air, meaning the air temperatures stay warmer throughout the night sometimes into the early hours of the morning” (Smith, 1996).

In addition to the higher temperatures than the rest of the district, the manipulation of the terroir is what makes the real difference here to bring it into the right temperature zone in order to produce high quality wine from Bordeaux varieties. An additional measure is to expose the fruit of the low vigour vines to the sun and after veraison the temperature of the grapes will be at or above 30°C, well above the desirable 25°C. By irrigation and some leaf plucking the vine is manipulated to think it is in a terroir that is hotter than it really is. Other viticultural techniques being used are row spacing, vine spacing, clones, rootstocks, yields and picking strategy, all of which have an effect. All these permutations together contribute to a wine style that results in the Gimblett Gravels area
producing truly ripe fruit from these varieties and delivering exceptional quality (Smith, 1996).

5.2 Terroir manipulation in the Western Cape—an illustration

In a personal interview with Gyles Webb of Thelema in the Western Cape winelands, he confirmed using various viticultural practices to manipulate the terroir of their vineyards. In order to obtain optimum ripe fruit, homogeneously, within their vineyard blocks they have to apply canopy management, use cover crops and manage the water supply. All of these viticultural practices are being used to contain vigour and ensure even ripeness and fruit with good flavour, colour and riper tannins. He states: “This is my terroir, without these manipulations I will have no ripe fruit” (Gyles Webb, personal communication, 2006).
“But you don’t have to look too far below the surface to see that there are subtle but important differences between old world and new world notions of terroir. Speaking generally, in the old world terroirists aim to make wines that express the typicity of the specific vineyard site, whereas in the more pragmatic new world, understanding terroir is seen as a route to improved quality” (Goode, 2003).

The afore going raises the question of the differences between terroir and typicity and whether winemaking could play a role in maintaining improved quality. In the Old World, winegrowers commonly use similar techniques that could help to lend a distinctive regional style, but sometimes they also adapt their techniques to best exhibit regional differences in their wines. This concept of typicity, which may owe more to human intervention than it does to classical definitions of terroir, is still of merit as it helps to maintain the sort of stylistic regional diversity that makes wine so interesting. Jeffrey Grosset, a well known Australian winegrower, makes the following statement: “I don’t see winemaking as part of terroir, but rather that poor winemaking can interfere with its expression and good winemaking can allow pure expression” (Goode, 2004:a).

Considering the abovementioned attempts at defining great terroirs in the Old World the author now turns to look at the potential of great terroirs in the rest of the world, and the components that play a role in what makes them great terroirs. It is this endeavour to understand the concept of terroir by New World wine producers that will yield a variety of styles and the highly individual expressiveness of an outstanding wine.

6.1 Old World wine countries
“...in the plant kingdom only the vine reveals the earth’s true flavour…” Such is the magic of wine that it is able to seize and later render the genius of a place, the distinctiveness of a terroir, its very essence (Rigaux, 2006).
6.1.1 France
6.1.1.1 Alsace

Varied mesoclimates provide Alsace with an infinite source of diversity. The best slopes with a southern exposure are found at the valley outlets. The Southern, south-eastern and south-western exposures have varying altitudes of between 150 m and 400 m. Rainfall is evenly distributed from January to December. The slopes have an incline of 30–80 %, of which the Rangen vineyard at Thann has the steepest slopes of the Grand Crus. The soils from the plains are heavy, silt-laden and shaly, with high-yield vines and wines high in malic acid and lacking aroma, while in the alluvial cones at the sunny valley outlets the stony and sandy soils produce aromatic wines with low malic acid. When comparing the soils on the plains to those on the slopes, the former often suffer water stress in summer or receive too much during the rainy period in September to October. This can result in rot or lack of ripening at harvest time. The vines on the slopes escape these maladies due to good exposure to sunlight and thus dry quickly enough to prevent premature rot, and produce wines with lower malic acid (Rigaux, 2006).

There are four white varieties allowed under the Alsace Grand Cru appellation. This represents 4% of production from 50 carefully demarcated terroirs, i.e. Riesling, Gewürztraminer, Pinot gris and Muscat. Riesling, the premier grape of Alsace, produces some of the greatest white wines and is adaptable to almost any type of soil, but prefers granite, volcanic or calcareous sandstone soils. These stony soils must be rich in trace elements and are not to exceed a 30% clay content. The vines are trained close to the ground to increase canopy surface, feeding only one or two bunches. At times, leaf plucking and uncovering the bunches may be necessary to allow good sun exposure. Yield is limited with short pruning. Most of the Alsace Grand Crus can be linked to a single geological terrain, but the Rieslings originating in the schists (Kastelberg Grund Cru) and the volcanic terrain of Rangen are particularly distinctive. (Rigaux, 2006).

Leonard Humbrecht has acquired many “abandoned vineyards (considered too difficult to cultivate) in his quest to find a unique locality to produce a singular wine from a grape variety that harmonises perfectly with the given terroir” (Rigaux, 2006). What follows is an example of the “earthprint” of one of his terroir specific wines.
6.1.1.2 Rangen Clos Saint Urbain, Grand Cru, at Thann

The following pertain:

- **Locality**: At the outlet of the Thur valley, 40 km south of Colmar.
- **Aspect**: Southernmost vineyard in Alsace, 80% steep incline and full southern exposure on a mountain slope enjoying many sunlight hours.
- **Soil**: Very unique, consisting of volcanic rocks and gravelly sediments in which volcanic elements are abundantly present. Surrounding stones come from hard rocks such as volcanic tuffs and greywacke and old lava flows consisting of brown mica andesite. This layer has a variable thickness of 40–60 cm above the fissured parent rock, allowing very deep root penetration. Soils are organically poor, but very fertile in minerality. It also drains quickly and the dark colour of the soil (a reddish brown shade) allows for higher soil temperatures. These two elements of the soil are responsible for regular stressing of the vine due to the heat of the soil and the rapid drainage.
- **Variety**: Riesling
- **Planting density**: 7 000–9 000 vines per hectare
- **Harvesting**: Later than normal. The ripening period is slow, yielding very high concentration levels of fruit aromas. A large amount of sunlight exposure avoids grey rot, however, if it does set in, due to the humidity caused by the river, then the alcohol rapidly increases from 14 º to 22 º within ten days.
- **Wine characteristics**: A dry wine with exquisite mineral tones that transcends the flintstone, yellow fruits and spice aromas.
- Other varieties: Pinot gris and Gewürztraminer are also planted here. The Pinot gris is mostly late-harvest and is distinctly marked by the volcanic rock, while the Gewürztraminer has a huge fruit impact and a very rich body.

In these sites the soil, climate and exposure are absolutely essential and the winegrower has to discover the best sites for the variety in order to produce a great wine. In these sites, terroir and variety is synonymous.

6.1.1.3 Burgundy

According to Henri Jayer, a well-known and acknowledged terroir supporter of Burgundy, one should approach Burgundy wines by trying to determine the norm, by whether it is convincingly expressive of its terroir. It is often difficult to distinguish between Chardonnays from the emerging wine world, but distinguishing a Chablis from a
Mersault is easy as the characteristics of the wine differ in colour, nose, texture and style of the wine. To try and understand the differences of terroir in Burgundy one must not separate terroir from the various territories. Although they all have geological and climatological differences they do have a long history and were all cared for by man in a particular way. Through this, the crus (the smallest common denominator of quality) developed by virtue of their uniqueness. These crus were not predestined to be great, but through a process of evolution over a long period of time they benefited from human intervention. There are 33 appellations that have Grand Cru status, of which the oldest is Clos de Bèze. Other famous ones are Musigny, Romanée, Richebourg and Romanée Conti for the reds, and Montrachet for the whites. These 33 appellations only deliver 2% of the production in Burgundy (Rigaux, 2006).

The modern expressions of Burgundy’s terroir and their wines are steeped in centuries-old traditions that are being revisited and used intelligently. It is a philosophy that demands total commitment to get the true expression of a cru. The winegrowers from Burgundy realised that they had to restore the natural balance so as to enable the soil to express its talent, that is, to produce wines that are among the greatest in the world.

A brief summary of what is now being done in the vineyard to allow terroir expression in a unique end product follows (Rigaux, 2006):

**Viticulture in Burgundy**

- The cultural environment: Centuries-old knowledge of the terroirs and original methods that were preserved are now carried over to the modern winegrowers/winemakers.
- The work environment: manual activities are encouraged in the vineyard but it does not rule out the introduction of new technologies, if its effect is to refine traditional approaches. Everything is done to find the true balance between the terroir and the plant material/variety.
- The soil: The soil is considered as a living creature and therefore the roles of clays, the humus quality, certain trace elements and, above all, the fragility of the soil is respected, and must be in balance with the climate and mesoclimate.
- Avoiding everything that impedes the functioning of the terroir:
  - maintain good soil structure by avoiding, or correcting, compacting of the soil,
- use organic management, e.g. fertilizer should be natural and no herbicides used that affects trace elements,
- do not intervene on the landscape, i.e. modifying watercourses and leveling of land that will affect the natural nourishment of the vine,
- maintain a balanced biological activity in the soil that allows roots of the vine to penetrate, explore the cru, and to express it in the fruit.
  - Increasing density of plantation to force down roots for better expression of terroir. This is in a trial phase.
  - Pruning and trimming is extended to March, later than the established custom, in order to reduce the symptoms of incurable diseases such as parasitic fungi, esca and eutypiosis.
  - Thinning is only used as a stopgap to curb yield. The yield is naturally controlled if it is in balance with the soil.

**Winemaking**

- Vinification is kept as simple as possible, considering the specific vintage
- Yeasts and microorganisms form part of the terroir and therefore the addition of yeast is not considered at all
- No corrective technologies are accommodated
- The winemaker is not to leave his own mark on the wine.

The aim of these wines from Burgundy is to get a purity of expression from the terroir so as to show its own unique qualities.

### 6.1.2 Italy

#### 6.1.2.1 Barolo region

Situated in north-western Italy, on the eastern slopes of the Alps, is Piedmont. Barolo is situated in the Piedmont region and forms part of the upper Po valley that extends for hundred of miles eastward, gradually opening up to the Adriatic Sea. It is Italy’s most famous wine region, with the best hills and terroirs, where the Nebbiolo, a single grape variety, reveals each climate’s characteristics.

Barolo is a rich, concentrated and full-bodied wine, with pronounced tannins and acidity. Stylistic differences among the various wines do exist however, because of the two
major soil types separated by the Alba-Barolo road running along the valley floor. On the one side is La Morra and Barolo to the west from Castiglione Falletto, Monforte d’Alba and to the east Serralunga d’Alba. The Barolo terroirs consist of successive layers of eastward sloping Miocene terrain. On the western side of the Barolo village the predominant formations are argillaceous-limestone tuffeau and Tortonian sands. These are relatively compact, fresher and more fertile, and characterise the soils from Barolo and La Morra, resulting in fruitier, more supple and aromatic wines that age earlier than those from the east. In the east the Tortonian sands gradually sink beneath the Helvetian white marls and sandy-limestone. These compact soils from Castiglione Falletto, Monforte d’Alba and Serralunga d’Alba are the kingdom for the Nebiolla grape and yield more structured wines that take longer to age (Fanet, 2004). However, the quality of the wine does not depend on the soil alone. Nebbiollo is very temperamental and is exclusively cultivated in the middle and upper parts of well-exposed south-facing and south-west-facing slopes. Quality vineyards depend greatly on the natural conditions of the landscape and its valleys, protected by the Alps, the influence of the sea breezes, in particular in the south-east sector. Other factors are soil conditions, the grape varieties and the rich experience of the winegrowers.

Regional wines such as Barolo and Barbaresco were the first Italian wines to obtain DOCG and DOC certification. These wines are world renowned due to the region’s pioneering commitment to quality and the strong focus of recognition of the concept of origin (Eurowine Immeuble, 2005).

Apart from the flagship Nebbiollo and Dolcetto, Barbera and Moscato varieties, Italy has a great diversity in grape varieties. These traditional grape varieties are cultivated as winegrowers believe they offer the best balance between the terroir and its potential, and to avoid contributing to the standardization of international viticulture. The winegrowers here are united in their commitment to defending the “typicity” of their wines in terms of its intrinsic quality (Stevenson, 1997).
6.2 New World wine countries

In the emerging world of wine it is considered that those environments where the most naturally adapted grape varieties reach full maturity yield great wines. With high temperatures the vines can ripen too quickly and loose some character and aroma, and if they fail to ripen or ripen too late, then they can be green, stalky, watery and overly tannic. A fine balance must be achieved for a great wine to be made. This is not always possible due to irregular vintages, but this is where the experienced winegrower, with human intervention, can make the difference in manipulating his terroir to reach consistency year after year. The classed growths in the Medoc of Bordeaux are a prime example of this. This better understanding of meso and microclimate and an enlightened appreciation of terroir is leading to greater expressiveness of wines, and showing their terroir footprint.

The concept of terroir in the context of a New World wine-producing region, namely the Napa Valley, will be discussed in greater detail. In other New World wine producing areas emphasis will also be placed on some of the wines produced to illustrate the “footprint of terroir” of those wines.

6.2.1 United States

6.2.1.1 Napa Valley, California

California accounts for almost 90% of American vineyards and has some of the best terroirs, comprising the well-known American viticultural areas (AVAs) like St. Helena, Rutherford and Oakville. The best soils are found in Oakville and Rutherford, where the vineyards are partly established in the argillaceous-silty sediments of the flat zone and partly in volcanic soils derived from Miocene basaltic magma.

In spite of a very short history for the premium American wine market, vintners have attempted to segment various agricultural sites into specific growing regions. America has currently 148 AVAs, and their appellation system is well on its way to international acceptance. The American AVAs system does not specify which varietals must be grown and many industry leaders decry this loose-knit organisation of the system. However, it creates the structure for them to eventually determine what is to be planted where, and to continue to correct and refine the AVAs system. There are very serious and dedicated American winemakers who focus on terroir wines and many of America’s
ultra-fine wines are single-vineyard productions and very limited productions within their AVA (Wong, 2002).

Winegrowers in California of ultra-premium wines do follow certain guidelines in order to produce superior quality grapes. Quality-producing areas in California fall into Zones 1–3, according to the Winkler system (Van Graan, 2002). Smaller areas are identified within these climatic zones for the cultivation of premium wines. The identification of these smaller areas are very important to producers and with the help of weather stations and temperature models (to determine a cultivar's ripening), “certain areas are classified as high potential on the basis of climatic data alone” (Van Graan, 2002). The role of the soils and topography is considered significant and therefore cultivars/rootstock combinations are selected accordingly, in order to properly match terroir and variety for the production of high quality grapes. However, there are producers that still manipulate vineyards regardless of terroir to produce grapes they consider superior. Generally speaking, California must still find its balance, between the terroir and the cultivar/rootstock combination, with little human intervention, to eventually produce premium quality grapes (Van Graan, 2002).

**Napa Valley’s future potential**

California, and particularly the Napa Valley, is an emerging wine region. There are dedicated winemakers and cutting edge technology is used to manage the vineyards and identify the terroirs. This presents the ideal opportunity to experiment with new varieties on existing sites or new sites, and to follow in the footsteps of those winemakers that play a leading role in establishing the expressiveness of terroir for their regions, as is done by Paul Draper with his single-vineyard sites (Draper, 2006). Already Pinot noir has impressed with its evolution in the California region as well as in Oregon. Eight Pinot noir zones have been identified in which expressive and world class Pinot noir, many with cult status, are produced. All these zones are found either within a Mediterranean-type climate region, or in pockets along the coast or maritime river valley, offering cooler temperatures, as well as in Oregon, with more climatic extremes. Within a time span of almost 20 years, and with development in the three areas of viticulture, vineyard site and winemaking, Pinot noir has successfully found its terroir expressiveness for these zones.
6.2.2 Australia

6.2.2.1 South Adelaide

A terroir wine that has reached international acclaim is Penfolds Grange; it is a perfect example of consistency and predictability demanded by the marketplace. As a collector’s item this wine is on price par with a Chateau Petrus, which comes from an acknowledged and great terroir. That is however where the similarity ends. The style of Penfolds comes from different selected terroirs. The characteristics reflected in this wine are the result of the winemaker’s input as well as that of a team of master blenders. This approach has given rise to what is described as “man made terroir” (Wong, 2002).

The great reputation of Chateau Petrus is linked to its exceptional terroir, and is acknowledged as a Grand Vin de Terroir. The Penfolds Grange is a super-premium product but, in contrast, selected from different terroirs, yet still acknowledged as a wine with icon status. In both instances terroir determines their respective status as icon wines, but in the latter case the human intervention factor plays the dominant role.

6.2.2.2 South Adelaide and Penfolds Grange

The most significant viticultural area in terms of production as well as acknowledged quality is the Adelaide region in Southern Australia. The best of South Australia’s vineyards are located in the Mount Lofty Ranges, of which the most famous wine-growing region is located in the Barossa Valley. Although the altitude is not very high (240 m above sea level), it varies considerably, providing a diversity of vineyard sites with predominantly brown argillaceous sandy soils. The Shiraz is the top variety from the Barossa Valley, and is known as the basis of the Penfolds Grange. Penfolds draws fruit from a combined vineyard area of 618 hectares in the Barossa region. It owns several of its own vineyards, but also purchases fruit from independent growers (Penfolds, 2005).

6.2.2.3 Eden Valley and Henschke Hill of Grace

Southeast of Barossa, at higher altitudes of 335–440 m, the cooler temperatures are more suitable for white wine production. Here the soils are derived from Cambrian mica-and range from sandy-silty to argillaceous-silty, with a high percentage of gravels, quartz and other rock fragments. The Henschke Hill of Grace, another highly acknowledged
quality wine, comes from this area, but this valley also produces exceptional Syrah and Chardonnay, acknowledged for their special terroirs. The Henschke Hill of Grace has vines that were planted in 1860 on their own roots from pre-phylloxera material. This eight-hectare vineyard on the original 32-hectare block sits at an altitude of 400 m. Here viticultural management practices are executed with absolute precision and meticulous records are kept, vintage-to-vintage. These practices, old vines, rich red soils and aspect all contribute to terroir expressiveness (Henschke, 2005).

6.2.2.4 Coonawarra and Penley Estate

Coonawarra has a great terroir for Cabernet Sauvignon fruit and the Penley wines are referred to by Jancis Robison as one of her two “Australian classified growths” (Epstein, 2001).

Coonawarra is on the southern tip of the South Australia region (Fig 3), almost the same distance from Adelaide and Melbourne, and is part of the so-called Limestone Coast. The land is very flat and low, lying barely above sea level, at less than 100 m. It is a long, narrow region, running north-to-south, with temperature variations of up to five degrees in any given day. Breezes and fogs from the sea keep the area cool so that grapes have a longer maturation period. This results in a characteristic intensity of fruit, both in terms of colour and flavour. The "terra rossa" (red soils) consists of red clay layered at varying depths up to about half a metre, over two to three metres of limestone. The limestone's porosity allows the vines access to a relatively high water table. The limestone is the remains of many former seabeds: 17 coastlines have disappeared from here over the past million years, as the sea has receded to the west. Today the land is very flat and low.

When the Penley Estate, Kym Vineyards, were developed they knew they had decades of proven grape history behind them. Notes kept in the family history (the Tolleys were barrel-makers in the early 1900s) reminded them that: “Coonawarra wines were distinctly different. They were dark purple in colour and they had a characteristic aroma whilst fermenting”. Penley is one of the newest wineries in the region, but it is built on 100 years of viticultural history (Epstein, 2005).
Coonawarra’s viticultural boundaries are in the process of being defined. Slight variations in any aspect can mean great differences in farming, and in wine pricing. For example, just on the outside of the terra rossa growing area is fertile, black soil. Though sharing the same mesoclimate, the black soil can become waterlogged, greatly affecting vine growth and the harvest.

Coonawarra has many other well-known Cabernets, but each winemaker has his own individual style, based on growing and winemaking preferences. Yet what they all do have in common is the special terra rossa soils of Coonawarra.

Although Australia is known for its branded commodity wines, it does have a great diversity of soil and climate. There are, however, very notable examples of expressive, terroir-driven single-vineyard wines with proven track records. Apart from the ones mentioned above, there are also Jasper Hill’s Georgias; Emily’s Paddock Shirazes, Giaconda Chardonnay; Jeffrey Grosset’s Polish Hill and the Watervale Rieslings.

6.2.3 New Zealand

New Zealand concentrates on quality, has branded itself internationally as a leader in Sauvignon blanc, and sells its wines at premium prices in the export market.

The New Zealand, Sauvignon blanc has carved out a niche through its intensely fruity and vibrant dry whites, which are considered as the world’s greatest Sauvignon blanc,
preferred by many to the wines of Sancerre and Pouilly-Fumé. The most well known of these Sauvignon blancs is Cloudy Bay, grown in Marlborough in the Wairau Valley. “The Marlborough district of the South Island is one of the few clear cut examples in the New World region with a homogenous terroir and climate, which are ideally suited to a particular variety – Sauvignon blanc” (Halliday & Johnson, 2003). Compared to the rest of New Zealand Sauvignon blancs, Marlborough produces Sauvignon blanc of consistent high quality and expressiveness. It is thus clear that individual terroir plays a crucial role in determining the flavour profile of their Sauvignon blancs as they do in other parts of the world as well.

In the past few years New Zealand, like other New World wine producing nations, is paying more and more attention to identify the best suited regions to particular grape varieties and wine styles. This has led to a proposed Geographical Indications Act, which will seek to classify wine producing areas (similar to California's AVA system). The Gimblett Gravels in Hawkes Bay, discussed earlier claims to be the New World's first wine region defined by terroir; the boundary is defined by soil type, not geographically or politically.

6.2.4 South Africa

Although South Africa is considered a New World wine country it is fast evolving into a mature wine country (Carey, 2001). There are wines that already express their terroir and offer uniqueness and diversity from other vineyard sites.

The relationship between terroir and variety is well illustrated in various well-known vineyards of the Western Cape that produce wines of consistent high quality, each showing their own terroir expression in a distinct style. A list of these wines can be found in Appendix 1.

This list of top performing wines is quite revealing. The criteria for this list (Appendix 1) were based purely on site-specific wines that are also top performers over a proven period of time, both nationally and internationally. However, it is interesting to note that Bordeaux blends excel in the Stellenbosch area, whilst Chardonnay and Shiraz favour the Robertson area. Shiraz features from the Paarl District and white varieties, Sauvignon blanc and Sémillon hail from the cooler areas in the Helderberg area.
(Stellenbosch District) and Constantia Ward. This, however, does not imply that those are the only areas suitable for the varieties mentioned as various areas bring forth a range of different styles, but these specific sites do seem to elevate the wines out of the ordinary and into a class of their own. They can therefore be considered as representative of terroir specific wines, each within its own appellation.

Figure 4. Constantia, as an example of the biodiversity of the South African vineyards.
(Source: Klein Constantia-personal communication, Adam Mason, 2005).
Chapter 7

TERROIR IN THE SOUTH AFRICAN VINEYARDS AND WINE INDUSTRY

The view from abroad

Andrew Jefford, renowned English writer, states that he is convinced that South Africa will be recognised as having great terroir but it is too soon to say where. “You must scrutinise your wine vintage after vintage, variety by variety, blend by blend (to ascertain whether grape has been appropriately matched to site). If not, you’re wasting your time” (Jefford, 2005).

Jefford (2005) equates the world’s best wines with those that most accurately reflect their terroir, which, in turn, has “everything to do with a particular winemaking environment and allowing this to stamp the resulting wine with character”. This, he points out, requires enormous effort and resources. Judging at the Fairbairn Capital Trophy Wine Show (2005), Jefford is of the opinion that South Africa should not allow the multi-nationals to “steamroll all over the vineyards. Do not allow the market forces for the masses to negate the importance of terroir–do not commoditize wine” (Jefford, 2005). We must use our diversity as a point of distinction.

7.1 Historical overview of the Western Cape Winelands and its development within the industry

Despite the volume of research and scientific contributions, the South African wine industry is predominantly based on empirical knowledge derived from our wine heritage. “South Africa is one of the few countries in the world to know precisely when the first vine was planted on its soil and by whom” (Fanet 2004). South Africa has rich natural features of historically identified bodies of land; a heritage of natural resources, which enable wine to be produced from great varieties; as well as a heritage of empirical human interaction with the soil, which has resulted in developing a variety of styles and high quality wines and its own winemaking traditions.

During the 19th century the South African wine industry received international acclaim for its production of the Constantia wines, which were rated amongst the world’s best, and
can be accepted as being South Africa’s first geographical indication of a body of land with the required natural features to produce great wines (Saayman, 1977). Even today the wines of Constantia are still considered among the finest ever produced.

7.2. Developments and government intervention
The co-operative movement played a major role in wine production over a long period, during which time the quality wines did not command priority of place as focus was concentrated on quantity.

Lack of quality control, whether by origin or otherwise, also contributed to and resulted in exploitation, and reputable vineyards like Constantia suffered as a result. Eventually, and at the behest of the industry, legislation was introduced which gave rise to the Wine of Origin (WO) control system being introduced in 1973. It is administered by the government appointed Wine and Spirits Board (WOSA, 2005). The new scheme was put in place to protect Wines of Origin as well as wines made from a specific variety and vintage.

7.3 The private sector
Today it is the privately owned cellars and overhauled co-operative wineries that are driving new viticultural initiatives and quality wine production to win international recognition for the South African wine industry. For further reading on this subject see “The role of environment and cultural aspects in the production of inter alia wine grapes” by Saayman (1988).

7.4 The natural heritage of the terroir of the South African winelands, emphasizing the bio-diverse nature thereof
Half of the Cape vineyards are situated between the Atlantic Coast and the high central plateau of the Great Escarpment. These winegrowing regions are influenced by two mighty oceans, the Atlantic Ocean and the Indian Ocean, which meet at Cape Agulhas, the most southerly tip of Africa. The Atlantic has the cold Benguela Current on the west coast and the warm Agulhas current comes in from the Indian Ocean on the west coast (Fanet, 2004). All the traditional wine regions are along the coastal zone, seldom further than 50 km inland (see Figure 4 and 6A). This means that they enjoy the beneficial effects of the prevailing synoptic winds and local summer breezes and winds off the sea.
These combined maritime influences, which bring coastal fog and cool sea breezes, make for a moderate Mediterranean climate, which greatly influences viticulture in the Cape.

In South Africa the ancient basement is visible throughout the country, and the Cape vineyards are established on ancient rock formation and soils derived from them (Fanet, 2004).

In general the vineyard landscape of the Western Cape is characterised by coastal plains, undulating foothills and mountain slopes with altitudes ranging from below 10 m to above 500 m. This is the origin of its biodiversity, which has given rise to a variety of soils/land bodies that occur over very short distances (WOSA, 2005). It is this extraordinary heritage that contributes to the distinctive and varied topography, and diverse soils that create ideal conditions and a unique set of conditions for the cultivation of wines of personalised character and complexity. It is also these combined factors and

Figure 5. Map of the Western Cape wine producing region

(Source: WOSA, 2005).

In South Africa the ancient basement is visible throughout the country, and the Cape vineyards are established on ancient rock formation and soils derived from them (Fanet, 2004).
the constant interplay between ancient soils, valley slopes, soaring mountains and coastal breezes that results in an extraordinary biodiversity as reflected in the country’s indigenous flora. With more than 9,600 plant species, 70% of which are native, the Western Cape is recognised as the smallest and yet the richest of the world’s great floral kingdoms. This same set of unique conditions in turn confer specific characteristics on the wine, conditions which reflect this remarkable biodiversity and support a large spectrum of wine varietals and styles (WOSA, 2005).

7.5 The importance of terroir in South Africa and the contribution thereof to the practice of zoning

South Africa is a leader in New World terroir research. A multi-disciplinary programme began 10 years ago, led by the ARC Infruitec-Nietvoorbij Institute of Viticulture and Oenology and the University of Stellenbosch, to identify what defines terroir and its effects on grape quality and style. This has already brought about improvements in the current viticultural practices and better matching of grape varieties to site, which in turn has lead to the opening up of new winegrowing areas (Long, 2002). Various other research programmes based on scientific assessments of the influence of soil and climate on vineyard performance have led to a far greater understanding of the influence of physical and chemical soil characteristics on wine quality. Progress has also been made in understanding the influences of wind, temperature, sunlight energy and humidity on vine performance. This research, as well as the 1995 initiated Terroir study officially the “Viticultural Terrain Identification for the Production of Cultivar Typical Wines” by ARC Infruitec-Nietvoorbij Institute of Viticulture and Oenology and the University of Stellenbosch has resulted in the identification of various natural terroir units (NTUs) that contribute to the broad spectrum and complexity of wine styles made in South Africa.

South African terroir research, which commenced as long ago as 1970, is today the envy of New World competitors such as Australia and the USA. At the Viticultural Zoning conference, 2004, Vaudour reviewed viticultural zoning and its aims in a worldwide perspective. She paid tribute to South Africa for some of the earliest terroir-related studies, specifically in the Western Cape (Saayman, 1977), in the Stellenbosch District (Carey et al., 2002), and soil studies by Saayman (1992) cited in Vaudour (2004).
7.6 Consumer acceptance of terroir as a mark of excellence

There is increasing interest from a minority group of consumers for knowledge and understanding of the origin of wines on offer on the shop shelves. These consumers want to be assured that the product can be linked to a particular place and that it is authentic. When it comes to fine wine they are interested in the diversity of wines and the way that it can communicate its regionality as well as offer a new experience. However, the majority of consumers’ palates are really more familiar with beverage wine. They generally do not understand the complex interactions between geology, climate and topography that influence the wine style and gives its typicity, and many view terroir only as some kind of historical or mystery term for soil. Neither do they understand the multiple facets of complexity of a terroir wine. However, it is up to the producer to introduce wines with more individuality to the consumer and create interest through diversity and geographic origins.

7.7 The demarcation of terroir in South African vineyards

Increasingly more producers are interested in obtaining a more “site specific” denomination for their wines. Already there have been many attempts to indicate the vineyard site, but it is only since 2004 that a need for the registration of single vineyards is being accommodated by the Wine of Origin scheme. This scheme is strictly regulated in order to prevent any abuse of the system (The Wine and Spirit Board, 2004).

As producers are improving the quality of their wines through viticultural progress it is necessary that they take ownership of and responsibility for the reputation of their origin and understand the significance of the environment/terrain/terroir for wine quality and character. This can only be achieved through the demarcation of controlled appellations of origin. The significant effect of terrain (interaction between soil, climate and topography) on wine quality and character is internationally recognised and the need for studies of these effects has been outlined by the Office International de la Vigne et du Vin (Carey, 2001). In order to remain competitive in an ever-expanding international wine market it is thus necessary to produce unique wines of high quality. To this end the Agricultural Research Council, the University of Stellenbosch, Winetech and the National Research Foundation are all sponsoring ongoing scientific studies to identify areas to produce such wines. For example, wine producing areas that have already been
identified are Stellenbosch-Klein Drakenstein and natural terroir units have been identified in the Bottelaryberg-Simonsberg-Helderberg study area, based on topography, soil and geology. Recently, the subject “The use of viticultural terroir units for demarcation of geographical indications for wine production in Stellenbosch and surrounds” formed the basis of a MSc thesis by Carey (2005) and was the topic of the PhD dissertation of Carey (2005). Internationally it is acknowledged that South Africa is leading in terroir research and in essence there is enough and well researched data available for South African producers to diversify in their vineyards and to allow terroir to stamp it with the expression of its origin.

7.7.1 The current Wine of Origin system

The Wine and Spirits Board is a statutory body that has appointed the Demarcation Committee to identify and demarcate viticultural areas. This technical committee does not represent any institution or organisation, but draws its members from the industry, and research and educational institutions, on the strength of their expertise in the fields of viticulture, oenology and soil/environmental science. Since 1973, South Africa’s Wine of Origin system has been demarcating units of origin on a national scale. This system is designed to control origin, cultivar purity and vintage year, as well as the quality of the wine (SAWIS, 2004).

South Africa lacks a long viticultural history of developed traditions and thus a strong emphasis is placed on scientifically proven and potential effects of natural factors in defining land bodies as units of origin (Saayman, personal communications, 2005). Wine of origin is relevant to terroir in the sense that even the smallest economically viable unit for the production of a quality wine needs to be demarcated in order to protect that terroir’s expressiveness as the intellectual property thereof, and to give authenticity and credibility thereto and to the Wine of Origin system. Currently the focus is on determining areas of origin according to terroir and in the identification of wards. The homogeneity of NTUs is studied, defined and grouped, which then forms the basis for the demarcation of a ward (the smallest geographical unit). These wards must have acceptable uniformity of soil, climate and geography as well as a recognition factor through its farming community in the name of the area. In the demarcation of these units, climate, typography and soil/geological patterns are considered to be the most important factors (Carey, 2001).
The current demarcation and registration of Wine of Origin areas is structured as follows:

There are three umbrella geographical units:

- The Western Cape
- Northern Cape
- KwaZulu-Natal

Then there are four categories of Wine of Origin units in South Africa:

- regions
- districts
- wards
- estates

The Western Cape is an umbrella geographical unit that encompasses all regions, districts and wards, except for one district (Douglas) and three wards (Hartswater, Benede-Oranje, Rietrivier-FS) Anon, 2002 cited in Saayman (2003), situated in the Northern Cape geographical unit (Saayman, 2003).

7.7.1.1 Wards

A ward is presently the smallest geographical unit with distinctive ecological characteristics. There are 53 demarcated wards under the Western Cape. In the demarcation of wards the following considerations apply.

The demarcation of wards, which is based on the study and identification of NTUs, has to show homogeniety. Wards are identified according to soil, climate and ecological factors. Each ward must have a geographical identity by which it has become known, and which identifies the area properly. These criteria are the most strictly applied for the zoning. These areas are demarcated on application by the producers, which in effect means that the producers do not have to prove originality, as these areas are allowed to develop to express their specific wine style (Carey, 2001).

In the demarcation of wards the following aspects are studied, evaluated and used in zoning a ward (Saayman, 2003). (Refer Fig 6 for the structure of the Wine of Origin system).
• All soil and climatic factors, or combinations thereof, which could have an effect on wine quality
• Existing cultural practices which may affect the wine character or distinguish one area from another
• Existing experience and evidence, proving that an area can really produce a unique wine
• Geographical and other factors that contribute towards the development of a traditional wine area
• The traditional name of an area, properly describing the area and by which the area has become known with the passing of time.

The cooling effect of sea breezes (Bonnardot, 1997, Bonnardot et al., 2001 cited in Saayman, 2003) evidently contributes to the reputation of several of these wards.

The following categories of demarcations are a further quality refinement of the Wine of Origin system.

7.7.1.2 Estate wines
The fourth category is estate wines, introduced in July 2003, after the previous concept of estate as the smallest demarcated origin fell away. The basic requirements to register a production unit for an “estate wine” are the following:

• Vineyard production units must adjoin each other
• Vineyard production units must be farmed as single units
• A cellar in which all processes up to final certification are completed (grapes grown, and wine made and bottled)
• Wine is only to be produced from grapes harvested on the registered unit.

7.7.1.3 Single vineyards
This delimitation of origin came into effect in October 2005 (The Wine and Spirit Board, 2004). “Single vineyards” means that producers are now permitted to indicate a wine as coming from a designated vineyard. Previously the word “vineyard” was totally prohibited under South Africa’s Wine of Origin legislation, which meant that Cape wines could not lay claim to single vineyard status neither label their wines as such. To date,
about 300 vineyards have been registered for the production of single-vineyard wines (SAWIS, Hugo v/d Merwe, personal communication, 2006). These wines are strictly monitored. The surface area of a production unit may not exceed 6 hectares.

7.7.1.4 Terroir specific wines (TSWs) or distinctive Wines of Origin

This category is still under development. It has been created to give recognition to terroir specific wines (TSWs) that must show the unique specific character components such as specific soil type, topography, meso and microclimate and exposure thereto. These differences must be identifiable and constant.

The terroir specific wines, indicated under (Figure 7), can only fall within a demarcated ward. The effect of terroir on wine characteristics has been scientifically demonstrated for South African conditions. The areas for production of TSWs must be demarcated using environmental characteristics as well as the empirical knowledge of wine produced from the unit in question.

The following pre-conditions have been proposed for TSWs: (Hugo vd Merwe, The Wine and Spirit Board - personal communication, 2006).

- The unit must be homogenous with regard to topographical, climatic, soil and geological patterns. Sufficient temperature meters are to be placed at strategic points within the unit to verify climatic patterns over a three-year period.
- Different sections with the same characteristics may be considered for TSWs
- TSWs will be applicable to wards only
- The borders are to be determined by The Wine and Spirits Board
- Scientific proof must be submitted by the applicant on the natural terroir unit as required by the Board
- The name of the unit must preferably be the actual geographic or traditional place name, but a new name may be considered

The inverted triangular diagram below (Fig 7) graphically illustrates how the “drilling-down” from the broadest demarcation of a land body to the smallest economical unit is achieved by applying the definition of terroir on each level:
The effect of terroir on wine characteristics has been scientifically demonstrated for South African conditions. The areas for production of TSWs must be demarcated using environmental characteristics as well as the empirical knowledge of wine produced from the unit in question.

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- Different sections with the same characteristics may be considered for TSWs
- TSW’s will be applicable to wards only
- The boarders are to be determined by the Wine and Spirits Board
- Scientific proof must be submitted by the applicant on the natural terroir unit as required by the Board
- The name of the unit must preferably be the actual geographic or traditional place name, but a new name may be considered
- The inverted triangular diagram below (Figure 7) graphically illustrates how the “drilling-down” from the broadest demarcation of a land body to the smallest economical unit is achieved by applying the definition of terroir on each level:

Figure 7. Structure of the Wine of Origin system (Hugo vd Merwe – fax communication, 2006)
## South African Wine Regions
### Production Areas

<table>
<thead>
<tr>
<th>Region: Breede River Valley</th>
<th>Region: Coastal Region</th>
<th>Region: Olifants River</th>
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<td>District Wards:</td>
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<td>Calitzdorp</td>
<td>Riebeekberg</td>
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<td>Upper</td>
<td>Tulbagh</td>
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<td>Outeinqua</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**BOBERG**

(for use in respect of fortified wines from Pearl and Tulbagh)

The following 3 geographical units exist:

1. **Northern Cape** which includes the production areas Hartswater, Douglas, Lower Orange and Rietrivier FS.

2. **Western Cape** which includes all other production areas except those mentioned under points 1 and 3.

3. **Kwazulu-Natal** which includes no other production areas.

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**Fig. 6** Structure of South African Wine regions
7.8 Natural terroir units (NTUs)

In the delimitation of wards the concept of a natural terroir unit (NTU) is used as the basis for the zoning of the ward. This description defines terroir with reference to the homogeneity of its environment and typicality of its end product.

A natural terroir unit has an agronomical potential that is eventually reflected in the characteristics of the wine, and forms the basis for the concept of terroir, which is described by Laville as follows: “A natural terroir unit (NTU) is a unit of the earth’s surface that is characterised by relative homogeneous patterns of topography, climate, geology and soil” (Laville, 1993 cited in Carey, 2001). In Carey’s description of the NTU, she distinguishes between the natural terroir unit and the terroir. She directly links terroir to the product which is a grouping of natural terroir units based on the typicality of the end product (Carey, 2001).

7.9 A survey of South African wines and their respective “footprint” of terroir

The author carried out a survey. This survey was conducted to illustrate the importance, and the interdependence of, the different natural terroir factors and viticultural practices on a wine of quality within demarcated wine areas. A questionnaire was compiled (see Appendix 4) and then sent out to 42 producers, having first contacted each one personally to request their participation. Of those approached, 30 completed and returned the questionnaire. Each producer could choose his/her own wine which they believe shows the most expressiveness of its terroir.

The criteria that the author used in the choice of producers to participate were the following:

- their wines should show a strong typicity of their terroir
  (Most wines, but not all, that were selected were from single-vineyards. The few producers that are not, produce blends of outstanding quality, but their grapes are from the estate only within a specific ward.)
- their wines are acknowledged internationally as quality wines in terms of the style that they are made, and show strong regionality
- the wines perform consistently well in national and international wine awards
- the quality is consistent from vintage to vintage
- most of the wines have a track record of at least 12 years, many much longer
• some of the wineries lie outside the traditional winegrowing areas in an upland location where the landscape, soils and mesoclimate approximate well to ideals based on current concepts of viti-vinicultural requirements. They are featured to illustrate the potential of newly discovered wine areas and to emphasize the regionality.

The tables in Appendix 2 give an in depth view of the special circumstances i.e. the natural terroir influences and viticultural practices of each winegrower for the production of their quality wine. It is evident that their individual achievements in the national and international markets as wines of distinction, is based on the dedicated application of the terroir concept by each winegrower. The wines have been categorised as per their Wine of Origin demarcation as to put it in context of the specific wine production area of either a District and/or a Ward and in some cases, new sites that were chosen for their relative cooler climatic conditions.

**Conclusion of Survey**

The most important common denominator that influences these wines is climate. A definite pattern indicates that climate and aspect benefit producers eg. Klein Constantia, Cape Point Vineyards, Vergelegen and Nitida, because of altitude and sea breezes for their premium white wines, especially Sauvignon blanc. Even though these producers also produce red wines very successfully, the white wines far exceed in class and expression of its terroir compared to an area like Stellenbosch.

Stellenbosch, especially the Simonsberg ward, consistent for its quality indicates that varieties like Cabernet Sauvignon also show an expression of terroir in a different league compared to other warmer areas like Paarl and Robertson. Here again, in these areas Shiraz seems to show itself in a Southern Rhône style (warmer) compared to Stellenbosch which is more Northern Rhône in style. Most producers indicated a cool meso-climate for these specific vineyards except for Tulbagh, Paarl and Robertson. Here, however either the South Easter or north-westerly wind brings a cooling effect to the vineyards. Most soils are indicated as well-drained with good water holding capacity. In vineyards where this is not the case and especially in extreme temperatures, it appears that older vineyards (20-40 years), probably because of deep rooting systems, are able to regulate their water supply and withstand any other physical restraints. There
is no single common denominator except for trellising in viticultural practices, and even here methods may differ. It is clear that the site with all its natural factors plays a definite role in these wines, and where the variety is appropriately matched it brings forth a distinctive wine with exceptional qualities.
Chapter 8

MARKETING AND TERROIR

At the Joint International Conference on Viticultural Zoning in Cape Town, South Africa, 2004, B.N. Njobe, Director General of the South African National Department of Agriculture, said: "South Africa invested in terroir research to counteract Europe". The use of the beauty of the landscape and terroir for promotion and marketing of wine was emphasised by several French and Italian presenters as well. Irrespective of how much is invested in terroir research, the “concept of terroir” as a value proposition for the producer as well for the consumer, has to be accepted first and foremost.

8.1 Acceptance of the role of terroir in the global market place

Three fundamentals need to be stated in the acceptance of terroir by the consumer:

- The fact that a wine originates from a demarcated/defined/known growing area does not of necessity mean that the wine will be a great, or even a good wine (Vino, 2003).
- In the mass market for wine, the consumer hardly knows of the existence of terroir and the contribution it makes to the wine s/he drinks
- The nature of the consumer market in the wine industry is such that the “first-time wine drinker” goes through a learning curve by progressing from the “mass market wine” to the “selective”, to “wines of distinction”. He becomes a discerning wine drinker over time, and may even become a wine connoisseur (Easthope, 2003).

That consumers do not know of the existence of the concept of terroir is understandable and a fault that can be laid at the door of the wine industry. That there is however winemakers and other industry cognoscenti who deny the existence of terroir as an influencing factor is inexplicable and inexcusable. These same winemakers are so impressed by oak influence, and the overripe fruit augmented by the sweetness of the commensurate alcohol, that the expression of terroir in the wine, becomes unrecognizable. Hence, the ignorance of consumers that do not understand the differentiating factors that separates a wine from a great terroir from a technologically enhanced wine.
8.2 The authenticity of terroir
The oversupply of wine as a commodity and the commensurate effect thereof in the consolidation of retailers in the world market is a given (it is not a subject dealt with here, for the reasons stated above).

Premium winegrowers resort to various market tools to reach their customers. These are mainly aimed at some distinctive trait or characteristic of their wines in the form of a brand, or other recognizable and/or distinguishing aspect of the wine. This is where terroir can play a major role, but also where the authenticity should carry the message. The recognizable values that can be attached to the wine through its specific terroir characteristics in the market place are invaluable to the winegrower to bring his product to market.

Whether South Africa becomes labeled as a commodity/mass wine producer and nothing more will greatly depend on its ability to distinguish its wine products on a basis acceptable and appreciated by the distinctive wine markets of the world.

Premium wine, and its ability to penetrate and eventually capture a market, hinges on terroir and the perception that a grape variety should be matched to the most suitable site for best expression of its unique characteristics recognized by the consumer. Emulating the Old World in general and the French in particular in this respect can give a crucial advantage in the market place. Brian Croser, previous Decanter’s Man of the Year (2004) states: “The French have a stranglehold on the concept of terroir. Go south of the equator and terroir disappears for some reason” (Croser, 2003).

South Africa is required to go to market with an authentic and scientifically based message about how the attributes of terroir improve the quality of our wine. The demarcation policy presently being implemented may bring us there. Winegrowers and marketers must ensure that they truly understand the value of the “concept of terroir” and guard against the overuse thereof for reasons of profit.
8.3 How we can bring the terroir message to the consumer?
Several studies emphasise the marketing value of terroir. It is now most important for
the consumer to understand the concept of terroir. It should be communicated in such a
way that it highlights the “difference of place” inherent in the wine, and conveys the
meaning thereof to the consumer. Here follows a summary of a presentation made at
the Terroir 2006 Conference (University of Davis, California), “Marketing Terroir: The
Taste of Place” (Busacca & Jones, 2006).

- We need to market: The Taste of Place
The question is: How do we market this Place of Taste? Purely on hard scientific data
only or by a resonance between wines of typicity and their place of origin and wines that
connect people to place in an authentic way?
- Marketing terroir: Each place of great wines, macro, meso, or micro, has a story
  that can be told in an authentic way that forges a spiritual bond in the mind and
  heart of the wine drinker with the wine and its place.
- Terroir should be telling the Story of a Place, specifically linked to the wine
- Terroir has an Intrinsic Landscape Aesthetic Resource Information System, i.e. in
  South Africa the biodiversity of the land and its botanic wealth
- Marketing terroir should offer an authentic terroir experience
  i.e. a lifestyle experience on the wine farm
- What is the experience of the Taste of Place?
  - The taste of the wine and its intrinsic flavour is supported by the whole sensory
    experience of the place
  - By experiencing the landscape of the wine, the whole landscape of place
    becomes food for thought through the tasting of the wine
  - Once you have experienced it, the wine can bring back these fond memories
    and will stay in your mind
- How do we capture the Taste of Place?
  - We use a label that speaks of the area.

8.4 The importance of biodiversity within the marketing message of terroir
At the 2006 Cape Wine Show, a Biodiversity Conference, the biodiversity of the South
African winelands was described as follows: “In the South Africa winelands, the constant
interplay between ancient soils, valley slopes, soaring mountains and coastal breezes
results in an extraordinary biodiversity which is reflected in our indigenous flora.” (WOSA, 2006). It is on this platform that the “brand South Africa” is to be marketed abroad as the “diversity in wine”.

Chapter 9

CONCLUSIONS

From the results of the author’s research on terroir, one main conclusion can be drawn, namely: that terroir is a vast subject, and one which expands exponentially because of the interdependence of a multitude of factors associated with terroir, as the fons origin of a great wine.

Wines from the New World are changing consumers’ ideas of what wines should taste like, and therefore of what terroir is. This has given rise to a changed approach and perspective on terroir, depending on whether the approach is that of the winegrower or that of the consumer. From a consumer’s perspective, when New World and Old World wines are compared, it is clear that there are New World terroirs that produce great wines. These wines reinforce the understanding of how terroir works, and that wines made from great terroir can stand alone.

This has led to increased interest by New World producers in terroir. Scientists are also turning their attention to defining it and to explaining how it can affect a wine. Due to the global demand for varietal wines and the limited international varieties that are available to winegrowers, producers have to find other ways to distinguish themselves from their competitors. The key to this requirement is to start with quality grapes that show homogeneous (even) levels of ripeness, and then to recognise the role that natural variation plays within and between the vineyards.

With the increasing adoption of technique, known as precision viticulture, vineyards are now commonly divided into sub-plots sharing similar characteristics (known as natural or basic terroir units) so that vineyard interventions can be precisely targeted to where they are required. Sites need to be identified and matched to the optimal variety. This may take many years through a process of trial and error, but it is the only way to eliminate the mistakes made in planting a variety in the wrong location. With precision viticulture and modern technologies this process will still take less time than the centuries it took Burgundy to find and record their best terroirs. This is the only way forward for all New World winegrowers to produce great wines from great terroirs within the shortest time span.

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In the New World of Wine, geographic designations vary greatly from European standards and there are no common production rules imposed by law to create common ground between them. Irrespective of the nature of any production rules and demarcation of the geographical areas, geographic designations still re-enforce the impression of quality that commands higher prices for the wines. The real issue that remains is how to define, and on what basis to outline, protected viticultural areas.

The Old World has a different understanding about the concept of terroir as it aims to make wines that express the characteristics of a specific vineyard, whereas the New World sees terroir as a tool to improve wine quality, and is used in the marketing of the wine. This illustrates the differences in approach between the Old and New Worlds of Wine; with the latter being the marketing oriented approach.

It is not only the soil, but also the wind, the rainfall, and the temperature that determines terroir and the human element plays a definite role. Before a vineyard can even be planted it needs to be planned by the winegrower, and thus many decisions and actions are taken by the winegrower that have an influence on terroir, which subsequently reflects in the taste of the wine. The key method of expressing terroir is through the work done in the vineyards by the winegrower. It is the winegrower who understands the limitations and characteristics of his area/s; it is he who successfully marries his terroir with variety to achieve terroir diversity, which is so sought after in the New World. Thus the interpretation by the winegrower of his vineyard site is crucial and will influence the style of the wine.

However, the intervention of the winegrower has to be limited, i.e. to low-impact soil management, minimal (if any) irrigation, and wood maturation that do not inherently change the flavour profile as rendered by the terroir. Wines made from grapes grown in such a way over the course of successive harvests will clearly express the characteristics of their site, vintage after vintage. The winegrower remains part of the true terroir expression but must recognise the time it will take to truly match the two, and have the knowledge to develop it into a site of great terroir.
The past decade has seen remarkable changes in the vineyards of the Cape Winelands and new viticulture practices have generally resulted in huge improvements in South African viticulture. There is an increased emphasis on vineyard management, the use of new varieties is innovative, and matching terroir to variety has resulted in better levels of ripeness. All these changes have brought about new styles of wines and new approaches to enthuse the new generation of winemakers. The enormous diversity of terroir in South Africa challenges these winemakers to be creative and make wines unique to their area of production.

The South Africa winemakers do not have to model themselves on what is being done in other countries, because they have the required plant material, knowledge, expertise and technology to make the most of the richness of their own biodiversity. What they do need however is the commitment to apply their skills and resources and put their own authentic terroir footprint on their wines. More importantly, South African wine producers are now beginning to recognise that their regions have inherent natural features, which are exposed to the most beneficial climatic influences. With a very distinctive and varied topography and diverse soils, presenting a bio-diversity of unique potential and offering ideal conditions they can create wines of unique character and complexity and they have the opportunity to bring forth world class wines on a constant basis.

This unique biodiversity, combined with the South African empirical winemaking knowledge, has succeeded in emulating the restrained elegance of the Old World wines, yet giving them a distinctive expression of the specific terroir from which they originate. It is this wealth of extraordinary natural features of bodies of land and the biodiversity, combined with the winemaking tradition of over 300 years, that can establish South Africa’s wines as having their own unique “terroir expressiveness”.

This general acceptance of terroir forms the basis for the geographical demarcation for wine areas of origin in South Africa. Producers have to interact with the natural features of the “body of land” and its biodiversity and transfer its specific characteristics to the wines. The identification of this body of land as the origin of this particular wine can then be demarcated as an acceptable and authentic site. This in turn leads to the eventual demarcation of natural terroir units (NTUs) of the ward in the South African context, to lend authenticity to the importance of terroir.
Today the Cape wine industry is faced with its ultimate challenge, namely: how to create a well organized, unified structure that will provide the support base necessary for South Africa to be acknowledged internationally as a wine country with great terroirs which produce wines that count among the world’s finest.

It is therefore necessary that the wine producers/wine growers stimulate the consumers’ interest in the diversity of terroir specific wines. Once they are able to enjoy the subtleties and complexity that are brought to wine through its terroir, the consumer is more prepared to pay, and prepared to pay more. It is because of this push from the winegrower and the acceptance of its importance that the identification of viticultural terroir is receiving renewed attention in the wine world. It is also putting increasing demands on scientists to find answers to the basis for viticultural zoning and illustrate the value thereof.

The South African producer has come to accept that larger volumes of terroir specific wines of consistently high quality are vital to increase South Africa’s competitiveness in international markets. They also realise that the South African wine industry has to differentiate itself from the rest of the world through a committed and unwavering dedication to authentic winemaking. To this end producers have already directed quality inputs into the entire wine production chain, from the production of quality grapes, the application of cutting edge technology in vinification and huge improvements in their marketing strategies.

It is crucial for the winegrower to understand the natural environmental influences on the grape in the vineyard and the resultant wine quality. It is equally crucial for him to consider the effects on grape quality and characteristics of new winegrowing areas so as to unlock their potential. An in-depth knowledge of the potential of the terroir and the optimal grape variety that can be planted on a specific site is essential.

The pronounced diversity of South Africa’s vineyards and wine landscapes is considered an asset, and the zoning and demarcation of areas of origin are rated extremely important by the industry. In international terms South Africa is still considered a low-end, mass market producer even though wine competitions and ratings by international
personalities have brought worldwide acknowledgement for certain wines and wineries. The South African wine industry has entered a critical period in the global market place and rapidly needs to build a “wine identity” by positioning itself in the super and ultra premium categories. South Africa will only achieve this by differentiating itself from the rest of the world and using the biodiversity of its wine regions, authenticated through the demarcation of registered designations of origin, and using terroir as a basis for delimitation. Protected geographical indications are necessary to reassure consumers that our terroir is authentic so as to maintain the high prices that we require for our premium wines.

Although the Wine of Origin Scheme has already provided, through legislation, for the category “distinctive wines of origin”, ongoing studies are still necessary to determine the delimitation of boundaries of Wine of Origin sub-wards, based on expected wine characteristics. This would require the producers’ acceptance of the importance of the uniqueness of the wines’ characteristics in its reflection of terroir, and identified as the imprint of a terroir specific wine. Then only can vineyards be delimited successfully for the production of terroir specific wines or distinctive Wines of Origin.

The legislation for single vineyards in South Africa is unique in the New World and an important marketing tool for producers who want to express their terroir with an authentic footprint. It is the smallest complex of natural environmental factors (terroir) and is based on specific guidelines, in order to produce high quality wines. Although this is a move in the right direction, it still does not guarantee wines showing their terroir expression. Therefore the newly suggested demarcation of terroir specific wines (TSWs), which will be wines with specific, identifiable and constant differences, is very necessary to bring distinctive wines with an identifiable origin to the marketplace.

With the production of wine for the mass market, wine has become a commodity, and terroir, other than it being the “carrier of the vine”, plays no role. This will always be an integral part of the wine industry and the mass-market in which it functions. This is so mainly because the financial/commercial considerations are paramount to the wine producer, as opposed to the winegrower who positions his/her wines to the more discerning wine drinker higher up on the “knowledge curve”. It is only the wines that are produced with terroir as the predominant defining characteristic that may be offered to the discerning consumer.
It follows that as smaller land portions of great terroir potential are identified, resulting in the production of TSWs from the NTUs, the supreme quality and limited quantities thereof result in limited availability on offer in the market place. This will command higher prices, affordable only to the most discerning wine connoisseurs. Terroir in the market place therefore plays a role throughout the entire market spectrum of consumers, from the “carrier of the vine” only in the mass market sector, to that of the most important contributor to the uniqueness of a great wine that is produced by the winegrower for the discerning consumer.

If we therefore speak of the global positioning of wine in the market place it is in the context of terroir as the defining element in the final product on offer in the market place, and that it is ultimately terroir that lifts wine above mere commodity status. The education of the above-profiled mass consumer, to move him/her to the targeted level of this market sector, is a function of the wine industry, and falls outside the scope of this thesis.

Currently, wine producers in South Africa are generally very enthusiastic about the concept of terroir, a minority is even very dedicated, however the industry as a whole needs to consider the following:

- The true power of terroir as a marketing tool is not yet realised and therefore not effectively utilised.
- Although South Africa is a frontrunner in terroir research in world terms, the concept of terroir and its impact on the final product is not always well understood by winemakers who are not also the winegrowers. The need to further develop the wine industry based on a deeper knowledge of terroir is a must, and terroir should be included as a compulsory subject in every tertiary curriculum in the field of viticulture/winemaking. The smallest identifiable soil footprint, which must still be an economically viable land portion, should be demarcated as a specific terroir unit (STU) to form an integral part of the natural terroir unit (NTU). With the STU as basis and the NTU as parameter, the marriage of this terroir unit must be made with the ideal and most compatible variety. This is to be done by the winegrower, who must contribute his/her experience (preferably of generations) to the resultant combination and produce a product of unparalleled quality. From this it follows that single vineyards as
presently defined are not necessarily a true expression of terroir as defined and understood in this thesis.

- The fact that the wine industry in the Old World countries is, for the greater part, carried by traditional families who are dependant for their existence on the wine they grow, is a stabilising factor, and one that is mostly absent in the New World wine countries.

- For South Africa to be successful in the international markets it must achieve recognition as a producer of super premium wines. In order to achieve this, producers/winegrowers need to invest more, and at a faster rate, in the diversity that is offered by this country’s terroir regions. As a small producer in global terms it is the single most important factor that can give South Africa the edge over other wine producing countries, and to even surpass the reputation of France.
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APPENDIX 1

South African producers

Stellenbosch

- Thelema: “The Mint” Cabernet Sauvignon, single vineyard, Simonsberg-Stellenbosch Ward
- Jordan: Nine Yards Chardonnay Reserve, single vineyard, Stellenbosch District
- Kaapzicht: Steytler Pinotage and Steytler Vision, Bottelary Ward
- Kanonkop: Paul Sauer Bordeaux blend, Simonsberg-Stellenbosch Ward
- Meerlust: Rubicon, Bordeaux blend, Stellenbosch District
- Delheim: Vera Cruz Shiraz, Simonsberg-Stellenbosch Ward
- Saxenburg: Mas Nicholas, Cabernet/Shiraz blend, Polkadraai Hills Ward
- De Toren: Fusion V, Bordeaux blend, Polkadraai Hills Ward
- De Trafford: Shiraz, Mont Fleur and Keermont 90% single vineyards,
- Rustenberg: Peter Barlow Bordeaux Blend, single vineyard, Simonsberg Stellenbosch District
- Stellenzicht: Syrah, Plum Pudding Hill, single vineyard, Stellenbosch District
- Simonsig: Red Hill Pinotage, single vineyard, Stellenbosch District
- Hartenberg: CWG Auction reserve, Gravel Hill single vineyard, Bottelary Ward
- Vergelegen: Sauvignon blanc Reserve, Schaapenberg, Stellenbosch District
- Vergelegen V Bordeaux blend, (Rondekop 5ha Cabernet Sauvignon), single vineyard, Stellenbosch District
- Rust and Vrede Estate Wine: Cab/Shiraz blend, Stellenbosch District

Paarl

- Glen Carlou: Syrah, Simonsberg-Paarl Ward
- Fairview: Solitude Shiraz-Perdeberg dryland vineyard
- Ridgeback: Shiraz, Paarl District
- Veenwouden: Merlot single vineyard, Paarl District

Walker Bay District

- Hamilton Russell: Pinot noir and Chardonnay
- Bouchard Finlayson: Pinot noir and Chardonnay
Constantia

- Klein Constantia: Vin de Constance Muscat de Frontignan, Constantia Ward
  Klein Constantia Perdeblokke Sauvignon blanc, high-altitude single vineyard, Constantia Ward
- Steenberg: Sauvignon blanc Reserve, 19 year old single vineyard
  Steenberg Sémillon, Constantia Ward
- Cape Point Vineyards: Sémillon, single vineyard, Cape Point District

Robertson

- Weltevrede (Bonnievale ward): three different Chardonnays, each from a specific site – Poet’s Prayer Chardonnay, Rusted Soil Chardonnay and Place of Rocks
- Weltevrede: The Travelling Stone Sauvignon blanc
- Springfield: Springfield Life from Stone Sauvignon blanc, from the estate’s rockiest soils, and Special Cuvee Sauvignon blanc, from a mature extra-cool riverine vineyard, Robertson District
- Springfield Methode Ancienne Cabernet Sauvignon, 23-year old single vineyard, Robertson District
- Graham Beck: The Ridge Syrah, (rich, red limestone soils), Robertson District

Darling

- Cloof: Crucible Shiraz
APPENDIX 2

Appendix 2

Constantia Ward - Klein Constantia Single Vineyard

-Steenberg

Steenberg Vineyards and the Klein Constantia wines fall within the Constantia ward. Since 1780, Constantia already had an international reputation for natural sweet wines. At present the ward is demarcated to include the vineyards on the eastern slopes of Table Mountain and Constantiaberg. It is 5-10 km distant from False Bay, receives 1 057 mm of rain, making irrigation unnecessary, and has a mean February temperature (MFT) of 20.6°C (Anon, undated). The deep, predominantly yellow-brown and reddish-brown, well-drained soils are mainly derived from granite, which forms the base of the sandstone that constitutes the upper formations of the mountains. The wine style has changed to dry white and red wines, highly esteemed by wine connoisseurs and made from classic European noble varieties (Sauvignon blanc, Chardonnay, Merlot, Cabernet Sauvignon, Cabernet franc, Shiraz).
<table>
<thead>
<tr>
<th><strong>Wine Profile</strong></th>
<th><strong>Klein Constantia</strong></th>
</tr>
</thead>
<tbody>
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<td><strong>Brand name of the wine.</strong></td>
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</tr>
<tr>
<td><strong>Grape variety</strong></td>
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<tr>
<td><strong>Location</strong></td>
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<td>Grid reference</td>
<td>34.03 South, 18.41 degrees East</td>
</tr>
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<td>Altitude range</td>
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<td>District or Ward</td>
<td>Constantia Ward</td>
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<tr>
<td><strong>Topography and mesoclimates</strong></td>
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<td>Vineyard altitude</td>
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<tr>
<td>Slope aspect</td>
<td>South facing eastern slope</td>
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<tr>
<td>Inclination of slope</td>
<td>Convex 30-36% incline</td>
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<td>Position on slope</td>
<td>Crest of Constantiaberg</td>
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<tr>
<td>Describe mesoclimates</td>
<td>Cool, Mediterranean</td>
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<tr>
<td>Average rainfall</td>
<td>1200mm per annum</td>
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<tr>
<td><strong>Soil</strong></td>
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<td>Parent soils</td>
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</tr>
<tr>
<td>Soils in vineyard</td>
<td>Glenrosa with saprolite subsoil</td>
</tr>
<tr>
<td>Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained</td>
<td>Soils were ploughed to a depth of 1 meter. Good soil aeration and drainage facilitate wider root distribution, moderate clay ensures adequate reserves of soil water</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td>Clones</td>
<td>SB 242 and SB 7</td>
</tr>
<tr>
<td>Rootstocks</td>
<td>Richter 110; Richter 99</td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td>Block size</td>
<td>2.13</td>
</tr>
<tr>
<td>Plant spacing between rows and within rows</td>
<td>2.5m and 1.0 within rows</td>
</tr>
<tr>
<td>Pruning</td>
<td>Spur</td>
</tr>
<tr>
<td>Type of canopy</td>
<td>Vertical position with the aid of moveable canopy wires</td>
</tr>
<tr>
<td>Irrigation type</td>
<td>Rain fed</td>
</tr>
<tr>
<td>Irrigation when</td>
<td></td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>Trellised</td>
</tr>
<tr>
<td>What type of training system</td>
<td>Bilateral cordon</td>
</tr>
<tr>
<td>Cordon height</td>
<td>0.75m; 1m for canopy support</td>
</tr>
<tr>
<td>Cover crops</td>
<td>Barley rye between alternate rows every autumn</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td>Yield</td>
<td>5.9 tons/ha</td>
</tr>
<tr>
<td>B degree at harvesting</td>
<td>23.3 degree B</td>
</tr>
<tr>
<td>Wine Profile</td>
<td>Steenberg</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td><strong>Wine Profile</strong></td>
<td>Steenberg Semillon</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>700 x 12</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>14 years</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>Up to 15% Sauvignon Blanc depending on the year</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Constantia</td>
</tr>
<tr>
<td><strong>Topography and mesoclimates</strong></td>
<td>100 - 120m</td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>South-East facing</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>Convex</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Midslope</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Medium - sea moderates climate</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Please refer to Vinpro or Groot Constantia weather station for these temps.</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>Please refer to Vinpro or Groot Constantia weather station for these temps.</td>
</tr>
<tr>
<td><strong>Does wind/ sea breezes play a role</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>describe meso climate</strong></td>
<td>Yes, cool climate</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>June - August 1200mm</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td>100% Clovelly: top 40cm consist of organic matter, loamy yellow brown soil below to a depth of 1 - 1.2m, gravel-like bedrock. See fax for more detail.</td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Granite</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Clovelly: top 40cm consist of organic matter, loamy yellow brown soil below to a depth of 1 - 1.2m, gravel-like bedrock. See fax for more detail.</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature, soil buffering, well drained</strong></td>
<td>The layers are all permeable so no physical restraints to a depth of 1 - 1.2m. Chemical amelioration was done at planting in the form of lime and nutrients but the soil does not lack anything that needed huge rectification. Yes, well drained soils. Moderate to good water holding capacity.</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress-neutron probe/pressure bomb</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>Clone is GD14</td>
</tr>
<tr>
<td><strong>Clones</strong></td>
<td>Richter 110</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>Spur pruning</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>Overhead irrigation</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Yes - 3 - 4 times (about 1500 cubic meters per hectare)</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Yes - 3 - 4 times (about 1500 cubic meters per hectare)</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes - 3 - 4 times (about 1500 cubic meters per hectare)</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Yes - 3 - 4 times (about 1500 cubic meters per hectare)</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Yield</strong></td>
<td>4 Ton. Ha</td>
</tr>
<tr>
<td><strong>B degree at harvesting</strong></td>
<td>24.5 degrees ave.</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>Not really - we do use wasps and ladybirds in the control of mealybug (leafoll virus). It has been tried for two years now in the valley as an experiment and seems to be successful but this applies to the whole farm not just this block.</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>Not really - we do use wasps and ladybirds in the control of mealybug (leafoll virus). It has been tried for two years now in the valley as an experiment and seems to be successful but this applies to the whole farm not just this block.</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>Not really - we do use wasps and ladybirds in the control of mealybug (leafoll virus). It has been tried for two years now in the valley as an experiment and seems to be successful but this applies to the whole farm not just this block.</td>
</tr>
</tbody>
</table>
The Cape Point Vineyards

The Cape Point Vineyards are planted on two estates: Noordhoek, and Scarborough, situated on the Cape Point peninsula. Cool sea breezes from the confluence of the two oceans of differing temperatures directly affects this narrow strip of land (11kms at its widest point) where grapes enjoy slow-ripening conditions, ideal for producing premium wines. Each of the three terroirs, with an excellent variety of soil & micro-climatic conditions, were selected for their specific suitability to the cultivation of particular varieties. On the cool south-facing slopes of Noordhoek Estate, Sauvignon blanc, Chardonnay and Pinot noir, as well as Semillon were planted. The warmer north-facing slopes on Scarborough Estate were selected for their potential to produce premium red wines, being planted to Cabernet Sauvignon and Shiraz.
<table>
<thead>
<tr>
<th><strong>Wine Profile</strong></th>
<th><strong>Cape Point Vineyards</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Cape Point Isliedh</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>300-400 x 12</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>6 years</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td>Generally mostly Sauvignon 15-30% Semillon depending on vintage</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Cape Point</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>Semillon: 80-100m, Sauvignon blanc: 170-210m</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>10-20%</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>convex</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>midslope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>medium</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>plus minus 19 degrees</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>Day: 21-23, night: 15-17</td>
</tr>
<tr>
<td><strong>Does wind/ sea breezes play a role</strong></td>
<td>Yes, wind pumps</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Definitely cool</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>1000-1200mm/ year</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Granite and sandstone</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Klapmuts, oakleaf, hutton and tukulu</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature, soil buffering, well drained</strong></td>
<td>Well drained soils</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress-neutron probe/pressure bomb</strong></td>
<td>yes: have good water holding. No, pressure bomb and vineyard monitoring</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>Yes: intensive soil analysis, aspect, different vine spacing, varying delivery drip pipe, infra red aerial photos, biological farming methods, specific root stock and clone selection, wind sensitive row</td>
</tr>
<tr>
<td><strong>Cultivars</strong></td>
<td>Sauv. Blanc and Semillion</td>
</tr>
<tr>
<td><strong>Clones</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>SB11 on R110 and GD1 on R99</td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>sput</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>drip</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Yes, plus minus 8 small irrigations depending on the vineyard. Wind dries things out incredibly</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>VSP</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Semillon is very sensitive but good spreading controls are in place</td>
</tr>
</tbody>
</table>
Nitida Cellars falls within the Durbanville ward (Fig. 9) and is another area recognised for high quality wines, producing grapes that are highly sought after, as is evidenced by the recent establishment of a cellar dedicated to this ward. This was done in partnership with most of the producers in the ward. Durbanville ward is characterised by a south-north running range of hills, known as Tygerberg and Kanonkop, opening up towards the west (10 km) and south (28 km) to the sea. The vineyards are situated mainly on the eastern slopes at altitudes of 100-300 m. Soils are derived from greywacke and phyllitic shales, and are mainly reddish-brown, deep and well drained. Contrary to typical Western Cape highly weathered soils, these soils are not acid. They have a good water-holding capacity, making dry land production possible, even with a rainfall of only 481 mm on the eastern slopes (Anon, undated) and even less on the western slopes. Although the mean February temperature is given as 22.4°C (Anon, undated), the duration of high temperatures during the day is short, due to cooling by prevailing summer sea breezes from False Bay which usually take effect at midday. Wines from this ward which attract attention are made predominantly from Sauvignon blanc, Chardonnay, Merlot and Cabernet Sauvignon varieties.
<table>
<thead>
<tr>
<th>Wine Profile</th>
<th>Nitida Cellars</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Sauvignon Blanc</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>400</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>5 - 8 years</td>
</tr>
<tr>
<td><strong>Grape variety</strong></td>
<td>Sauvignon blanc 95%, Sauvignon blanc 5% semillon</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>District or Ward</td>
</tr>
<tr>
<td><strong>District or Ward</strong></td>
<td>Durbanville</td>
</tr>
<tr>
<td><strong>Geology</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>220 - 280 above sea level</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>South</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Concave</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Midslope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>22 Degrees Celsius</td>
</tr>
<tr>
<td><strong>Does wind/sea breezes play a role</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Cool, close to Atlantic</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>550mm</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Clovelly Hutton</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained</strong></td>
<td>No chemical restraints. Yes, well drained soils. Yes, good water holding capacity.</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neutron probe/pressure bomb</strong></td>
<td>Capacitance probe</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Cultivars</strong></td>
<td>Sauvignon Blanc</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>Rootstocks R110, but changing to 101-14.</td>
</tr>
<tr>
<td><strong>Vineyards: size, age, first production</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Plant spacing between rows and within rows</strong></td>
<td>1.5 x 2.7</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>Short bearer cordon</td>
</tr>
<tr>
<td><strong>Type of canopy</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Drip</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Yes, 2 - 3 times</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Trellised</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>2 wired Perold, 1.8m</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Yield</strong></td>
<td>10 tons Ha</td>
</tr>
<tr>
<td><strong>B degree at harvesting</strong></td>
<td>22 degree B</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>No</td>
</tr>
</tbody>
</table>
Philadelphia ward – Capaia

The ward of Philadelphia is a new ward within the Tygerberg District north of Durbanville which also benefits from cooling Atlantic influences. The hilly terrain of this area means some of the vineyards are higher than usual, up to 260m above sea level. This facilitates a significant difference in day-night temperature and results in slower ripening. Some highly regarded Cabernet Sauvignons, Merlots and red blends have already emerged from this promising appellation. The vines of Capaia were established in 1997 with the first harvest in 2003. From the first release this Bordeaux blend have been awarded many accolades and though it does not fall in the same category as Thelema or a Kanonkop as far as track record is concerned, it is worth noting as an area of great potential and the added diversity of a cooler area.
<table>
<thead>
<tr>
<th>Wine Profile</th>
<th>Capaia Wines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Capaia</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>5400 x 6 x 750ml</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>6 Years</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td>Usually</td>
</tr>
<tr>
<td><strong>Relationship to coast</strong></td>
<td>Close to West Coast</td>
</tr>
<tr>
<td><strong>District or Ward</strong></td>
<td>Philadelphia</td>
</tr>
</tbody>
</table>

**Topography and mesoclimate**

- **Vineyard altitude**: 155 - 270m
- **Slope aspect**: South, S-East, North, North-East & West
- **Inclination of slope**: Both convex & concave
- **Position on slope**: Midslopes & Footslopes
- **Day/night temperature variation**: Medium
- **Temperature during ripening**: Plus minus 16 min - 26 max average (No official records)
- **Day/night temperature at harvesting**: Plus minus min - 26 max Average (No official records)
- **Does wind/ sea breezes play a role**: Yes. Very big influence
- **Describe meso climate**: Yes. Both cool meso climate & cool terroir
- **Average rainfall**: Plus minus 450mm. Winter months

**Soil**

- **Parent soils**: Colluvium
- **Soils in vineyard**: Ph Ranges from 3.5 to 6.5 (Ave: plus min. 5.4). Loamy & clay soils with sub-soil clay content of 30-35%. Very old soils of Pliocene material of plus min. 2,500,000 yrs. Excellent internal drainage. Lithocutanic soils on Eastern ridge of the higher part of the Koeberg, with neocutanic soils on rest of farm. No subsoil barriers. Shalestone occurs in parts too.

**Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained**

- **Mulching, cover crops in winter, weed control in growing season to limit water stress. Yes, very well drained soils. Water holding capacity and cation exchange capacity is considered very favourable.**

**Measuring of water holding/stress- neutron probe/pressure bomb**

- **No**

**Vineyard management**

- **Precision viticulture tools**: No
- **Cultivars**: SO4, Richter 110 & MO 314, 343, 348; CS15, 46, 169B; PR400, 8719, CF1A, 214, 312, 623
- **Clone and Rootstocks**: SO4, Richter 110 & MO 314, 343, 348; CS15, 46, 169B; PR400, 8719, CF1A, 214, 312, 623
- **Vineyards: age**: 9 Years
- **Pruning**: 2 - bud spur pruning
- **Irrigation type**: Drip
- **Irrigation when**: Yes. Plus min. Tice
- **Trellised or bush vines**: Trellised
- **What type of training system**: 3 wire double & single cordon
- **Cover crops**: Yes
- **Management of leafroll virus**: No
- **Footprint of the wine- general observations**: The complete terroir complex-soil climate, viticulture, clone
- **Organic/ Bio-dynamic farming principles**: No
Darling/ Groenekloof Ward –Cloof Single Vineyard Shiraz

Cloof falls within the Groenekloof ward of Darling. It lies further to the north and 10-12 km from the cold Atlantic Ocean is another range of hills, running parallel to the coast and consisting of erosion exposed granite intrusions. This area has been demarcated as Groenekloof ward (Fig. 4), but is popularly known as Darling. Here the climatic conditions are very similar to those of Durbanville, with a MFT of 22.4°C and annual rainfall of 538 mm (Anon, undated). Again, this ward is characterised by deep reddish-brown soils formed from pre-weathered granite, with a good water holding capacity, making viticulture without irrigation possible. Grapes from this ward are highly contested for by various cellars and winemakers, proving the merit of this ward and serving as justification for its demarcation as a wine of origin unit. The most coveted grapes from this ward are Sauvignon blanc, Merlot, Cabernet Sauvignon and to a lesser extent, Pinot noir.
### Wine Profile: Cloof Crucible Shiraz

<table>
<thead>
<tr>
<th>Brand name of the wine.</th>
<th>Cloof Crucible Shiraz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Name:</td>
<td>Cloof Cabernet Franc.</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td><strong>1000 x 12</strong></td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>Two blocks situated next to each other, planted 1998 and 2000 of 1.11 ha and 1.25 ha respectively</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td>Straight Shiraz</td>
</tr>
<tr>
<td><strong>District or Ward</strong></td>
<td>Origin Darling, ward Groenekloof. We discontinued the name Groenekloof in 2003, when SAWIS officially recognised Darling as an area, for commercial purposes in unison with the other 3 cellars in the Darling Area</td>
</tr>
</tbody>
</table>

### Topography and mesoclimate:

<table>
<thead>
<tr>
<th>Vineyard altitude</th>
<th>Between 145m and 150m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Slope aspect</strong></td>
<td>East facing</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Upper foot slope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Medium, the South Easter blow's from 1400hr until approx 2000hr each day, which keeps the temperature fairly uniform except during the February/March heat wave where the drop can be up to 10 perc. C between pre and post South Easter.</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>25Perc. C</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>Day 30 Perc C, Night 22 Perc C</td>
</tr>
<tr>
<td><strong>Does wind/sea breezes play a role</strong></td>
<td>Not really, Shiraz is prone to wind damage so the vines grow constantly</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Warm climate</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>Spring: 100mm, summer: 20mm, autumn: 150mm, winter: 300mm</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td>Decomposed granite and clay (75/25%)</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Not available</td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Decomposed granite and clay</td>
</tr>
<tr>
<td><strong>Soil characteristics - water holding and regulation, soil temperature, soil buffering, well drained</strong></td>
<td>Decomposed granite and clay. Yes the vineyards are not irrigated and stress due to insufficient water during the growing season isn't common in our vineyards. Except when we have poor rainfall through the year.</td>
</tr>
</tbody>
</table>

### Vineyard management:

| **Precision viticulture tools** | No, the previous owner just planted there but never had the chance to enjoy the fruit of what was planted. With hind sight we realised after 2002, when the farm was bought by the current owner and the first harvest was produced that the site was the best suited to Shiraz as well as Merlot. |
| **Cultivars**                 | Single vineyard Shiraz |
| **Clones**                    | We don't know the specific clone but all vines if grafted on R99 |
| **Rootstocks**                | We don't know the specific clone but all is grafted on rootstock R99 |

### Site characteristics:

<table>
<thead>
<tr>
<th>Plant spacing between rows and within rows</th>
<th>1.2m x 3 m</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pruning</strong></td>
<td>Bush vine, 4 to 6 arms with two buds per arm</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Noa</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>No, bush vines, un-irrigated</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Bush vines</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes, in winter we sow wheat, which we either spray with herbicides or left to die naturally. This is for humus and amelioration of the soil structure.</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Not at this stage as they are still young</td>
</tr>
</tbody>
</table>

### Harvesting:

<table>
<thead>
<tr>
<th><strong>Yield</strong></th>
<th>2.5 t/ha</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Berry composition</strong></td>
<td>approx 720 1/ton</td>
</tr>
<tr>
<td><strong>B degree at harvesting</strong></td>
<td>Merlot: 16% ha, 650 l/ton, Cab. Franc: 2.5% ha, 880 l/ton, Cab. Sauv: 0.9% ha, 740 l/ton</td>
</tr>
<tr>
<td><strong>Chemical wine analysis</strong></td>
<td>Alc: 15.54%, Total Extract: 42 g/l, TA: 6.9 g/l, Ph: 3.88, RS: 5.2 g/l</td>
</tr>
<tr>
<td><strong>Footprint of the wine</strong></td>
<td>Decomposed granite that helps maturation of berries at night and that they are bush vines</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>No, but we try to be as ecological as possible, hence our next project to join the biodiversity program, which is already at a very advanced stage</td>
</tr>
</tbody>
</table>
Simonsberg-Stellenbosch Ward

- Thelema Vineyards  Single Vineyard C/S

Thelema Vineyards falls within the ward of Simonsberg-Stellenbosch. This ward is a very sought-after address in terms of quality wines in Stellenbosch, more particularly the western, southwestern and southern slopes of Simonsberg, Stellenbosch Mountain and Helderberg. These zones are again characterised by yellow-brown to reddish-brown, deeply weathered soils with good drainage and water-holding properties, typically situated at altitudes of 150-400 m.

In these zones, the Simonsberg-Stellenbosch ward (Fig. 4) is making a name for itself and encompasses more than nine well-known estates and private cellars. Here the MFT is 21.5°C and annual rainfall 755 mm (Anon, undated). This ward has predominantly south-westerly aspects and, because of altitudes commonly higher than 200 m, it is generally open to the cool south-westerly summer sea breezes from False Bay, 25 km distant. The wines from this ward are predominantly red, made from Cabernet Sauvignon, Merlot and Shiraz, with wines made from the locally bred Pinotage variety also regularly reaping awards locally and internationally.
<table>
<thead>
<tr>
<th>Wine Profile</th>
<th>Farm Name: Thelema</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brand name of the wine.</td>
<td>Thelema Cabernet Sauvignon “The Mint” 2004</td>
</tr>
<tr>
<td>Cases produce 12/6</td>
<td>1000 cases of 12</td>
</tr>
<tr>
<td>Age of vineyards</td>
<td>21 Years</td>
</tr>
<tr>
<td>If a blend- percentages of the xx varieties</td>
<td>100% Cabernet Sauvignon</td>
</tr>
<tr>
<td>varieties blended</td>
<td></td>
</tr>
<tr>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>District or Ward</td>
<td>Simonsberg</td>
</tr>
<tr>
<td>Topography and mesoclimate</td>
<td></td>
</tr>
<tr>
<td>Vineyard altitude</td>
<td>Approx 370 metres above sea level</td>
</tr>
<tr>
<td>Slope aspect</td>
<td>North, North-east</td>
</tr>
<tr>
<td>Position on slope</td>
<td>Probably footslope</td>
</tr>
<tr>
<td>Day/night temperature variation</td>
<td>Don't know</td>
</tr>
<tr>
<td>Temperature during ripening</td>
<td>I’d have to look it up somewhere - it doesn't really interest me</td>
</tr>
<tr>
<td>Day/night temperature at harvesting</td>
<td>I can’t change the climate so I tend not to worry too much about Perhaps</td>
</tr>
<tr>
<td>Does wind/ sea breezes play a role</td>
<td>Yes</td>
</tr>
<tr>
<td>Describe meso climate</td>
<td>Coolish</td>
</tr>
<tr>
<td>Soil</td>
<td></td>
</tr>
<tr>
<td>Parent soils</td>
<td>Decomposed granite</td>
</tr>
<tr>
<td>Soils in vineyard</td>
<td>Mainly Tukulu</td>
</tr>
<tr>
<td>Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained</td>
<td>They are generally quite acidic. Have well drained soils. Good water holding capacity.</td>
</tr>
<tr>
<td>Measuring of water holding/stress- neutron probe</td>
<td>Neutron probe doesn't measure water stress. We use pressure bomb</td>
</tr>
<tr>
<td>Vineyard management</td>
<td></td>
</tr>
<tr>
<td>Precision viticulture tools</td>
<td>Depends on your definition of precision viticulture. We like to think that we are precision farmers</td>
</tr>
<tr>
<td>Clones</td>
<td>Clone 163 on 101-14</td>
</tr>
<tr>
<td>Site characteristics:</td>
<td></td>
</tr>
<tr>
<td>Pruning</td>
<td>Cordon-trained, spur pruning</td>
</tr>
<tr>
<td>Irrigation type</td>
<td>Drip</td>
</tr>
<tr>
<td>Irrigation when</td>
<td>We irrigate when necessary, depends on conditions</td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>VSP training</td>
</tr>
<tr>
<td>Cordon height</td>
<td></td>
</tr>
<tr>
<td>Cover crops</td>
<td>Yes, permanent fesque grass</td>
</tr>
<tr>
<td>Management of leafroll virus</td>
<td>Yes</td>
</tr>
<tr>
<td>Harvesting:</td>
<td></td>
</tr>
<tr>
<td>Organic/ Bio-dynamic farming principles</td>
<td>Not really, but we do make our own compost and use this on the bankies and we adopt what we call &quot;sensible viticultural practices&quot;</td>
</tr>
</tbody>
</table>
Stellenbosch inclusive of the Helderberg - Vergelegen Single Vineyard
<table>
<thead>
<tr>
<th>Wine Profile</th>
<th>Vergelegen</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Sauvignon Blanc Reserve</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>500 x 12</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>16 years, planted in 1990</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>Grid reference</td>
<td>34.09degree South, 18.55degree East</td>
</tr>
<tr>
<td>Altitude range</td>
<td>Coastal Lowlands 100m- 315 m max</td>
</tr>
<tr>
<td>Relationship to coast</td>
<td>False Bay 7km to south-west</td>
</tr>
<tr>
<td>District or Ward</td>
<td>Table Bay 46 km wet-north-west</td>
</tr>
<tr>
<td><strong>History of farm</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td>Vineyard altitude</td>
<td>300m above sea level</td>
</tr>
<tr>
<td>Slope aspect</td>
<td>Southern slope</td>
</tr>
<tr>
<td>Inclination of slope</td>
<td>convex</td>
</tr>
<tr>
<td>Position on slope</td>
<td>Crest</td>
</tr>
<tr>
<td>Day/night temperature variation</td>
<td>Medium</td>
</tr>
<tr>
<td>Temperature during ripening</td>
<td>19.9 - 20.3</td>
</tr>
<tr>
<td>Day/night temperature at harvesting</td>
<td>Day = 27.88, Night=16.42</td>
</tr>
<tr>
<td>Does wind/ sea breezes play a role</td>
<td>Yes</td>
</tr>
<tr>
<td>Describe meso climate</td>
<td>Yes - cool</td>
</tr>
<tr>
<td>Average rainfall</td>
<td>600-700mm, May - August</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td>Soils in vineyard</td>
<td>Glenrosa, 70-80 shale fragments on weathered, relatively soft shale parent materials.</td>
</tr>
<tr>
<td>Soil characteristics- water holding and regulation, soil temperature;soil buffering, well drained</td>
<td>Well drained</td>
</tr>
<tr>
<td>Measuring of water holding/stress- neutron probe/pressure bomb</td>
<td>No chemical restraints</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td>Precision viticulture tools</td>
<td>No</td>
</tr>
<tr>
<td>Clones</td>
<td>SB 159</td>
</tr>
<tr>
<td>Rootstocks</td>
<td>Richter 110</td>
</tr>
<tr>
<td>Vineyards: age</td>
<td>16 Years old vines</td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td>Block size</td>
<td>4.06ha</td>
</tr>
<tr>
<td>soil preparation</td>
<td>shift delve ploughed to 80-90cm depth</td>
</tr>
<tr>
<td>Plant spacing between rows and within rows</td>
<td>2.5m between</td>
</tr>
<tr>
<td>Pruning</td>
<td>1.5m within rows spur pruned</td>
</tr>
<tr>
<td>Type of canopy</td>
<td>Vertically supported</td>
</tr>
<tr>
<td>Irrigation type</td>
<td>Drip</td>
</tr>
<tr>
<td>Irrigation when</td>
<td>Schaapenberg is dryland</td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>Trellised</td>
</tr>
<tr>
<td>What type of training system</td>
<td>9- wired lengthened Perold</td>
</tr>
<tr>
<td>Cordon height</td>
<td>0.75m</td>
</tr>
<tr>
<td>Cover crops</td>
<td>Barley rye</td>
</tr>
<tr>
<td>Management of leafroll virus</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td>Yield</td>
<td>5-6 Tons Ha</td>
</tr>
<tr>
<td>B degree at harvesting</td>
<td>25.5 B degree</td>
</tr>
<tr>
<td>Organic/ Bio-dynamic farming principles</td>
<td>No</td>
</tr>
<tr>
<td>Wine Profile</td>
<td>Rust en Vrede</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Rust en Vrede Estate Wine</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>7000</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>Average of 9 years</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td>Cab. = 60%, Shiraz = 30%, Merlot = 10%</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>District or Ward Stellenbosch, Helderberg</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>Plus min.350m above sea level</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>North facing</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Convex</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Footslope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>28 - 34 Perc. Celc</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>Min. + - 12 Deg. C Max. + - 32 Deg C</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Warm climate</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>750mm Winter</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Weathered Granite, Clay</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Deep, red in colour, good Water retention</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature;soil buffering, well drained</strong></td>
<td>No chemical or physical restraints in soil. Reasonably drained soils. Yes, good water holding capacity.</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neutron probe/pressure bomb</strong></td>
<td>No chemical or physical restraints in soil. Reasonably drained soils. Yes, good water holding capacity.</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Cultivars</strong></td>
<td>Cab Sauv.; Shiraz; Merlot</td>
</tr>
<tr>
<td><strong>Clones and Rootstocks</strong></td>
<td>101 - 14</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>Short spur</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Drip</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Yes, + - 3 times</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Trellised</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>3 wire cordon</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Whole farm replanted</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>No</td>
</tr>
<tr>
<td>Wine Profile</td>
<td>Farm Name: Cordoba</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>--------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Cordoba Crescendo</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>900 x 12 x 750 ml</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>3 years to 21 years</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties</strong></td>
<td>Plus min. 70% Cab Franc, Plus min. 10-20% Merlot, Plus min. 10-20% Cab Sauv</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>identified NTU</td>
</tr>
<tr>
<td><strong>Relationship to coast</strong></td>
<td>Close</td>
</tr>
<tr>
<td><strong>District or Ward</strong></td>
<td>Helderberg - Stellenbosch</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>300 - 500 m.a.s.l.</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>North-East, North-West</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Convex</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Midslope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Moderate variation due to maritime influence</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>20 - 21 Deg. C</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>Day: 24-26Deg C Night: 15-17Deg C</td>
</tr>
<tr>
<td><strong>Does wind/ sea breezes play a role</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Meso climate moderately cool</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>800 mm May - August</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Shale and Granite</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Oakleaf/Tukulu - of shale and granitic origin, 20-30% clay, good drainage due to stones, deep &amp; Lo</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature, soil buffering, well drained</strong></td>
<td>Low ph - add lime. Yes have well drained soils. Good holding capacity due to clay</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neutron probe/pressure bomb</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Clones</strong></td>
<td>Cab Franc ID, Cab Franc 214, Cab Franc 623, Cab Franc 312, Merlot 192, Merlot 36, Merlot 343, CabSauv 163, C Sav 46, C Sav 37</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>R110 - 101-14</td>
</tr>
<tr>
<td><strong>Vineyards: size, age, first production</strong></td>
<td>21 Y.</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>2-bud spurs</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Drip</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Largely dry land. Young vineyards irrigated 1-2 times/season</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Trellised</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>7 Wire hedge or VSP</td>
</tr>
<tr>
<td><strong>Cordon height</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Not permanent - Winter only</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>Biodynamic to a certain degree - environmentally sensitive agricultural practices applied.</td>
</tr>
<tr>
<td>Wine Profile</td>
<td>Rudera Wines</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Rudera Robusto Chenin blanc</td>
</tr>
<tr>
<td><strong>Rudera Chenin blanc. Noble late Harvest</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>750 x 6 x 750ml</td>
</tr>
<tr>
<td><strong>5966 x 375ml</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>Planted between 1985 and 1979</td>
</tr>
<tr>
<td><strong>Planted between 1986 and 1979</strong></td>
<td></td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td>100% Chenin blanc</td>
</tr>
<tr>
<td><strong>100% Chenin blanc</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Previously Stellenbosch, Koelenhof - Now a Helderberg vineyard is added</td>
</tr>
<tr>
<td><strong>Stellenbosch, Koelenhof</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>Between 200m and 300m</td>
</tr>
<tr>
<td><strong>Between 200m and 300m</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>North West</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Concave</td>
</tr>
<tr>
<td><strong>Concave</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Midslope and valley</td>
</tr>
<tr>
<td><strong>Midslope</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Medium</td>
</tr>
<tr>
<td><strong>Medium</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>n/a</td>
</tr>
<tr>
<td><strong>n/a</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Does wind/ sea breezes play a role</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Yes, cool climate</td>
</tr>
<tr>
<td><strong>Yes, cool climate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>winter</td>
</tr>
<tr>
<td><strong>Winter</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Shale and sandstone</td>
</tr>
<tr>
<td><strong>Shale</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Mostly broken shale and koffieklip</td>
</tr>
<tr>
<td><strong>Mostly broken shale</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained</strong></td>
<td>Well drained soils, yes. One vineyard have good water holding capacity, but not the other vineyard.</td>
</tr>
<tr>
<td><strong>Yes, well drained soils. Yes,</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neutron probe/pressure bomb</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>No</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>No</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyards: size, age, first production</strong></td>
<td>27 Year old vines</td>
</tr>
<tr>
<td><strong>27 Year old vines</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>2 eye pruning</td>
</tr>
<tr>
<td><strong>2 eye pruning</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Sprinkler</td>
</tr>
<tr>
<td><strong>Sprinkler</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>bush vines</td>
</tr>
<tr>
<td><strong>bush vines</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>No</td>
</tr>
<tr>
<td><strong>No</strong></td>
<td></td>
</tr>
<tr>
<td>Wine Profile</td>
<td>De Trafford Wines</td>
</tr>
<tr>
<td>--------------</td>
<td>------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>De Trafford Shiraz 2004</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>258 x 12 x 750ml</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>9 years</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>Relationship to coast</td>
<td>Close</td>
</tr>
<tr>
<td>District or Ward</td>
<td>Stellenbosch Berg</td>
</tr>
<tr>
<td><strong>Topography and mesoclimatic</strong></td>
<td></td>
</tr>
<tr>
<td>Vineyard altitude</td>
<td>400m</td>
</tr>
<tr>
<td>Slope aspect</td>
<td>North West facing</td>
</tr>
<tr>
<td>Inclination of slope</td>
<td>concave</td>
</tr>
<tr>
<td>Position on slope</td>
<td>midslope</td>
</tr>
<tr>
<td>Temperature during ripening</td>
<td>Relatively Cool</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td>Parent soils</td>
<td>Rocky granitic-based Hutton soil</td>
</tr>
<tr>
<td>Soils in vineyard</td>
<td>Rocky granitic based Hutton in Mont Fleur vineyard and Deep red Hutton in Keermont vineyard</td>
</tr>
<tr>
<td>Soil characteristics-</td>
<td>water holding and regulation, soil temperature; soil buffering, well drained</td>
</tr>
<tr>
<td>Measuring of water holding/stress- neuron probe/pressure bomb</td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td>Precision viticulture tools</td>
<td>Shiraz</td>
</tr>
<tr>
<td>Cultivars</td>
<td>Shiraz</td>
</tr>
<tr>
<td>Clones</td>
<td>Clones SH21A; SH1A &amp; SH99 all on - 101 - 14 rootstock. 5000 vines/hect</td>
</tr>
<tr>
<td>Rootstocks</td>
<td>101-14</td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td>Irrigation when</td>
<td>Sometimes light irrigation if necessary (see tasting notes)</td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>Trellis</td>
</tr>
<tr>
<td>What type of training system</td>
<td>7 wire vertical trellis with moveable foliage wires</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td>Yield</td>
<td>5 Tons per hectare</td>
</tr>
<tr>
<td>B degree at harvesting</td>
<td>23.5 - 25.6B</td>
</tr>
<tr>
<td>Wine Profile</td>
<td>Farm Name: Saxenburg</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Saxenburg Shiraz Private Collection/SSS Saxenburg Private Collection Sauvignon Blanc</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>PC = 4000 SSS = Max. 300 5000 x 12 x 750 ml.</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>15 Years 6 - 21 years</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Kuilsriver, Stellenbosch Kuilsriver (Polkadraai) Stellenbosch</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>180 - 250 mm 200 - 220m</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>West to North West South - Southwest</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Concave Concave</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Midslope - crest Midslope - to the crest</td>
</tr>
<tr>
<td><strong>Does wind/sea breezes play a role</strong></td>
<td>No, not on this slope Yes - South west wind from False Bay</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Cool climate Cool climate</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>Spring + - 50-75mm., summer + - 25-30mm., winter 250 - 450mm. Spring + - 50 - 75mm, summer + - 25 - 30mm, winter 250 - 450 mm.</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Decomposed granite with some clay undermine Granit with gravel on top</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Cartref / light structure sandy/litoquatic Oakleaf / Swartland</td>
</tr>
<tr>
<td><strong>Soil characteristics - water holding and regulation, soil temperature; soil buffering, well drained</strong></td>
<td>Some soils are shallow and we need to rip well during autumn and irrigation in late summer. Well drained soils, most are but some patches not. Medium - need to irrigate during late summer. No, only some spots which are rocky. Yes, well drained soils. Most soils have good water holding capacity but the decomposed granite not.</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress - neutron probe/pressure bomb</strong></td>
<td>Judging the vegetation. We watch the vegetation in the vineyards and react before forecast heat waves.</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>Ripping, Machine Harvest Machine Harvest</td>
</tr>
<tr>
<td><strong>Cultivars</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Clones and Rootstocks</strong></td>
<td>Clones SH 9C, SH99B, SH 1A on 101-14 x R99 Clone SB10 E, SB 316, SB 317A - R49 x R110</td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Plant spacing between rows and within rows</strong></td>
<td>1 x 1,8m.</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>Double cordon (2 bud) Double cordon (2 bud)</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Drip Drip</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Yes, max. 2X during late summer + - 15mm each. Yes, maximum 2x during late summer + - 25mm each.</td>
</tr>
<tr>
<td><strong>What type of training system and Cordon height</strong></td>
<td>(a) Double-cordon, 1,8m high frame with lifting stations for the vegetation. (a) Double-cordon, 1,8m frame with lifting station for the vegetation. (b) Cordon height = 0.6m.</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes, spray it down and mulch it later. Yes, spray it down and mulch it later.</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Not yet, but soon, we have to replant some of the vineyards. No - not on the Savignon Blanc</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Yield</strong></td>
<td>2-4T Ha 5 T Ha</td>
</tr>
<tr>
<td><strong>B degree at harvesting</strong></td>
<td>25 - 27 degree B 24 Deg. Balling</td>
</tr>
<tr>
<td><strong>Chemical wine analysis</strong></td>
<td>Shiraz 2003 pH 3.8, TA 5.8, RS 2.0, Alc. 14.0 (14.3) TA6.3, pH 314, RS 4.5, Alc. 13.5 (13.7)</td>
</tr>
<tr>
<td><strong>Footprint of the wine-general observations</strong></td>
<td>Low fertility of soils on warm western slopes</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>No but limited treatment is my opinion No but I believe in little as possible treatment rather &quot;farm&quot;-correct.</td>
</tr>
<tr>
<td>Wine Profile</td>
<td>Farm Name: Simonsig</td>
</tr>
<tr>
<td>--------------------------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Merindol Syrah</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>Simonsig Redhill</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>1000 x 12</td>
</tr>
<tr>
<td><strong>1995</strong></td>
<td>1200 x 12</td>
</tr>
<tr>
<td><strong>if a blend- percentages of the xx varieties</strong></td>
<td>Simonsig Redhill</td>
</tr>
<tr>
<td><strong>blended</strong></td>
<td>Pinotage Single Vineyard</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Bottelary Hills</td>
</tr>
<tr>
<td><strong>District or Ward</strong></td>
<td>Stellenbosch origin, No ward</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>145 - 150m above sealevel</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>Slope 3% North-East</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Slightly convex</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Midslope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>medium</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>February: Average 21.7Deg C, 28Deg C Max. 15.3Deg C Min.</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>March: 26.5Deg C Max., - 14.1Deg C Min.</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Cool climate</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>700mm - July, August</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Granite origin</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Shaly: Villafortes, Pinedene</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature, soil buffering, well drained</strong></td>
<td>No chemical or physical restraints Well drained soils and good water holding capacity.</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neutron probe/pressure bomb</strong></td>
<td>Yes, make use of neutron probe</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td>No - We know the quality of the soil is superb for red wine growing</td>
</tr>
<tr>
<td><strong>Cultivars</strong></td>
<td>Shiraz Pinotage</td>
</tr>
<tr>
<td><strong>Clones</strong></td>
<td>SH 99B Pi 48</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>101 - 14 101 - 14 rootstock</td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>2 bud spurs.</td>
</tr>
<tr>
<td><strong>Type of canopy</strong></td>
<td>2 bud spurs</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Dripper</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Sprinkle: 4hr opstellings - 40mm</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Yes, depending on the information. + - 6 times. Anything from 12 - 24hrs/</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>Yes: Sprinkle irrigation - Twice a year: Before and after harvest.</td>
</tr>
<tr>
<td><strong>Cordon height</strong></td>
<td>Vertical shoot position. 5 wire systems.</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Yes, but only about 3% of the vines</td>
</tr>
<tr>
<td><strong>Footprint of the wine- general observations</strong></td>
<td>Yes: about 2-3% infection</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>No</td>
</tr>
</tbody>
</table>

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### Wine Profile

<table>
<thead>
<tr>
<th>De Toren Private Cellar</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>De Toren Fusion V</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>3850 x 12bts</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>Oldest 15 years, youngest 2 years</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the x varieties blended</strong></td>
<td>Cab. Sav. 57%, Cab. Franc 11%, Merlot 14%, Malbec 14% Petit Verdot 4%</td>
</tr>
<tr>
<td><strong>District or Ward</strong></td>
<td>Stellenbosch (Polkadraai Hills)</td>
</tr>
</tbody>
</table>

### Topography and mesoclimate

| **Vineyard altitude** | 200meters above sea level |
| **Slope aspect** | South West and South |
| **Inclination of slope** | Concave |
| **Position on slope** | Crest of slopes |
| **Day/night temperature variation** | Large |
| **Temperature during ripening** | 30 degrees Celsius during pigment formation |
| **Day/night temperature at harvesting** | Night 12C, Day 30C |
| **Does wind/ sea breezes play a role** | No |
| **Describe meso climate** | Yes, cool climate and cool terroir |
| **Average rainfall** |  |

### Soil

| **Soil characteristics- water holding and regulation, soil temperature, soil buffering, well drained** | Not really any restraints, but in the summer due to large amount of clay in the bottom soils we might irrigate small parts that we know struggles to prevent the clay drying out totally and cut of the vines. Have well drained soils. |
| **Measuring of water holding/stress- neutron probe/pressure bomb** | Fairly good water holding capacity. Watermark system that is connected to probes that are at depths of 300mm, 600mm and some places 900mm |

### Vineyard management

| **Cultivars** | C/S; Merlot; C/Franc; Petit Verdot; Malbec |
| **Clones** | Up to 17 various clones |
| **Rootstocks** |  |
| **Vineyards: size, age, first production** | Youngest 2 years - Oldest 15 Y |

### Site characteristics:

| **soil preparation** | After pruning we mulch the material. We only plough before we put down the covercrop and at no other time we plough. |
| **Plant spacing between rows and within rows** | Some vineyards are 2,5m and some 2,5mx1m and some 1,8mx1m. All depended on the soil type and cultivar |
| **Pruning** | All hand pruning, 2 buds per shoot and wide spacing on cordon arms. |
| **Irrigation type** | Drip |
| **Irrigation when** | Yes, we have drip and depended on the season we irrigate |
| **Trellised or bush vines** | Trellised |
| **What type of training system** | 6 movable wire system, |
| **Cordon height** | 1,2metres |
| **Cover crops** | Yes |
| **Management of leafroll virus** | Old block of Cab S but we manage it in a way to prevent it spreading and planning to replace this block. |

### Harvesting:

| **Yield** | 6-10T/Ha |
| **B degree at harvesting** | 25 B degree ave |
Bottelary Hills Ward - Hartenberg Estate Single vineyard
- Kaapzicht Estate

The wines of Hartenberg and Kaapzicht falls within the Bottelary Hills ward. There are three wards already demarcated in the Bottelary range of hills in the Stellenbosch District, all of them again benefiting from cooling summer sea breezes. These are Papegaaiberg, Devon Valley and Bottelary (Fig. 4). Several estates and private cellars have distinguished themselves in terms of quality wines in these wards, especially the Bottelary ward, Pinotage again being prominent here.
<table>
<thead>
<tr>
<th>Wine Profile</th>
<th>Farm Name: Hartenberg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Gravel Hill Shiraz</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>100 x 6 bottle cases - only for Cape Winemakers Guild, not sold at the farm. Can produce 1000 x 6 bottle cases</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>37 Years</td>
</tr>
<tr>
<td>District or Ward</td>
<td>Bottelary, Stellenbosch</td>
</tr>
</tbody>
</table>

**Topography and mesoclimates**

<table>
<thead>
<tr>
<th>Slope aspect</th>
<th>North-facing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inclination of slope</td>
<td>Convex</td>
</tr>
<tr>
<td>Position on slope</td>
<td>Midslope</td>
</tr>
<tr>
<td>Day/night temperature</td>
<td>Medium</td>
</tr>
<tr>
<td>variation</td>
<td></td>
</tr>
<tr>
<td>Temperature during ripening</td>
<td>19 - 24 Deg. Celcius</td>
</tr>
<tr>
<td>Day/night temperature at</td>
<td>Night - 15 D. Celcius, Day - 28 D Celcius</td>
</tr>
<tr>
<td>harvesting</td>
<td></td>
</tr>
<tr>
<td>Does wind/ sea breezes play</td>
<td>Yes</td>
</tr>
<tr>
<td>a role</td>
<td></td>
</tr>
<tr>
<td>Describe meso climate</td>
<td>No, warm</td>
</tr>
<tr>
<td>Average rainfall</td>
<td>600mm - June - August</td>
</tr>
</tbody>
</table>

**Soil**

<table>
<thead>
<tr>
<th>Parent soils</th>
<th>Decomposed granite and Table Mountain Sandstone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soils in vineyard</td>
<td>Small, granular, coffe bean coloured stones, mixed with broken clay and Kroos</td>
</tr>
<tr>
<td>Soil characteristics- water</td>
<td>Yes, physical restraint, soil depth is 0,5m - 1,0m on pure clay. Yes, have well drained soils. Yes, have good water holding capacity.</td>
</tr>
<tr>
<td>holding and regulation, soil</td>
<td></td>
</tr>
<tr>
<td>temperature;soil buffering,</td>
<td></td>
</tr>
<tr>
<td>well drained</td>
<td></td>
</tr>
<tr>
<td>Measuring of water</td>
<td>No, pressure bomb readings or leaves of the vines and C probe readings in the vineyard.</td>
</tr>
<tr>
<td>holding/stress- neutron</td>
<td></td>
</tr>
<tr>
<td>probe/pressure bomb</td>
<td></td>
</tr>
</tbody>
</table>

**Vineyard management**

<table>
<thead>
<tr>
<th>Precision viticulture tools</th>
<th>No, the site happened to produce exceptional fruit for almost 40 years.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivars</td>
<td>Shiraz</td>
</tr>
<tr>
<td>Clones</td>
<td>SH 470, 174, 300, 99</td>
</tr>
<tr>
<td>Rootstocks</td>
<td>101-14 Mgt. rootstock</td>
</tr>
<tr>
<td>Vineyards: age</td>
<td>50% 37 Years and 50% 12Years</td>
</tr>
<tr>
<td>Pruning</td>
<td>Spur pruning with 2 bud bearers</td>
</tr>
<tr>
<td>Irrigation type</td>
<td>Drip + micro irrigation</td>
</tr>
<tr>
<td>Irrigation when</td>
<td>Yes. Depending on the season (dry/wet) + probe + pressure boms readings.</td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>Trellised. Extended Double Perold</td>
</tr>
<tr>
<td>Cover crops</td>
<td>Yes</td>
</tr>
<tr>
<td>Management of leafroll virus</td>
<td>No</td>
</tr>
<tr>
<td>Footprint of the wine-</td>
<td>The site contributes most</td>
</tr>
<tr>
<td>general observations</td>
<td></td>
</tr>
<tr>
<td>Organic/ Bio-dynamic</td>
<td>Yes, biodynamic</td>
</tr>
<tr>
<td>farming principles</td>
<td></td>
</tr>
<tr>
<td>Wine Profile</td>
<td>Farm Name: Kaapzicht</td>
</tr>
<tr>
<td>-------------------------------------------------</td>
<td>---------------------------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Kaapzicht Steytler Pinotage</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>1000 x 6</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>36 yrs - 50%, 12 yrs - 50%</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>District or Ward</td>
<td>Bottelary, Stellenbosch</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td>Vineyard altitude</td>
<td>140m</td>
</tr>
<tr>
<td>Slope aspect</td>
<td>East and West</td>
</tr>
<tr>
<td>Inclination of slope</td>
<td>Convex</td>
</tr>
<tr>
<td>Position on slope</td>
<td>Footslope</td>
</tr>
<tr>
<td>Day/night temperature variation</td>
<td>Medium to large</td>
</tr>
<tr>
<td>Temperature during ripening</td>
<td>Do not monitor</td>
</tr>
<tr>
<td>Describe meso climate</td>
<td>Mild to cool. Contributing factors: South West wind coming off Falsebay</td>
</tr>
<tr>
<td>Average rainfall</td>
<td>600mm July/August</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td>Parent soils</td>
<td>Weathered Granite</td>
</tr>
<tr>
<td>Soils in vineyard</td>
<td>Clovelly</td>
</tr>
<tr>
<td>Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained</td>
<td>No buffer to soils. Have well drained soils.</td>
</tr>
<tr>
<td>Measuring of water holding/stress- neutron probe/pressure bomb</td>
<td>Yes, good holding water capacity. No, don't make use of neutron probe.</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td>Precision viticulture tools</td>
<td>No</td>
</tr>
<tr>
<td>Cultivars</td>
<td>Cab Sauv.; Merlot; Pinotage</td>
</tr>
<tr>
<td>Rootstocks</td>
<td>R 99</td>
</tr>
<tr>
<td>Pruning</td>
<td>Bush vine - short bearers</td>
</tr>
<tr>
<td>Irrigation type</td>
<td>Sprinkle</td>
</tr>
<tr>
<td>Irrigation when</td>
<td>Once in January</td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>Bush vines</td>
</tr>
<tr>
<td>Cover crops</td>
<td>Yes, in winter</td>
</tr>
<tr>
<td>Management of leafroll virus</td>
<td>A little</td>
</tr>
<tr>
<td><strong>Harvesting:</strong>*</td>
<td></td>
</tr>
<tr>
<td>Yield</td>
<td>7-8 Ton Ha</td>
</tr>
<tr>
<td>Berry composition- average solid content</td>
<td>Small berries</td>
</tr>
<tr>
<td>B degree at harvesting</td>
<td>25-26 degreeB</td>
</tr>
<tr>
<td>Footprint of the wine- general observations</td>
<td>Contributing factor- Low yield and small berries</td>
</tr>
<tr>
<td>Organic/ Bio-dynamic farming principles</td>
<td>No, I can't afford a crop failure, I leave it to the people with isolated vineyards</td>
</tr>
</tbody>
</table>
Elgin Ward -Paul Cluver

-Iona Vineyards

The wines of Paul Cluver and Iona Vineyards fall within Elgin. On the crest of the sandstone Hottentots Holland mountain range is a large basin at an altitude of 200-250 m, where medium structured, often ferruginous soils developed from Devonian Bokkeveld shale parent material. This is the Elgin ward (Fig. 4), traditionally an apple-growing region. The MFT here is 19.7°C and annual rainfall 1010 mm. Elgin has been recognised as a very high potential wine grape area. Wines with exceptional fruitiness have already been produced here and there is a strong drive among producers to establish a code of conduct in terms of varieties, cultural methods and wine styles for this ward in order to qualify for a ‘distinctive wine of origin’ certification. This is a category provided for by legislation but it has as yet never been exploited by any group of producers. The recommended varieties are Sauvignon blanc, Merlot and Shiraz. Cabernet Sauvignon is still considered doubtful because of the late ripening in this cool zone. All indications are that Elgin can become the hub of top of the range quality wines in the Western Cape.
## Wine Profile

<table>
<thead>
<tr>
<th></th>
<th>Paul Cluver</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Paul Cluver Sauvignon Blanc</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>9000/6</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>2 - 15 years</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>District or Ward: Elgin ward</td>
</tr>
</tbody>
</table>

### Topography and mesoclimate

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>500m - 300m</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>South, South-West, West</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Convex</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Midslope/Crest</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Large</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>18 Perc. Celcius</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>Night 12 P C, Day 23 P C</td>
</tr>
<tr>
<td><strong>Does wind/sea breezes play a role</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>800 mm April - September</td>
</tr>
</tbody>
</table>

### Soil

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent soils</strong></td>
<td>Bokkeveld shales</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Gravelly Decomposed shale with clay</td>
</tr>
<tr>
<td><strong>Soil characteristics-water holding and regulation, soil temperature, soil buffering, well drained</strong></td>
<td>Yes, Clay. Yes/No (Drainage is used). Yes, good water holding capacity</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress-neutron probe/pressure bomb</strong></td>
<td>Yes, Clay. Yes/No (Drainage is used). Yes, good water holding capacity</td>
</tr>
</tbody>
</table>

### Vineyard management

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Cultivars</strong></td>
<td>Sauvignon Blanc</td>
</tr>
<tr>
<td><strong>Clones</strong></td>
<td>11, 316, 317, 215</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>R110, R99, 101, 24</td>
</tr>
<tr>
<td><strong>Vineyards: age</strong></td>
<td>18 Years</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>Short Bearer</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Micro IRR</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Yes, 4 - 6 times</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Trellised, 5 - 7 wire</td>
</tr>
<tr>
<td><strong>Planting width</strong></td>
<td>2.5 x 1.0</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>No</td>
</tr>
</tbody>
</table>

### Harvesting:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Yield</strong></td>
<td>5-6 Ton Ha</td>
</tr>
<tr>
<td><strong>Footprint of the wine-general observations</strong></td>
<td>Cool climate</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>No</td>
</tr>
</tbody>
</table>
## Wine Profile

<table>
<thead>
<tr>
<th>Brand name of the wine.</th>
<th>Iona</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases produce 12/6</td>
<td>7000 x 12</td>
</tr>
<tr>
<td>Age of vineyards</td>
<td>3-8 years</td>
</tr>
<tr>
<td>Location</td>
<td>Elgin Ward</td>
</tr>
</tbody>
</table>

## Topography and mesoclimates

<table>
<thead>
<tr>
<th>Vineyard altitude</th>
<th>410 to 425m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slope aspect</td>
<td>South, North East, North West, South East</td>
</tr>
<tr>
<td>Inclination of slope</td>
<td>Convex 15 to 25%</td>
</tr>
<tr>
<td>Position on slope</td>
<td>Crest</td>
</tr>
<tr>
<td>Day/night temperature variation</td>
<td>Large</td>
</tr>
<tr>
<td>Temperature during ripening</td>
<td>15,7 degrees</td>
</tr>
<tr>
<td>Does wind/ sea breezes play a role</td>
<td>No</td>
</tr>
<tr>
<td>Describe meso climate</td>
<td>Yes, probably one of very few in SA</td>
</tr>
<tr>
<td>Average rainfall</td>
<td>957mm</td>
</tr>
<tr>
<td>Parent soils</td>
<td>Post glacial alluvial, decomposed TMS</td>
</tr>
<tr>
<td>Soils in vineyard</td>
<td>La Mottek Kroonstad, Cartref, Mispah, Avalon</td>
</tr>
<tr>
<td>Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained</td>
<td>No chem. Or physical restraints in soil. Have well drained soils. Have good water holding capacity</td>
</tr>
<tr>
<td>Measuring of water holding/stress- neutron probe/pressure bomb</td>
<td>No, not effective. We use a pressure bomb which measures moisture content of the leaves.</td>
</tr>
</tbody>
</table>

## Vineyard management

<table>
<thead>
<tr>
<th>Precision viticulture tools</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivars</td>
<td>Sauvignon Blanc</td>
</tr>
<tr>
<td>Clones and Rootstocks</td>
<td>Sb 316, 317, 11a, 159, 215, 7 R110, R99, 101/14</td>
</tr>
<tr>
<td>Pruning</td>
<td>2 bud T cordon</td>
</tr>
<tr>
<td>Irrigation type</td>
<td>Drip</td>
</tr>
<tr>
<td>Irrigation when</td>
<td>Only when necessary (pressure bomb readings) 1 to 3 times/season</td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>Trellised</td>
</tr>
<tr>
<td>What type of training system</td>
<td>hedge 5 wire movable</td>
</tr>
<tr>
<td>Cover crops</td>
<td>Yes, Fescue</td>
</tr>
<tr>
<td>Management of leafroll virus</td>
<td>No</td>
</tr>
<tr>
<td>Footprint of the wine- general observations</td>
<td>Climate the biggest contributor</td>
</tr>
<tr>
<td>Organic/ Bio-dynamic farming principles</td>
<td>Environmentally friendly practices making use of weather station as well.</td>
</tr>
</tbody>
</table>
Robertson district - Bon Courage Single Vineyard

- Springfield Single Vineyard

- Weltevrede Single Vineyard

All three of these wineries are to be found in Robertson and the owners of these have been growing grapes for generations. They strongly believe in the terroir of their area and make sure they allow the expressiveness of their terroir to reflect in their wines. The Robertson district's lime-rich soils make the area eminently suitable for winegrowing. Situated in the Breede River valley, the river is the lifeblood of this lower rainfall region. Although summer temperatures can be high, cooling south-easterly winds channel moisture-laden air into the valley.

Robertson is renowned for the quality of its wines and while traditionally considered white wine territory and known mainly for its Chardonnays and more recently for the quality of its Sauvignon blanc, it is also the source of some of the Cape's finest red wines, particularly Shiraz and Cabernet Sauvignon, while the distinctive fortified dessert wines for which it was originally famed, continue to be produced. Robertson incorporates several wards, including Bonnievale.
<table>
<thead>
<tr>
<th>Wine Profile</th>
<th>Bon Courage Estate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Bon Courage Inkara Shiraz</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>500 x 12</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>7 years</td>
</tr>
<tr>
<td><strong>Grape variety</strong></td>
<td>Shiraz</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Robertson, single vineyard Bon Courage Estate</td>
</tr>
<tr>
<td><strong>Topography and mesoclimatet</strong></td>
<td></td>
</tr>
<tr>
<td>Vineyard altitude</td>
<td>365 FT</td>
</tr>
<tr>
<td>Slope aspect</td>
<td>Crest</td>
</tr>
<tr>
<td>Inclination of slope</td>
<td>Concave</td>
</tr>
<tr>
<td>Position on slope</td>
<td></td>
</tr>
<tr>
<td>Day/night temperature variation</td>
<td>Large</td>
</tr>
<tr>
<td>Temperature during ripening</td>
<td>30 - 35 Degrees Celsius</td>
</tr>
<tr>
<td>Day/night temperature at harvesting</td>
<td>Night: 17 Deg. Celsius; Day: 28 Deg. Celsius</td>
</tr>
<tr>
<td>Does wind/ sea breezes play a role</td>
<td>No</td>
</tr>
<tr>
<td>Describe meso climate</td>
<td>Cool Terroir</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td></td>
</tr>
<tr>
<td>Parent soils</td>
<td>Calcareaous Karoo Soil; Langeberg Gravel soil.</td>
</tr>
<tr>
<td>Soils in vineyard</td>
<td>Stone Calcareaous Karoo Soil</td>
</tr>
<tr>
<td>Soil characteristics- water holding and regulation, soil temperature;soil buffering, well drained</td>
<td>No. Yes, well drained soils. Yes, good water holding capacity.</td>
</tr>
<tr>
<td>Measuring of water holding/stress- neutron probe/pressure bomb</td>
<td>Tension Metres.</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td>Precision viticulture tools</td>
<td>No, we identified the specific site years ago - suited for red wine production. We wanted to concentrate on Shiraz.</td>
</tr>
<tr>
<td>Cultivars</td>
<td>Shiraz</td>
</tr>
<tr>
<td>Clones</td>
<td>SA1</td>
</tr>
<tr>
<td>Rootstocks</td>
<td>Richter 99</td>
</tr>
<tr>
<td>Vineyards: size, age, first production</td>
<td></td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td>Block size</td>
<td></td>
</tr>
<tr>
<td>soil preparation</td>
<td></td>
</tr>
<tr>
<td>Plant spacing between rows and within rows</td>
<td>Between rows: 2.4m and within: 1.2m</td>
</tr>
<tr>
<td>Pruning</td>
<td>Guiot: Renewal System.</td>
</tr>
<tr>
<td>Type of canopy</td>
<td></td>
</tr>
<tr>
<td>Irrigation type</td>
<td>Drip</td>
</tr>
<tr>
<td>Irrigation when</td>
<td>From October to November, 50 cubic/hectare</td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>Trellised</td>
</tr>
<tr>
<td>What type of training system</td>
<td>Perold 4 wire; 1 m</td>
</tr>
<tr>
<td>Cordon height</td>
<td></td>
</tr>
<tr>
<td>Cover crops</td>
<td>No, too stoney</td>
</tr>
<tr>
<td>Management of leafroll virus</td>
<td>No</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td>Yield</td>
<td>5 Tons Ha</td>
</tr>
<tr>
<td>Berry composition- average solid content</td>
<td>24 months from tank to bottle. In Btl: 6 - 7 years</td>
</tr>
<tr>
<td>B degree at harvesting</td>
<td>27.5 degrees B</td>
</tr>
<tr>
<td>Chemical wine analysis</td>
<td>Alc: 14.38 RS: 3.2 pH: 3.64 TA: 5.6</td>
</tr>
<tr>
<td>Footprint of the wine-general observations</td>
<td>Harvesting at phyiological and phenolic ripeness, low yields and small berries</td>
</tr>
<tr>
<td>Organic/ Bio-dynamic farming principles</td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Wine Profile</strong></td>
<td><strong>Farm Name:</strong> Springfield</td>
</tr>
<tr>
<td>------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Methode Ancienne Cabernet</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>600 x 12</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>35 years</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td>100 % Cab Sauvignon</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td><strong>District or Ward</strong></td>
<td>Robertson</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>600 m</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>Southerly</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Convex</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Midslope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>huge</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>Guess 25 degrees</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>Night 12 to 15, Day 28 to 32</td>
</tr>
<tr>
<td><strong>Does wind/ sea breezes play a role</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Cool climate at night, warm meso climate during daytime</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>240 mm mainly in July to September</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>75% Quartz with underlying Karoo soils</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature;soil buffering, well drained</strong></td>
<td>35 years ago they did not do any corrections. Yes, well drained soils.</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neutron probe/pressure bomb</strong></td>
<td>Yes, good water holding capacity. No, do not make use of the neutron probe.</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>35 years ago we did not have these luxuries</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>R 99</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>Bush vine 4-6 arms with 2 buds per arm</td>
</tr>
<tr>
<td><strong>Type of canopy</strong></td>
<td>Spur and cane</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>None, Bushvines</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Yes, depending on weather. On average 4 hours every 2 weeks from the start of veraison. We stress the vineyard from berryset until veraison and do not irrigate.</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>Single cordon</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Koorog</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Yield</strong></td>
<td>1,5 Tons per Ha</td>
</tr>
<tr>
<td><strong>Berry composition- average solid content</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Footprint of the wine-general observations</strong></td>
<td>Non vigorous rootstock combined with soils that are self restricted results in low yield; age of vines and cold nights</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>We work with natural yeast, thus we have to adhere to working as close to nature as possible. Only two sulphur dustings per year</td>
</tr>
<tr>
<td>Wine Profile</td>
<td>Farm Name: Springfield</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Methode Ancienne Cabernet</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>600 x 12</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>35 years</td>
</tr>
<tr>
<td><strong>If a blend- percentages of the xx varieties blended</strong></td>
<td>100 % Cab Sauvignon</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Robertson</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>600 m</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>Southerly</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Convex</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Midslope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>huge</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>Guess 25 degrees</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>Night 12 to 15, Day 28 to 32</td>
</tr>
<tr>
<td><strong>Does wind/ sea breezes play a role</strong></td>
<td>Yes</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>Cool climate at night, warm meso climate during daytime</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>240 mm mainly in July to September</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>75% Quartz with underlying Karoo soils</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained</strong></td>
<td>35 years ago they did not do any corrections. Yes, well drained soils.</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neuton probe/pressure bomb</strong></td>
<td>Yes, good water holding capacity. No, do not make use of the neutron probe.</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>35 years ago we did not have these luxuries</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>R 99</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>Bush vine 4-6 arms with 2 buds per arm</td>
</tr>
<tr>
<td><strong>Type of canopy</strong></td>
<td>Spur and cane</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>None, Bushvines</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Yes, depending on weather. On average 4 hours every 2 weeks from the start of veraison. We stress the vineyard from berryset until veraison and do not irrigate.</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>Single cordon</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Koorog</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Yield</strong></td>
<td>1.5 Tons per Ha</td>
</tr>
<tr>
<td><strong>Berry composition- average solid content</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Footprint of the wine-general observations</strong></td>
<td>Non vigorous rootstock combined with soils that are self restricted results in low yield; age of vines and cold nights</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>We work with natural yeast, thus we have to adhere to working as close to nature as possible. Only two sulphur dustings per year</td>
</tr>
<tr>
<td><strong>Wine Profile</strong></td>
<td><strong>Weltevrede Estate</strong></td>
</tr>
<tr>
<td>------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Weltevrede The Travelling Stone Sauvignon blanc</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td>Approximately 500 x 12</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>8 Years</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td>Bonnievale</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>Between 100 and 150 m</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>Flat</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Even</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Valley bottom</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Large</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>25 degrees</td>
</tr>
<tr>
<td><strong>Does wind/sea breezes play a role</strong></td>
<td>No, but the south eastern breeze does blow from Cape Infanta into the funnel the Riviersonderend and Langerberg mountains froms and cools off the Bonnievale area at the southern end of the Robertson Valley</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>No. Internationally speaking not even Elgin, Constantia or Hemel-en-Aarde is cool. The whole of South Africa is a warm wine growing country.</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>250-350mm, mostly winter (May to Aug.)</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature, soil buffering, well drained</strong></td>
<td>Well drained soils. Very good water holding capacity.</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neutron probe/pressure bomb</strong></td>
<td>No, but similar technologies</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>Weltevrede is mapped in 72 different vineyards, some as small as less than half a hectare - All according to soil-changes. It is interesting to realise that my great grandfather, who founded Weltevrede in 1912, understood the concept of terroir, although I am sure he never knew the term.</td>
</tr>
<tr>
<td><strong>Clones</strong></td>
<td>SB 11</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>Rootstock R99</td>
</tr>
<tr>
<td><strong>soil preparation</strong></td>
<td>Have well drained soils. Have very good water holding capacity.</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>spur</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>Drip</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>Yes, a vine needs between 550 and 600 mm of water to live. We get only half in the form of rain. Irrigation scheduling differs with every vineyard. For this terroir the water holding capacity is so good that irrigation is limited to only a few times per year.</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Trellised</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>5 wire Perold with movable wires</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes, make use of cover crops</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>No management of leafroll virus</td>
</tr>
<tr>
<td><strong>Footprint of the wine - general observations</strong></td>
<td>Alluvial soils contribute to the terroir</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>To a large extend but not registered</td>
</tr>
</tbody>
</table>
Tulbagh District

Rijks
The farm of Rijks falls within the Tulbagh district which is surrounded on three sides by the great Winterhoek Mountains. Soils in the valley are extremely variable. The area is characterised by extreme differences in day and night temperatures. Mountainous terrain creates numerous different mesoclimates which can be used to great advantage. Unique to the valley's geographical composition is the 'cold trap', a phenomenon which occurs as a result of the encapsulating mountains, shaped like a horseshoe, with Tulbagh situated at the north of the 'bowl'. Within this bowl, once a prehistoric lake, the cold air of the previous night lies undisturbed. With no air movement from the sides, this cold bubble is trapped under the warming air above as the sun makes its way from east to west. The result is relatively cool average temperatures.
# Wine Profile

<table>
<thead>
<tr>
<th>Brand name of the wine.</th>
<th>Rijk's Private Cellar Semillon</th>
<th>Rijk's Private Cellar Shiraz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cases produce</td>
<td>12/6</td>
<td>800x6</td>
</tr>
</tbody>
</table>

**Location**

| District or Ward        | Tulbagh                       | Tulbagh                     |

**Topography and mesoclimate**

| Vineyard altitude       | 300 m                         | 300m                         |
| Slope aspect            | 1 facing east and 1 facing west. | 1 facing east, 2 with no slope and 2 with a westerly facing slope |
| Inclination of slope    | 10 degrees - convex           | Convex                       |
| Position on slope       | Midslope                      | Midslope                     |
| Day/night temperature variation | Large                    | Large                       |
| Temperature during ripening | 25 Celcius                  | 25 Celcius                   |
| Does wind/sea breezes play a role | Yes, strong south-easterly | Yes, strong south-easterly |
| Describe meso climate   | No, not cool climate          | No, not cool climate         |
| Average rainfall        | 400mm/annum. May to beginning August | 400mm/annum. May to beginning of August |

**Soil**

| Parent soils            | Vertical Malmesbury Shale     | Vertical Malmesbury Shale    |
| Soils in vineyard       |                               |                             |
| Soil characteristics- water holding and regulation, soil temperature, soil buffering, well drained | No. Yes, have well drained soils. No, not good water holding capacity. | No. Yes, well drained soils. No, not good water holding capacity. |
| Measuring of water holding/stress- neutron probe/pressure bomb | Yes | Yes |

**Vineyard management**

| Precision viticulture tools | Yes, precision viticulture. One east-west row direction to get more spicy aromas and one north-south planted block to get yellow fruit character. | Yes, precision viticulture. 2 east-west row directions to get more spicy aromas and 3 north-south planted blocks to get liquorice to blackberry aromas. |
| Cultivars                 | Shiraz                        | Semillon                    |
| Clones                    | SH99: SH1: SH9                | GD121A                      |
| Rootstocks                | 101/14                        | 101/14                      |
| Vineyards: age            | 9 Years                       | 7-9 Years                   |
| Block size                | 2 x 0.8 Ha blocks             | 5 x 1.0 Ha blocks           |
| Pruning                   | Two eye per bearer. Average of 9 bearers per vine. | Two eyes per bearer. Average of 7 bearers per vine (more sunlight penetration) |
| Type of canopy            |                                |                             |
| Irrigation type           | Micro and dripper             | Micro and dripper           |
| Irrigation when           | Yes. Approx. 8 times          | Yes. Approx. 8 times        |
| Trellised or bush vines   | Trellised                     | Trellised                   |
| What type of training system | Extended Perold system       | Double Cordon-Extended Perold system |
| Cover crops               | No                            | No                          |
| Management of leafroll virus | No                       | No                          |

**Harvesting:**

| Yield                     | 8 T Ha                        |                             |
| Footprint of the wine- general observations | Canopy management and sunlight penetration contributes most to complexity of wine | Canopy management and sunlight penetration contributes most to complexity of wine |
| Organic/ Bio-dynamic farming principles | We believe in minimal interference. | We believe in minimal interference. |
Paarl District

Fairview Single Vineyard Shiraz

The home of Fairview wines is a 300ha farm on the south-west-facing slopes of Paarl Mountain, a granite rock outcrop in the heart of the Paarl wine district, viticulturally among the most historic and influential areas of the Cape winelands. About 50 km from Cape Town, Paarl is situated beneath a large granite outcrop formed by three rounded domes, the prominent one named Paarl (which means pearl rock). The summers are long and warm, and rainfall enough to make irrigation advantageous only in exceptional circumstances. A large variety of grapes are grown in Paarl, of which Cabernet Sauvignon, Pinotage, Shiraz, Chardonnay and Chenin blanc have the most potential.
<table>
<thead>
<tr>
<th>Wine Profile</th>
<th>Fairview</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Fairview Solitude Shiraz</td>
</tr>
<tr>
<td><strong>Approximately 340 x 12</strong></td>
<td>Approximately 800 x 12</td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>10 years</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td><strong>District or Ward</strong></td>
<td>Paarl</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Vineyard altitude</strong></td>
<td>115m</td>
</tr>
<tr>
<td><strong>Slope aspect</strong></td>
<td>West and North</td>
</tr>
<tr>
<td><strong>Inclination of slope</strong></td>
<td>Flat</td>
</tr>
<tr>
<td><strong>Position on slope</strong></td>
<td>Footslope</td>
</tr>
<tr>
<td><strong>Day/night temperature variation</strong></td>
<td>Large to medium</td>
</tr>
<tr>
<td><strong>Temperature during ripening</strong></td>
<td>22degrees Celcius</td>
</tr>
<tr>
<td><strong>Day/night temperature at harvesting</strong></td>
<td>Day 25-27Deg C and Night 18 Deg C</td>
</tr>
<tr>
<td><strong>Does wind/ sea breezes play a role</strong></td>
<td>No, we do however get some wind damage</td>
</tr>
<tr>
<td><strong>Describe meso climate</strong></td>
<td>A little cooler</td>
</tr>
<tr>
<td><strong>Average rainfall</strong></td>
<td>420mm and mostly winter</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Parent soils</strong></td>
<td>Malmesbury Group</td>
</tr>
<tr>
<td><strong>Soils in vineyard</strong></td>
<td>Oakleaf on weathered shales</td>
</tr>
<tr>
<td><strong>Soil characteristics- water holding and regulation, soil temperature;soil buffering, well drained</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Measuring of water holding/stress- neutron probe/pressure bomb</strong></td>
<td>Yes, good water holding capacity, Yes, make use of neutron probe to measure water stress</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Precision viticulture tools</strong></td>
<td>We used Remote Sensing to select the most homogeneous part</td>
</tr>
<tr>
<td><strong>Cultivars</strong></td>
<td>Fairview Solitude Shiraz</td>
</tr>
<tr>
<td><strong>Clones</strong></td>
<td>SH 1A</td>
</tr>
<tr>
<td><strong>Rootstocks</strong></td>
<td>SH 1A</td>
</tr>
<tr>
<td><strong>Pruning</strong></td>
<td>Spur pruned</td>
</tr>
<tr>
<td><strong>Irrigation type</strong></td>
<td>None</td>
</tr>
<tr>
<td><strong>Irrigation when</strong></td>
<td>No, dryland viticulture</td>
</tr>
<tr>
<td><strong>Trellised or bush vines</strong></td>
<td>Trellised</td>
</tr>
<tr>
<td><strong>What type of training system</strong></td>
<td>Yes, vertical trellis with 6 removable wires</td>
</tr>
<tr>
<td><strong>Cover crops</strong></td>
<td>Yes, make use of cover crops</td>
</tr>
<tr>
<td><strong>Management of leafroll virus</strong></td>
<td>Starting a little bit</td>
</tr>
<tr>
<td><strong>Harvesting</strong></td>
<td>At 26.4degree Balling</td>
</tr>
<tr>
<td><strong>Organic/ Bio-dynamic farming principles</strong></td>
<td>No</td>
</tr>
</tbody>
</table>
Cederberg Single Vineyard Shiraz

At an altitude of more than 1000 m above sea level, Cederberg Private Cellar is South Africa’s highest winery. A cool continental climate, with snow in winter and northwesterly breezes in the hot summers, combined with several different soil types, unpolluted air and crystal clear waters, make this dramatic landscape the ideal terroir for a wide range of noble wines, most notably its prize reds.
<table>
<thead>
<tr>
<th>Wine Profile</th>
<th>Farm Name: Cederberg</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Brand name of the wine.</strong></td>
<td>Cederberg Teen-die-hoog Shiraz</td>
</tr>
<tr>
<td><strong>Cases produce 12/6</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Age of vineyards</strong></td>
<td>8 years</td>
</tr>
<tr>
<td><strong>Location</strong></td>
<td></td>
</tr>
<tr>
<td>Altitude range</td>
<td>950-1100m</td>
</tr>
<tr>
<td>District or Ward</td>
<td>Cederberg</td>
</tr>
<tr>
<td><strong>Topography and mesoclimate</strong></td>
<td></td>
</tr>
<tr>
<td>Vineyard altitude</td>
<td>980</td>
</tr>
<tr>
<td>Slope aspect</td>
<td>South to East</td>
</tr>
<tr>
<td>Inclination of slope</td>
<td>Concave</td>
</tr>
<tr>
<td>Position on slope</td>
<td>Midslope</td>
</tr>
<tr>
<td>Day/night temperature variation</td>
<td>Large + - 15 to 25 Degrees Celcius</td>
</tr>
<tr>
<td>Temperature during ripening</td>
<td>29.5 Deg. Cels.</td>
</tr>
<tr>
<td>Day/night temperature at harvesting</td>
<td>28,6 Deg Celc. Day, Night 7 Deg. Cels</td>
</tr>
<tr>
<td>Does wind/ sea breezes play a role</td>
<td>Little bit.</td>
</tr>
<tr>
<td>Describe meso climate</td>
<td>Cool terroir. Cooling effects of NW winds.</td>
</tr>
<tr>
<td>Average rainfall</td>
<td>650mm 90% May to August</td>
</tr>
<tr>
<td><strong>Soil</strong></td>
<td></td>
</tr>
<tr>
<td>Parent soils</td>
<td>Malmesbury slate</td>
</tr>
<tr>
<td>Soil characteristics- water holding and regulation, soil temperature; soil buffering, well drained</td>
<td>No. Yes, have well drained soils. Good water holding capacity, yes and no.</td>
</tr>
<tr>
<td>Measuring of water holding/stress- neutron probe/pressure bomb</td>
<td>No.</td>
</tr>
<tr>
<td><strong>Vineyard management</strong></td>
<td></td>
</tr>
<tr>
<td>Precision viticulture tools</td>
<td>No</td>
</tr>
<tr>
<td>Cultivars</td>
<td>Shiraz</td>
</tr>
<tr>
<td>Clones</td>
<td>SH1</td>
</tr>
<tr>
<td>Rootstocks</td>
<td>Richter 99</td>
</tr>
<tr>
<td><strong>Site characteristics:</strong></td>
<td></td>
</tr>
<tr>
<td>Pruning</td>
<td>2 Buds</td>
</tr>
<tr>
<td>Type of canopy</td>
<td></td>
</tr>
<tr>
<td>Irrigation type</td>
<td>Micro</td>
</tr>
<tr>
<td>Irrigation when</td>
<td>4 - 5 times</td>
</tr>
<tr>
<td>Trellised or bush vines</td>
<td>Trellised</td>
</tr>
<tr>
<td>What type of training system</td>
<td>Extended Perold</td>
</tr>
<tr>
<td>Cover crops</td>
<td>Yes</td>
</tr>
<tr>
<td>Management of leafroll virus</td>
<td>No</td>
</tr>
<tr>
<td><strong>Harvesting:</strong></td>
<td></td>
</tr>
<tr>
<td>Yield</td>
<td>5 Ton Ha</td>
</tr>
<tr>
<td>Organic/ Bio-dynamic farming principles</td>
<td>Just minimum - spraying</td>
</tr>
</tbody>
</table>
APPENDIX 4

The terroir “footprint” of your wine

Choose anyone of your wines that you believe best reflects the “terroir” in the characteristics or expression of this specific style of wine and that you would classify as a super premium wine. Then please fill in your answers to this questionnaire in the blocks provided. Please feel free to add anything else that you may consider as crucial to the “footprint” of your wine.

Thank you for your participation.

Section 1: Your Wine

1. What is the brand name of the wine?

2. How many cases of 12/6 do you produce?

Are you able to increase your production?

2.1. If so, how?

3. How old are your vineyards?

4. If a blend- percentages of the xx varieties blended?

5. Within which ward does your wine fall?

5.1. If not, do you feel that your vineyards should fall under a specific ward?

5.2. If so, which one?

6. Does your vineyard currently fall into an identified natural terroir unit?

7. Is your wine made from a single vineyard?
8. Did you make use of the technical tools of Precision Viticulture for site selection or to make improvements in your vineyards for better homogeniety and wine style identity? Which ones?

Section 2. Topography- Mesoclimate effecting your vineyards and contributing to this specific wine (if, the wine is a blend, please give the information for all the vineyards making up the blend.)

1. At what altitude are your vineyards?

2. What is the slope aspect of your vineyards?

3. What is the inclination of the slope? (convex or concave landscape)

4. Is your vineyard planted on the crest, midslope, footslope or valley bottom?

5. Do you have large, medium or little day-night temperature variation?

6. What is the optimum mean temperature during pigment formation?

7. What is the mean temperature range during the month of ripening?

8. What is the average day and night temperature during harvesting

9. Do strong winds play a role by limiting vegetative growth of your vines?

10. Would you describe your meso climate as a cool climate or the vineyard area as a cool terroir?

10.1. if so, what are the contributing factors for this meso climate?

11. What is the average annual rainfall? 11.1. Please give the figures for spring, summer autumn and winter if you have that available.
### Section 3: Geology – Soil  *(Please complete for all vineyards, if the wine is a blend)*

1. Which parent soils are found in your vineyards?

   1.1 Please give a soil profile of your vineyard.

2. Do you have any chemical or physical restraints in your soil?  
   3.1 If so, what did you do to buffer your soils against climatic extremes?

3. Do you have well drained soils?

4. Do the soils have good water holding capacity?

5. How do you measure water stress?

6. Do you make use of cover crops?  
   6.1 Do you plough and mulch during the year? Specify type.

### Section 4: Vineyard Management  *(Please complete for all vineyards, if the wine is a blend)*

1. Do you have to irrigate your vineyards? 1.1. If so, how many times throughout the season do you irrigate?

1.2. What type of irrigation do you make use of?

2. What kind of pruning do you practice?

2.1. Do you make use of a consultant/viticulturist for this purpose?
3. Are your vines trellised or are they bush vines?
   3.1. What type of trellising and training system do you use?
   3.2. What is your cordon height?

4. What is your plant spacing between rows and within rows?

5. Which clones and rootstocks do you use for your terroir specific wine?
   5.1. Does leafroll virus affect any of these vines?

6. Do you consider these vines to be in such balance that it reaches physiological and phenolic ripeness simultaneously?
   6.1. If not, what do you think you can still do in the vineyard for these vines to reach this level?

7. What in your opinion, is the single most important aspect contributing to the complexity and particular style of your wine?

8. If you make your “terroir specific” wine from a single-vineyard block what is the single most important factor of that geographical unit that contributes to the distinctiveness of your wine?

9. What would you consider the optimal bottle maturation time for your specific terroir wine?

10. Berry composition: What is your average yield and what is your average solids content (B degree) at harvesting?

11. Is there any aspect/s of your terroir that you can compare to a well known AOC in France? 10.1. If so, which one?

12. If you are not already growing Mediterranean varieties do you have any plans to do so in future? 12.1. Please state which varieties you are presently cultivating or intend to cultivate?
13. Which variety/ies do you consider the most suitable to build an international brand for SA.?

14. Do you believe that “vineyard designation” and the words “Terroir specific wine” will assist in the distinctive image of your wine and contribute to the more successful marketing of your wine?

15. Do you apply organic or biodynamic farming methods in the cultivation of these specific vineyards?

16. Can you please provide a chemical analysis of your wines.

Please return your answers by latest 20 July 2006

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