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D5: Fortified Wines

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FRONT COVER IMAGE
Consejo Regulador de las Denominaciones de Origen 'Jerez-Xérès-Sherry' – 'Manzanilla-Sanlúcar de Barrameda' – 'Vinagre de Jerez'

MAPS
Designed by Cosmographics Ltd

ILLUSTRATIONS
Illustration on page 16, CalowCraddock Ltd

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List of Abbreviations

DO	Denominación de Origen
IVBAM	Instituto do Vinho, do Bordado e do Artesanato da Madeira
IVDP	Instituto dos Vinhos do Porto e do Douro
IVP	Instituto do Vinho do Porto
LBV	late bottled vintage
PDO	Protected Denomination of Origin
PGI	Protected Geographical Indication
PX	Pedro Ximénez
RCGM	rectified concentrated grape must
SAT	Systematic Approach to Tasting
VDN	Vins Doux Naturels
VOS	Vinum Optimum Signatum / Very Old Sherry
VORS	Vinum Optimum Rare Signatum / Very Old Rare Sherry
VSP	vertical shoot position
VVO	very very old

Key Choices Affecting Style, Quality and Price in Fortified Wines

1

Fortified wines are made in a very diverse range of styles; red, white and rosé; dry to sweet; and youthful and aromatic to fully developed and oxidative. This chapter will highlight some of the key production stages and choices that influence the style, quality and price of the principal fortified wines as a category, before each of these wines is studied in more focus in the next chapters. (Note, this is not a complete account of factors affecting style, quality and price for each fortified wine.)

GRAPE VARIETY

The grape variety may either provide its own aroma and flavour characters to the wine or be simply used as a relatively neutral base for the flavours of maturation. Vins Doux Naturels (VDNs) from Muscat are the most obvious example of a fortified wine where the grape variety provides the main flavours of the wine; and this is enhanced by protective winemaking and early release from the winery. Even in Rutherglen Muscat, where the wines have been aged in warm and oxidative conditions, the aromatic notes of Muscat are still noticeable in the best wines. By comparison, Palomino is a relatively neutral variety, and the characteristic aromas of Sherry all come from the maturation process.

Structural components such as acidity and, in black grapes, colour and tannin are also important factors. Madeira, notable for its high acidity, is made with a number of grape varieties, such as Sercial and Verdelho, that have naturally high levels of acidity. By comparison, although the combination of a bone-dry palate, low glycerol and pungency from high levels of acetaldehyde can give a sensation similar to acidity in some particularly Fino and Manzanilla Sherries, the actual level of acidity is low, a characteristic of the Palomino grape.

Colour is an important consideration in red wines. Port is usually made from a blend of grape varieties and one of the factors considered in the blend will be attaining a suitable level of colour in the base wine. The aims are very different in a basic Tawny Port, which needs to look aged in a short period of time and hence will be made from wines that are light in colour when compared to a Vintage Port, which will be expected to retain a deep colour over decades of bottle maturation. For the latter case, grape varieties that can enhance the intensity of colour include Touriga Nacional and Sousão.

In a similar way to colour, the level of tannins in black grape varieties will also be influential. High levels of tannins are not required nor desirable in early drinking styles of red fortified wines such as Ruby Port or Maury Grenat. By comparison, the role of tannins in colour stability makes medium (+) or high levels of tannins beneficial in long-aged wines. Tannins soften with age, and therefore, in these wines, even high levels of tannins can become integrated into the wine and provide necessary structure and balance on the palate.

VINEYARD SITE

As well as the grape variety, vineyard location and climate are important influences on the base material used in the production of fortified wines. The vineyards of the Douro are scored according to factors such as location, aspect and altitude, and this score determines how

Factors such as location, altitude and aspect have an important role in Port production.

much Port wine that plot of land can produce. Vintage Ports will often be made from the grapes of certain vineyard plots known for their ability to produce outstanding-quality wines that will age well.

Vineyard site can also have an influence on the style Muscat-based VDNs. Muscat de Frontignan in the Languedoc produces slightly fuller wines with riper flavours from low altitude vineyards in comparison with the high-altitude sites of Muscat de St-Jean-de-Minervois.

TIMING OF HARVEST

The timing of harvest is also an important consideration in many styles of fortified wines. In no case is botrytis, even as noble rot, desirable and therefore growers will be looking to harvest before the increased risk of rain, and hence increased humidity, in the autumn. For some styles, fruit will be picked when it reaches or goes just beyond the minimum level of potential alcohol required by law. Unripe fruit flavours will be avoided, but in the case of Sherry made from Palomino, the potential alcohol and health of the grapes are much more important for determining harvesting date than the range of flavours in the grapes.

In other styles, such as Rutherglen Muscat, Pedro Ximénez (PX) and Moscatel Sherry, the grapes are typically left on the vine for longer than than would be required for normal full maturity to concentrate the sugars, necessary in these wines that have very high levels of residual sugar.

SKIN CONTACT AND EXTRACTION

The extraction of colour, tannins and flavour from the grape skins is a key process in the production of red fortified wines. These wines are often sweet and made by adding the fortifying alcohol midway through the fermentation process, limiting the period of maceration to as little as 2–3 days. Especially in wines that are to undergo long ageing and hence need high concentrations of colour, tannin and flavours, this means that extraction techniques

need to be as effective as possible. The Port industry in particular has developed specialist equipment that permit maximum extraction while remaining gentle enough not to crush seeds and release bitter tannins. The contrast to this is the production of basic Tawny and Rosé Ports in which less extraction is desirable to create wines with a paler appearance.

Some producers of white fortified wines such as Madeira, Muscat-based VDNs and White Port, may let their white grapes macerate for a limited time on skins, generally to increase body and texture and extract additional flavours. By contrast, skin contact is not desirable for biologically aged Sherries such as Fino and Manzanilla as the phenolic compounds extracted can restrict the growth of *flor* yeast.

TIMING OF FORTIFICATION

Dry fortified wines are fortified once fermentation is complete. The majority of sweet fortified wines are produced by fortifying midway through fermentation, stopping the fermentation by raising the overall alcohol level above that at which yeasts can operate and leaving residual sugar that was present in the grapes. Producers will usually calculate the timing of fortification according to the level of residual sugar that is desired in the final wine; the greater the amount of sugar, the earlier the fortification.

Some styles of Sherries such as Pale Cream, Medium and Cream are made by fermenting the wine to dryness and then adding a sweetening component. This can create wines in different styles than would be possible by fortifying during fermentation. In the example of Cream Sherry, a dry Oloroso is often blended with PX, combining the characteristics of aged, dry Palomino with raisined PX.

THE FORTIFYING SPIRIT

The majority of fortified wines are fortified with 95–96% abv grape spirit. Spirits with such high alcohol content are neutral in aroma and flavour, and hence these spirits do not mask the characteristics of the wine. Furthermore, the high level of alcohol minimises the volume of spirit needed to bring the fortified wine to the required alcoholic strength (usually between 15–22% abv depending on style) leading to less dilution of the base wine.

The exception is Port, which must be fortified with a grape spirit of 77% abv (+/– 0.5%). As the spirit is distilled to a lower level of alcohol, it is more characterful and contributes more of its own aroma and flavour characteristics to the blend. Also due to its lower strength, a significant volume of spirit is required to bring the partially-fermented must up to its required alcoholic strength of 19–22% abv, again, meaning that the style and quality of the spirit has an important influence of the style and quality of the final wine. Although some producers choose to use more aromatic styles of spirit, especially in red Ports, in Rosé Ports a relatively subtle spirit will be chosen so as not to overpower this more delicate style of wine.

The strength and volume of the fortifying spirit added influences the final alcohol level of the wine (see note on The Systematic Approach to Tasting for Fortified Wines).

MATURATION

The maturation process is a defining stage in the production of many fortified wines.

Some fortified wines, including a number of VDNs, Ruby and Rosé Ports and some White Ports, are released relatively early from the winery with the intention that they should be drunk soon after release. Often, these wines are stored in stainless steel or concrete and are protected from oxygen; they therefore show youthful, primary flavours.

Small wooden vessels, such as these in Madeira, help to increase oxidation rates, which is desirable in some styles of fortified wines.

Other wines are released after a short period of ageing with the intention that they will improve in bottle. These wines, which include Vintage and some late bottled vintage (LBV) Ports, will be stored for a few years in large oak vessels before bottling. As these wines are designed to age in bottle, they will generally be very concentrated with high levels of tannins on release. After a number of years in bottle, the fresh fruit develops to dried fruit and the tannins soften and integrate.

Other fortified wines, such as premium Tawny Ports, Madeiras, Rutherglen Muscats and some styles of VDNs and Sherries, are aged oxidatively, often for extended periods of time. Their maturation is usually carried out in relatively small wooden vessels to encourage oxygen exposure. The small size also increases the rate of evaporation from the vessel and leads to ullage. It is a choice of the winemaker how often to top-up the vessels and whether to fill them completely to the top as part of managing exposure to oxygen. A number of these wines are also matured in warm or heated conditions, which further speeds up oxidation, evaporation and general maturation. The oxidative ageing tends to develop aromas of nuts, caramel and dried fruits.

Another technique is biological ageing; used for Fino and Manzanilla Sherries. These wines are aged under a veil of *flor* yeast that protects the wine from oxidation, while lowering levels of glycerol (and hence body) and contributing aromas of hay, apple skin, bread dough and nuts.

MADERISATION

The process whereby a wine is heated and oxidised is sometimes known as maderisation; the term taking its name from the process of maturation that is used, and has been for a number of centuries, for the wines of Madeira.

RANCIO

Rancio is a tasting term used to describe a collection of aromas and flavours that are found in some styles of wines. Aromas are varied but typical descriptors include leather, wood varnish and strong coffee. The chemistry concerning their origin is not well understood, but it appears that the compounds extracted from wooden vessels, oxygen and time all play a role.

BLENDING

Blending is one of the most important processes in fortified wine production. Grapes, must or wines from different grape varieties, vintages and vineyard sites may all be blended, depending on the regulations for the wine style being made, as well as wines that have been handled differently in the winery.

The key aims of blending include:

Balance

The components that need balancing will differ depending on the style of the wine. For all fortified wines, alcohol is relatively high (compared to unfortified wines) and therefore in wines of good quality and above, this should be integrated within the other components of the wine. As stated in Maturation, many styles of fortified wines undergo long periods of ageing. These wines become increasingly concentrated and lose their primary fruit characters. Although these wines are complex, a better balance in the final wine is usually achieved by blending some younger wines with the older wines, to provide a degree of freshness against the developed flavours. This is a practice that is particularly notable in Sherry and Rutherglen Muscat.

Consistency

Many fortified wines are non-vintage products and therefore it is expected that they will show consistency year on year. In some regions, the wines of different vintages mature separately (called static maturation). At a certain point, skilled blenders will taste a variety of wines from different vintages and use their experience to create the blend. In Sherry production, a solera system is used. This is a method of fractional blending that ensures consistency among the vessels of a particular age. A modified version of a solera system is used for Rutherglen Muscat.

Style

Blending is an essential method of influencing style. In Port, the blend of grape varieties will be an important factor in the level of colour, tannin and flavour concentration in the young wine and therefore its ability to age. In sweetened Sherries, the blending in of the sweetening component, such as PX wine, completely transforms the style of the final wine. Brands are important in most fortified wine categories, and therefore blending is often used to create a certain ‘house style’ across the product range.

Complexity
Similar to the above points, wines of different ages or that have been treated differently in the winery may be blended to gain a greater range of flavours.

Volume
In most regions producing fortified wines, vineyard holdings are small and therefore it is necessary to blend grapes from a number of different producers. Similarly, a number of fortified wines are matured in small vessels and therefore blending of these vessels is usually needed before bottling to make up a sufficient volume of consistent wine.

Price
Fortified wines can reach premium and super-premium prices, but a significant proportion of sales volumes are made up of wines that are mid-priced or even inexpensive. Meeting a competitive price point is essential and, in order to obtain the best value product, the producer may decide to add a small amount of older wine to give some complexity to a blend of younger, more simple wines.

FINISHING

The majority of fortified wines will be stabilised, fined and filtered before bottling to ensure they are clean and clear for the consumer.

Some styles of Port, such as Vintage, Single Quinta, Crusted and some LBVs, are purposely not filtered. Sediment may be noticed when these wines are opened and poured, and decanting or passing the wine through a wine funnel and strainer may be necessary.

Equally, some styles of Sherry termed '*en rama*' either undergo a light fining and filtration or not be fined or filtered at all. In style they are generally more pronounced and complex than their fined and filtered counterparts.

THE SYSTEMATIC APPROACH TO TASTING FOR FORTIFIED WINES

When tasting fortified wines, the Systematic Approach to Tasting (SAT) should be used in much the same way as it is used for unfortified wines. The one area of difference is the assessment of level of alcohol.

The fortified wines in the Specification all have alcohol levels of 15% abv or higher, and hence all would be 'high' if calibrated on the same scale as unfortified wines. Therefore, the scale for alcohol for fortified wines is:

- low: 15–16.4% abv
- medium: 16.5–18.4% abv
- high: 18.5% abv and above.

For all of the other scales of the SAT, fortified wines should be treated on the same scale as unfortified wines. For example, a fortified wine that is assessed as 'medium intensity' should have an intensity comparable to that of a medium-intensity unfortified wine.

Sherry

2

Sherry is a fortified wine made in the area around the city of Jerez in Andalusia. This area has a long history of growing grapes and producing wines that dates back to the rule of the Phoenicians. Even from these early times, Sherry was a wine that was widely traded. The period of Moorish rule from the 8th to the 13th centuries meant wine consumption was prohibited, but vineyards and wine production continued. After Jerez came under Christian rule in the 13th century both domestic consumption and exports grew rapidly as English, Irish and Flemish traders began to ship the wines. The wines further benefitted from free trade agreements with France and England, and after Christopher Columbus discovered America from his base in Andalusía, large volumes of Sherry were also shipped to America. The next few centuries saw both challenging and prosperous periods for the Sherry industry. A number of events, including the Peninsular Wars and then the plague of phylloxera, devastated the industry, yet in calmer periods several successful shipping businesses were established. The popularity of Sherry in the late 19th and early 20th centuries meant that other countries began to produce their own, often poor-quality, 'Sherries' and in 1933 Spain's first wine-related Regulatory Council, the Consejo Regulador, was formed, setting regulations to control the production and trading of Sherry wines.

Although Sherry sales fell during the Second World War, they recovered in the decades following, and Sherry sales reached their peak in the 1970s, with shipments reaching 1.5 million hL in 1979.[1] However, this figure halved in the following decade as younger generations of consumers sought out different styles of wines. The fall in demand resulted in a surplus of Sherry, largely formed of cheap and low-quality wines.

During the boom years, the production of Sherry rose dramatically. As demand decreased, there became a surplus of cheap Sherry that had not been produced with quality in mind.

Ruiz Mateos S.A., also known as Rumasa, was one business that played a key part in these fluctuations. Rumasa started as an *almacenista* (see Wine Law and Wine Business), before starting to ship its own Sherry in 1950. It soon began to supply Harveys of Bristol with wine for their brands and became a major supplier for their Bristol Cream, through which it accumulated considerable wealth. Rumasa began to build a business empire, taking over not only a number of Sherry bodegas (wine companies) but also other businesses such as hotels and banks. By the late 1970s it dominated the Sherry industry, and through consolidation of production facilities, drove down prices; a tactic that would negatively affect the Sherry industry for decades to come. In 1983 the government nationalised Rumasa, claiming that it owed millions in unpaid taxes. Its Sherry bodegas were sold, causing a substantial rise in unemployment and social unrest. In addition, a large number of other bodegas closed or were sold and merged as they were unable to sustain themselves in a market burdened with large quantities of low-quality wines based on inexpensive brands. In these difficult times, brands changed ownership multiple times.

Since this time, the Consejo Regulador has been working hard to bring vineyard plantings, stock levels and sales back into balance, and to promote the quality of Sherry.

2.1. The Growing Environment and Grape Growing

LOCATION AND CLIMATE

Located in Andalusía in southern Spain at low latitude (36°) and with low altitude (0–90 metres above sea level), with influences from the Atlantic Ocean, Jerez has a hot Mediterranean climate with hot, dry summers and mild, relatively rainy winters.

The Atlantic also brings a cool, damp wind called the *poniente* that provides a cooling, humid influence in the summer. However, the *levante*, a hot, drying wind from north Africa, can make the climate more arid. This can cause grapes to transpire more quickly, concentrating the sugars. Too much sugar can be a challenge because it may become difficult to ferment the wine to dryness, which is particularly problematic for the development of the *flor* yeast that is integral to the style of some Sherry wines (see Biological Ageing).

Jerez experiences a high number of cloud-free days; therefore, sunlight hours in the growing season are high, helping to give fully ripe grapes but also meaning that, without sufficient shading, grapes can easily become sunburnt.

200m+ 100-200m 0-100m

The grapes for Sherry must come from the delimited area of around 7,000 hectares known as the *Zona de Producción* or *Marco de Jerez*. Grapes grown in this zone can either be used for Denominación de Origen (DO) Jerez-Xérès-Sherry or DO Manzanilla – Sanlúcar de Barrameda. This is also the limited area for growing grapes for Sherry vinegar. There is one exception to this rule: the grape variety Pedro Ximénez (also called PX) can be grown around Montilla (within Andalusía, in the mountains above Malaga, but outside the *Zona de Producción*) and be included in wines labelled as DO Jerez-Xérès-Sherry.

The vineyards of Jerez are also divided into smaller delimited areas called *pagos*. Each is thought to produce wines with different characteristics from the others, a function of factors such as aspect, location, small differences in soil, etc. The 2021 regulations for Sherry allow the naming of a *pago* on the wine label.

SOILS

The key soil is *albariza*, a mixture of limestone, silica and clay. The clay means that *albariza* is very effective at retaining and gradually releasing water from winter rainfall, vital in a region that is very dry during the growing season. The *albariza* also forms a crust when dry, which is helpful in reducing evaporation from the soil surface. The ability of the *albariza* to retain water means that higher planting densities and yields are possible in Jerez (average 70 hL/ha) than in other regions in Spain with hot, dry climates (where low-density bush vines are required if irrigation is not used). High yields are also possible, as grapes for Sherry do not need to have the same concentration of flavours as grapes for unfortified wines; most of the flavour comes through the maturation process. The light colour of the *albariza* soil also means that it reflects light back into the vine canopy aiding the ripening of the grapes.

A Sherry vineyard in winter, clearly showing the light-coloured *albariza* soil.

Other soils in the region include *barros*, which has greater clay content, and *arenas*, which is sandy. In practice, the vast majority of vines are planted on the *albariza*.

GRAPE VARIETIES

Palomino

Palomino (also called Palomino Fino and Listán) is the principal variety, used in all dry and sweetened styles of Sherry. It accounts for 97 per cent of the vineyard area. (The rest is equally divided between Moscatel and Pedro Ximénez). It is mid to late ripening, well-suited to dry, sunny weather and capable of producing large yields. However, it loses acidity quickly when it nears maturity. It is also a neutral variety and therefore does not tend to add much of its own primary aromas to Sherry wines.

Moscatel (Muscat of Alexandria)

Moscatel is sometimes called Moscatel de Chipiona after the coastal town of Chipiona, around which it is mainly grown, generally on sandy *arenas* soils. It is late ripening and well adapted to heat and drought. In contrast to Palomino, it is an aromatic grape (grape, blossom). It is generally used to produce sweet fortified wines of the same name.

Sandy soils in vineyards around Chipiona

Pedro Ximénez (PX)

PX is used for the production of sweet fortified wines called PX or Pedro Ximénez, and as a sweetening agent. Its small, thin-skinned grapes accumulate high levels of sugar and are then traditionally dried in the sun to further concentrate that sugar. It is a neutral variety and therefore its flavours mainly come from the drying and maturing processes. PX accounts for less than one per cent of production by volume within the delimited Sherry area. However, legislation permits for it to be grown in the Montilla district in the province of Córdoba and shipped into the *Zona de Producción* either as fresh or raisined grapes, or more likely, as young wine.

The new regulations allow the introduction of six varieties that were grown in the region before phylloxera.[2]

VINEYARD MANAGEMENT

The Sherry vineyards are in the process of being transformed, mainly to accommodate mechanisation of all the annual tasks including pruning, harvesting and soil management.

The principal training system used to be replacement cane pruning, here called *vara y pulgar*. However, an increasing number of vineyards are now cordon trained (single or double) and spur pruned, which is more suitable for mechanisation. Vertical shoot position (VSP) trellising ensures the canopy remains open and arranged for easy mechanisation, although some shading of the bunches is needed to prevent sunburn. While within-row spacing can be quite tight (just over 1 m), between-row spacing is wide enough to allow tractors to pass.

Maximum yields permitted by the legislation are 80 hL/ha; however, it is rare that this maximum is reached and, depending on the year, yields are usually in the range 60–70 hL/ha.

Troughs are dug to limit water running down vineyard slopes

A close-up of the troughs

The vineyards are generally planted on gentle (10–15 per cent) slopes where the *albariza* is mainly to be found. Each year after harvest the soil is worked to create a series of troughs or gullies down each row of vines to catch the winter rains. Without this, most of the rainwater would flow down the sloped vineyards rather than permeating the soil. This system, termed *aserpia*, was very labour intensive and is now mainly done mechanically.

The most widely used rootstocks are 333EM, 41-B and 13-5 EVEX (all hybrids of *V. vinifera* and *V. berlandieri*). The last of these was developed by the local viticultural research station and has been found to be the most successful to date. This rootstock is tolerant of limestone soils (preventing the vine from suffering from chlorosis) and drought, while also producing good yields.

The dry growing season means that Jerez has relatively little problem with disease; however, mildew can be a problem in the spring due to warm humid weather after any rain. VSP training helps to promote air circulation to reduce the development of such diseases, but systemic fungicides are typically used as when treatment. The hot climate and moderating influence from the Atlantic means that frost is not an issue. European grapevine moth is a problem, however, and often managed using pheromone traps.

Harvest begins in the first week of August, starting on the more inland vineyards and finishing with the cooler coastal plots by the second week in September. Harvest tends to be as early as possible to avoid the risk of autumn rain; any rot would be very undesirable, particularly for biologically aged wines (see Biological Ageing). The grapes are usually picked with approximately 12 per cent potential alcohol, total acidity of around 5 g/L and pH of 3.3–3.5. Palomino loses acidity quickly in the final stages of ripening, and therefore acidification is sometimes required if levels fall much below 5 g/L.

The PX and Moscatel grapes for naturally sweet wines (see Styles of Sherry) tend to be harvested slightly later. A higher concentration of sugar in the grapes when harvested makes the drying process that follows easier and quicker.

Around 60 per cent of the total grape volume is harvested by machine, mostly at night or in the early hours of the morning when temperatures are coolest to reduce chances of oxidation and microbial spoilage.[3]

2.2. Winemaking

The grapes are pressed on arrival at the winery. Skin contact is not desirable, particularly for biologically aged wines (for more details, see Biological Ageing) as phenolic compounds can restrict the growth of *flor* yeast. These styles will tend to be made from free run juice and the lightest pressings (called the *primera yema*). Oloroso wines tend to be made from later press fractions that are extracted using greater pressure. The higher levels of phenolics in these pressings mean the *flor* struggles to develop. The final press fractions will be used for other products, such as the wine used for seasoning barrels. Free run juice and the first pressings typically make up around 60–75 per cent of the juice yield, and therefore producers who mainly make Oloroso (e.g. Fundador) may also use free run juice in these styles. The maximum permitted juice yield is 70 L/100 kg of grapes.

The must will be clarified before fermentation either by cold settling, centrifugation or flotation. The *albariza* soil is dusty, and therefore clarification is important to remove these particles from the must.

It is common for the musts from different vineyard sites to be fermented separately to create many different base wines (wines before fortification and maturation) that can then be blended as needed. Most producers use cultured yeasts and ferment at around 22–26°C (72–79°F), both of which are beneficial for a reliable fermentation to dryness. The vast majority of the aromas and flavours in Palomino-based Sherries comes from the maturation process, and therefore producers are not looking to enhance fruit or other flavours during the fermentation. Fermentation generally takes place in stainless steel vessels. However, a small number of producers are using barrel fermentation (with old barrels) for some of their wines to give a fuller body.

The first phase of fermentation is usually quick and vigorous as the fermentation temperatures are not particularly cool. The vast majority of the sugar is fermented within the first seven days. This is followed by the slow phase of fermentation during which the last of the sugar is fermented. This usually takes a couple of weeks.

Malolactic conversion is prevented as acidity is typically already low and buttery flavours are not wanted. It is usually avoided by chilling the must; for biologically aged wines, using SO_2 to prevent malolactic conversion would negatively affect the development of *flor* yeast.

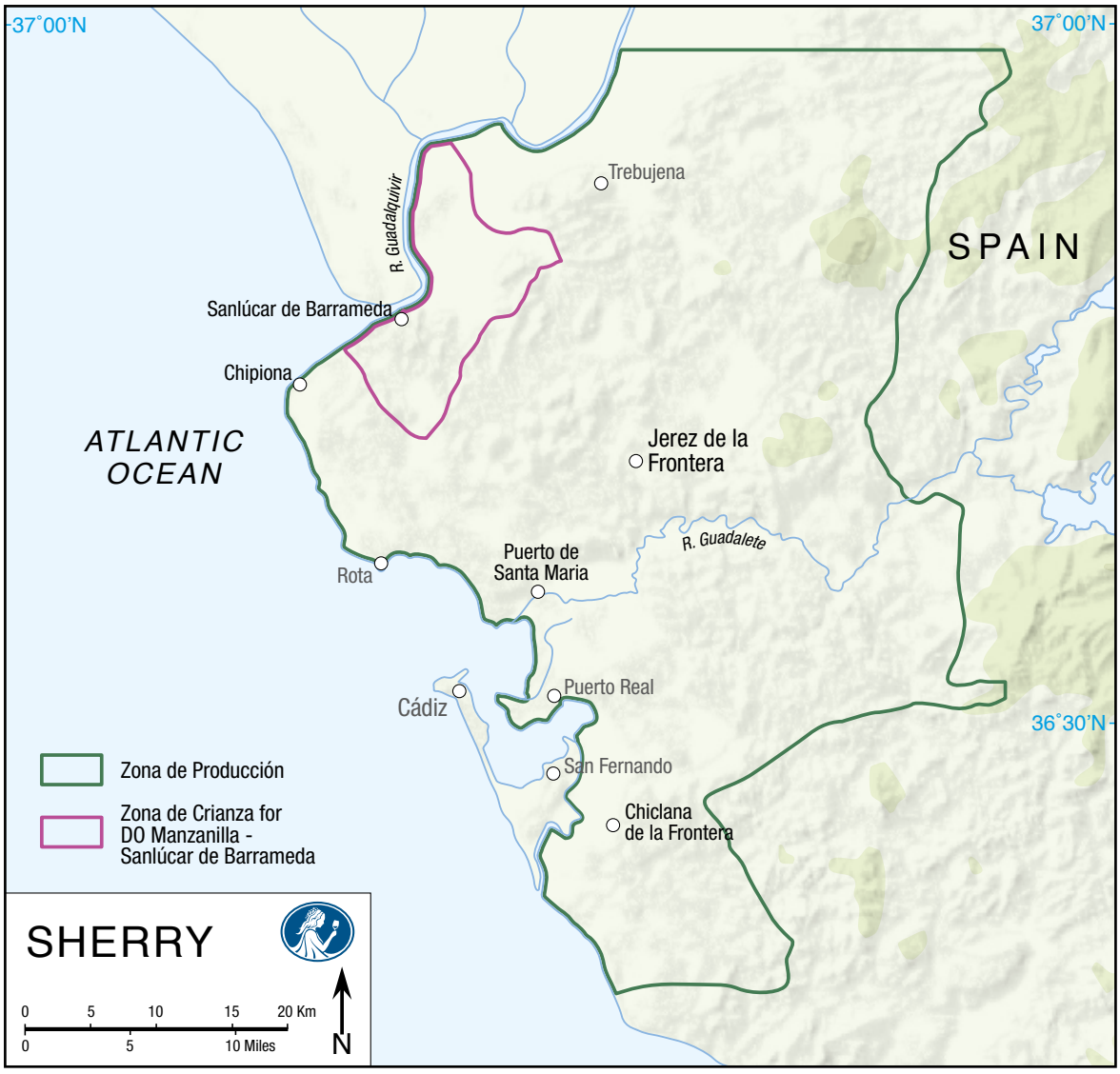
After fermentation, each batch of base wine will be tasted and sent for analysis. This is known as the First Classification and it decides whether the batch will be used for biological ageing (lighter-bodied, less intensely flavoured wines) or oxidative ageing (fuller-bodied, more intense wines). Those wines destined for biological ageing will be fortified to 15–15.5% abv, the optimum concentration of alcohol needed for *flor* yeast to grow. (The new regulations remove the requirement to fortify base wines that are 15% abv naturally, but this point has not yet been approved at EU level.) Wines destined for oxidative ageing will be fortified to 17% abv, at which *flor* yeast cannot survive. The liquid used to fortify the base wines is 95% abv grape spirit and therefore does not add its own aroma and flavour characteristics to the wine.

After fortification the wines are now in a stage called *sobretablas*, when they are stored before joining the solera system. These wines may remain in tanks or be transferred to wooden barrels. After a number of months, the wines that were marked out for biological ageing at the First Classification will be tasted and analysed in the Second Classification. Wines that have a full layer of *flor* and have remained fresh will be classified as potential Fino or Manzanilla. Those that are slightly less delicate may be marked as potential Amontillado, and those that are even more full-bodied and intensely flavoured may be marked as potential Palo Cortado. The wines will then enter the solera system.

MATURATION

In the past,the maturation of wines labelled DO Jerez-Xérès-Sherry had to take place in one of the three municipalities of Jerez de la Frontera, El Puerto de Santa María and Sanlúcar de Barrameda, together called the *Zona de Crianza*. However, under the new regulations, they can be aged anywhere in the Production Zone. The maturation process for DO Manzanilla – Sanlúcar de Barrameda must take place in the municipality of Sanlúcar de Barrameda.

The maturation of Sherry takes place in old wooden vessels. The vessels in any one bodega may range in size; however, the most widely used is the 600 L butt. The vessels tend to be made of American oak, primarily for historical reasons (American oak was brought back to Spain during the Spanish conquests), but it also has the benefit of being cheaper than French oak. The vessels are very old, so are not used to contribute oak flavours.



The architecture of many bodegas is purposefully designed to create and maintain optimum conditions during maturation without the need for modern air conditioning systems. The traditional bodegas have thick walls helping to keep their temperatures constant. They are also generally tall buildings with high ceilings, meaning that warm air rises away from the rows of butts, which are only stacked three or four butts high. These tall buildings also have small windows positioned high up near the roof. The windows are orientated to allow cool, damp south-westerly winds from the Atlantic to enter, helping to lower temperatures and raise humidity levels. The windows have thin blinds to diffuse sunlight and prevent dust and insects entering. The floors are often made of earth, and this can be regularly wetted during the summer to help lower temperatures and increase humidity.

The temperatures and humidity in a bodega are especially important for growth and maintenance of *flor* as part of biological ageing. Despite the effective design of bodegas, there is still some fluctuation in conditions between summer and winter, and therefore growth of *flor* can often not be maintained throughout the year (although see Fino and Manzanilla in Styles of Sherry).

Sherry bodegas often have thick walls, high ceilings and wettable earth floors to reduce fluctuations in temperature and humidity.

The solera system

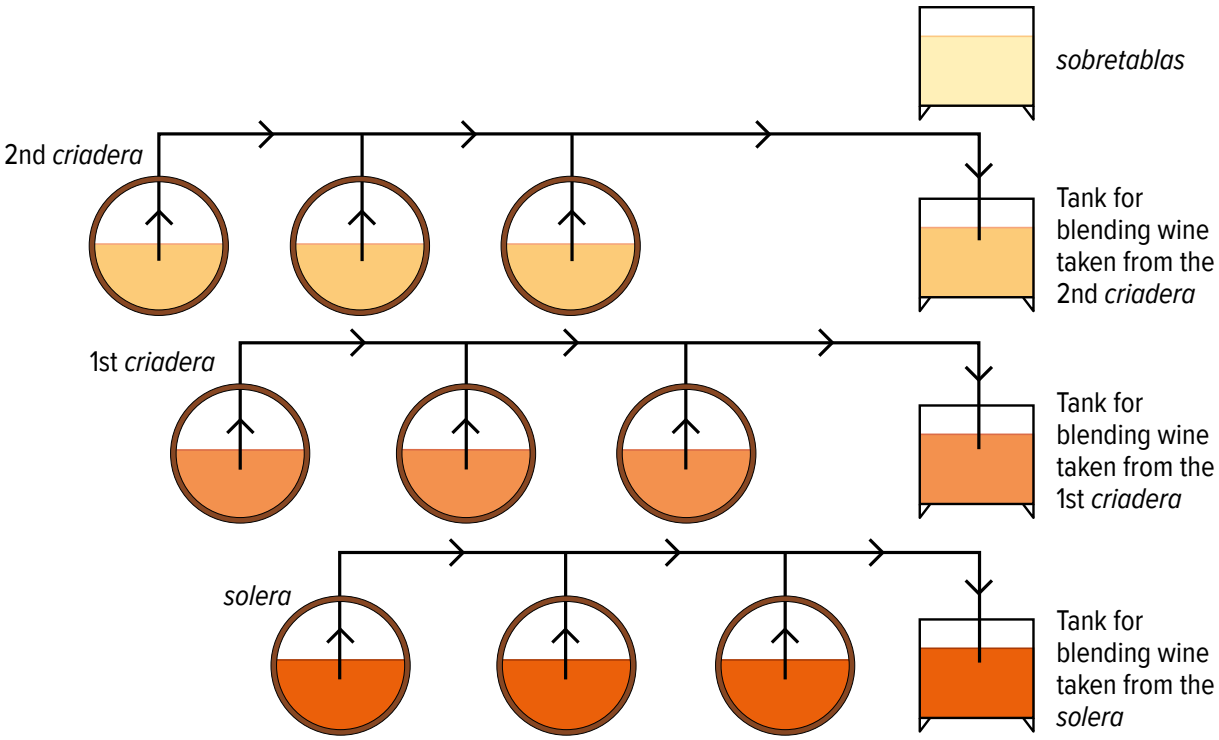
Most Sherry is a non-vintage product, and the solera system is a method of fractional blending that is used to maintain consistency and quality year after year. The barrels of wines that make up the solera system are grouped in sections known as *criadera*. The barrels belonging to the same *criadera* contain wine of the same age, and of a different age from barrels in other *criaderas*. The *criaderas* are named according to the relative age of wine that they contain. The *criadera* of the oldest wine is called the *solera*. The *criadera* with the next oldest wine is called the 1st *criadera*. The 2nd *criadera* has younger wine than the 1st *criadera* and the 3rd *criadera* has younger wine than the 2nd *criadera*, and so on. Each *criadera's* barrels will be stacked together in an area of the bodega.

The key rule is that no more than 40 per cent of the wine from one solera system can be removed for blending and bottling each calendar year, and hence the solera system always retains most of its wine. A further rule is that any wine that is released and bottled for sale must be a minimum of two years old.

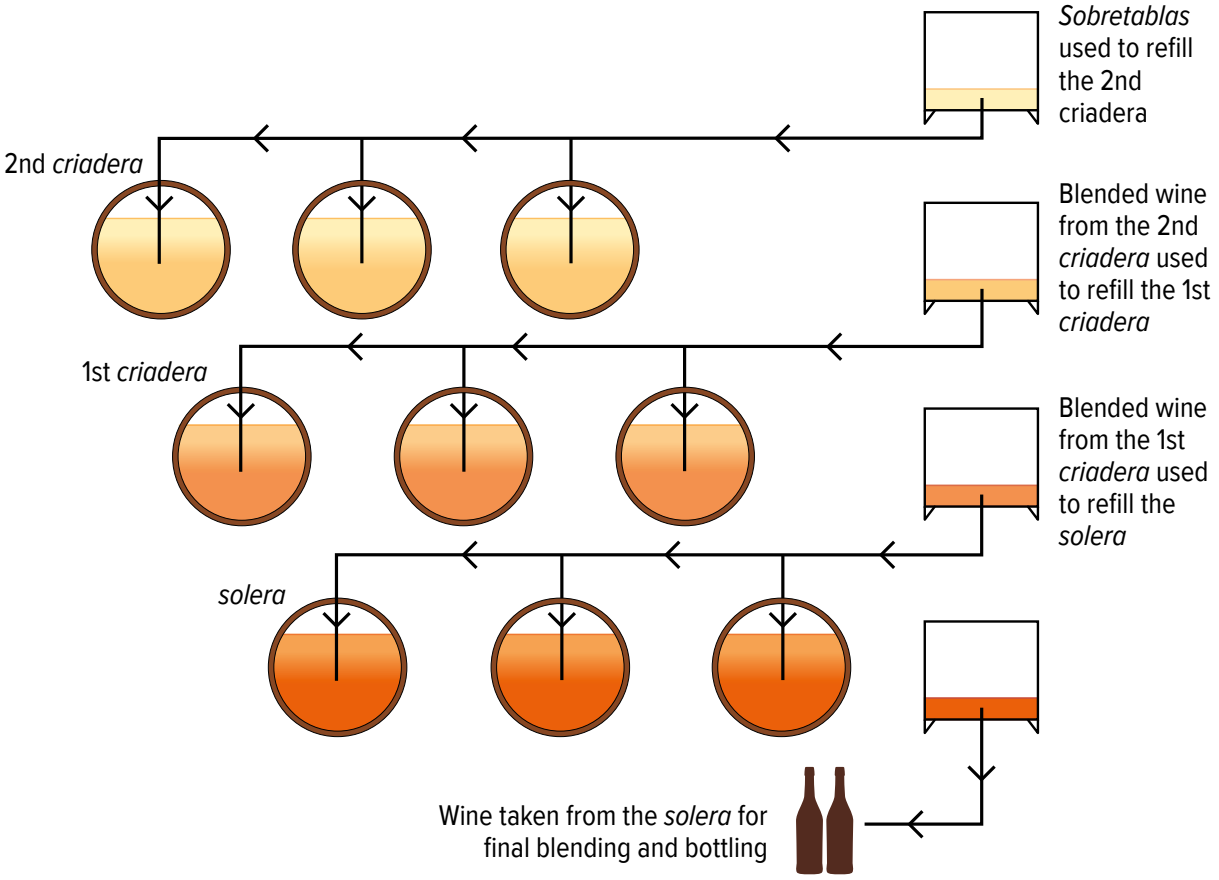
The basic process is as follows:

- A proportion of wine (up to 40 per cent) is taken from each barrel in the *solera* (oldest group of barrels).
- The same proportion of wine is taken from the barrels in the 1st *criadera*, blended in a tank to ensure consistency and then used to top up the barrels in the *solera*. Hence, the younger wines from the 1st *criadera* are blended with the older wines from the *solera*.
- The same proportion of wine is taken from the barrels in the 2nd *criadera*, blended in a tank and then used to top up the barrels in the 1st *criadera*.
- This process is repeated for each *criadera*, and the barrels in the youngest *criadera* are topped up with wines from the *sobretablas*.

Stage 1 – Emptying the *Solera* and *Criaderas*



Stage 2 – Refilling the *Solera* and *Criaderas*



This is a simplified picture of the process. In reality, wines can be removed early from the solera system for bottling before they reach the *solera*. This will be done for reasons of both style and, given the expense of having wine tied up in maturation, price. For example, an inexpensive Fino may be made from relatively young wines from, for example, the 4th and 5th *criaderas*, perhaps with a small proportion of 1st *criadera* wine to give some complexity. By comparison, a mid-priced or premium Fino may be made with a greater proportion of wine from the *solera* and 1st *criadera* for their complexity, with some younger wine from the 4th or 5th *criadera* to give a hint of freshness.

Wines from one solera system can also be blended with the wines of a different solera system during final blending, or some of the wine from one solera system can be fed into a different solera system for further maturation. For example, the wine for an Amontillado may undergo five years in a Fino solera system and then eight years in an Amontillado solera system.

Biological ageing

Biological ageing refers to the practice of maturing wine under a layer of *flor*. *Flor* comprises four strains of *Saccharomyces cerevisiae*. These yeast strains are found on the skins of the grapes from the Jerez region (they are also present in the bodegas where the Sherry is

A glass-fronted barrel to show biological ageing. This photo was taken in winter and the reduced growth of flor is clear to see; the level to which the flor grew in autumn can be seen on the glass. Note also the dead yeast cells at the bottom of the barrel.

matured) and under the correct conditions, a layer of the yeasts naturally forms on the surface of the young wine. The wine needs to be a maximum of 15.5% abv (*flor* yeast consume alcohol, but struggle to survive in alcoholic conditions above 16% abv.). It is also important not to add SO_2 to the wine as otherwise *flor* will be inhibited. *Flor* also needs plentiful oxygen; therefore, Sherry butts are left 85–90 per cent full and the bungs are loosely inserted to ensure the *flor* is in contact with oxygen in the headspace of the barrel. The warehouse in which the wine is stored will need to have temperatures between 16–20°C (61–68°F) and humidity levels above 65 per cent.

The layer of *flor* has a number of influences on the wine. First, it protects the wine from oxidation, and hence these wines remain pale lemon in colour. Second, the *flor* consumes alcohol in the wine and releases acetaldehyde, which gives aromas that can be described as apple (often apple skin or bruised apple), hay and/or chamomile and sometimes a slightly bitter taste. It also consumes glycerol, which gives the matured wine a lighter body. Glycerol also has a slightly sweet taste, and the reduction in glycerol can contribute to the very dry nature of biologically aged Sherries. *Flor* also reduces the levels of acetic acid.

The nature of the *flor* (i.e. the prevalence of each of the four yeast strains) changes in the different areas of the region, from bodega to bodega and even over the different stages of the solera system. This can influence the amount of alcohol consumed and the amount of acetaldehyde produced.

Over time in barrel, the *flor* yeast reproduces and dies. The dead yeast cells fall to the bottom of the barrel and autolysis takes place. This can lead to savoury, nutty flavours and enhances the texture of the wine. Various other aroma compounds form during the biological ageing process due to the reactions between alcohols, acids and acetaldehyde.

As well as maintaining style and quality, the solera system for biologically aged wines has another function: the young wine from the *sobretablas* is rich in nutrients for the *flor*, such as alcohol, glycerol and acetic acid. As the wine matures under *flor*, these compounds are used up. The blending of younger wines into older wines therefore helps to refresh the nutrient levels in older wines, keeping a thick layer of *flor* alive, which continues to protect the wine from oxidation. Partly for this reason, in Fino and Manzanilla solera systems smaller proportions of wine tend to be removed more frequently throughout the year. Another benefit of removing and bottling small volumes of wine more frequently is that the wine should be fresher when it reaches the point of sale (rather than having bottled stock sitting in a warehouse over the course of a year). This is important, as these wines do not improve with bottle ageing and should be consumed as fresh as possible.

Oxidative ageing

Oxidative ageing has a very different influence from the biological ageing process. The colour of the wines gradually changes away from lemon to gold, amber and then brown. Levels of alcohol increase slightly with ageing as, in the environment of the bodega, water is generally lost from the barrel at a quicker rate than ethanol; it is estimated that 3–5 per cent of volume is lost each year.[4] (Some evaporation also occurs during biological ageing, but the consumption of alcohol by *flor* is more significant, meaning alcohol levels decrease.) This also means that other components of the wine become more concentrated. Glycerol levels rise and this gives wines that have been oxidatively aged a fuller, rounder body than those that have been biologically aged. Aroma and flavour compounds increase in concentration and evolve from primary characteristics to tertiary, oxidative characteristics such as caramel and nuts. During

oxidative ageing, acetaldehyde decreases slightly, but levels of acetic acid and ethyl acetate (associated with volatile acidity) increase slightly.

FINISHING AND PACKAGING

Most Sherries are tartrate stabilised (often by contact process), fined and filtered prior to bottling. Filtration is particularly necessary in biologically aged Sherries to remove *flor* yeast. Otherwise *flor* could start to develop once the bottle is opened and the wine is in contact with oxygen.

Closures can be driven cork, cork stoppers or screw cap. All Sherries must be packaged and sealed within the three Sherry towns.

2.3. Styles of Sherry

To be labelled as one of the styles below, the wines must conform to certain attributes as set by the Consejo Regulador. These attributes include the level of residual sugar, typical alcohol level, colour and other characteristics that are in line with how the wine has been matured.

DRY SHERRIES

Dry Sherries must have a maximum of 5 g/L of residual sugar.

Fino and Manzanilla

Both of these styles of wine must have spent their entire ageing process under a film of *flor* (biological ageing). They are pale lemon in colour and on the palate, dry, light to medium bodied, with low acidity and low alcohol of 15–15.5% abv. Their aromas and flavours depend on the length of time they have spent in the solera, but may include aromas associated with acetaldehyde rather than primary fruit, bread dough and almonds. The wines range from good to outstanding in quality, and are inexpensive to premium or even super-premium.

Wines that are matured in the coastal municipality of Sanlúcar de Barrameda qualify as Manzanilla – de Sanlúcar de Barrameda. Its proximity to the Atlantic, and hence its maritime climate, means that it does not have such extreme summers and winters and that humidity is relatively high. These conditions are ideal for *flor* growth, and it is often observed that solera systems in Sanlúcar de Barrameda have thicker layers of flor than those in Jerez de la Frontera. It is also thought that, while seasonal changes in temperature cause the *flor* to thin during the summer and winter in Jerez, the conditions in Sanlúcar de Barrameda are able to support thicker layers of *flor* throughout the year.

Although this may suggest that Manzanilla should have higher levels of acetaldehyde than Fino, this is not found to be the case. It is thought that differences in the *flor* strains between the two towns are a likely reason for this; the strain that has been shown to produce some of the highest levels of acetaldehyde is not present in *flor* samples taken from Sanlúcar de Barrameda. The greater protection from oxygen and lower levels of acetaldehyde mean that Manzanillas often taste lighter and fresher than Finos.

Given that Manzanilla solera systems have thicker levels of *flor* than Fino solera systems, they need replenishing with young wines more frequently to support this growth. Hence, small volumes of wine will be released and bottled several times throughout the year to ensure that the *flor* is constantly maintained.

Fino Viejo and Manzanilla Pasada

These labelling term describe wines made with biological ageing with a minimum average age of seven years. . The *flor* may be left to die naturally by not refreshing the barrels with new wine for around a year. The wines may then enter a solera system for Fino Viejo or Manzanilla Pasada.

Amontillado

This is a wine that must have attributes from both biological and oxidative ageing. The wines will start in a Fino solera system, be re-fortified to 17% abv to kill the *flor* and then be matured oxidatively in an Amontillado solera system. Inexpensive Amontillados are likely to use young biologically aged wines (e.g. those taken out of one of the youngest *criaderas* in a Fino solera system) that then are blended into an Amontillado solera system, again, for a short period of ageing. More expensive wines will be matured for longer and hence be more complex. Amontillados tend to be good to outstanding in quality, and are mid-priced to premium or even super-premium.

Part of an Amontillado solera system

Palo Cortado

This style of Sherry is the most difficult to define. To be classified as this style, the wine must have 'aromas similar to those of an Amontillado, but a palate more similar to that of an Oloroso, as a consequence of its oxidative ageing once the initial film of *flor* has disappeared'.[5] It must also have a sugar level of under 5 g/L and alcohol of between 17–22% abv. However,

as long as these parameters are met, there are no stipulations on winemaking and maturation practices.

Most commonly, these are wines that have undergone a number of years in a Fino solera system to then be put into a Palo Cortado solera system. The wines selected for Palo Cortado are generally those Finos at the Second Classification that are less delicate, show more complexity and perhaps are less able to support a thick layer of *flor* so have already undergone some mild oxidation.

Although it is hard to generalise, a producer's Palo Cortado will generally have spent less time biologically ageing than their Amontillado, and therefore the characteristic acetaldehyde aromas will be present but less prominent than those on an Amontillado. This also means that glycerol levels remain higher, and this, combined with the concentration of the components in the wine as part of the ageing process, means that Palo Cortados usually have a slightly fuller, rounder body than those of Amontillados. Although there are some mid-priced Palo Cortados, more often these wines are premium priced and tend to be very good or outstanding in quality.

Oloroso

These wines have attributes from oxidative ageing. After fermentation, they are fortified to 17% abv to stop *flor* developing. They are brown in colour with dried fruit (raisin, prune) and oxidative caramel and walnut flavours. As with the other styles of Sherry, inexpensive wines of acceptable to good quality will be released from the solera system earlier than more expensive, higher quality examples. Well-matured Olorosos are often very good or outstanding in quality and sell at premium prices.

EN RAMA

In recent years there has been a trend for *en rama* Sherries. It is generally used to describe wines that have been finished and packaged in a way to be the best representation of the wine straight from the barrel. In the new legislation, the term *en rama* has been defined legally for the first time. These are wines that have not undergone any stabilisation practice other than filtering, i.e., they may not be clarified, fined or cold stabilised. For some bodegas, this may also mean no filtration. However, for wines that are exported, it is common that a light filtration (using large pore size to capture particles of *flor*) will have been carried out. The term can be applied to any of the above dry styles of Sherry; however, Fino En Rama is most commonly seen. *En rama* wines tend to taste more intense and complex than the bodega's regular bottling, and sell for higher prices.

NATURALLY SWEET WINES

Once harvested, the grapes for naturally sweet wines are laid out to dry in the sun for 2–3 weeks. Water evaporates from the grapes, concentrating their sugar levels, and raisin-like aromas develop. The fermentation for these wines stops naturally at around 4–6% abv due to the very high sugar levels. The wines are then fortified to a concentration of 15–16% abv. They are usually matured oxidatively in their own solera systems, where gradual evaporation causes the sugars and flavours to concentrate further.

The most common grape varieties used for naturally sweet wines are PX and Moscatel. Most Sherry producers make a single varietal PX. These wines must have a minimum residual sugar level of 212 g/L, but it is usual for them to reach 450–550 g/L. The wines are full-bodied (with a consistency similar to syrup), low in acidity with pronounced aromas and flavours of raisins, molasses and liquorice. Single varietal Moscatel is much less common. These wines must have minimum sweetness level of 160 g/L, but in reality they tend to have 325–375 g/L of residual sugar. They can either be protected from oxygen to give a non-oxidative style or aged in barrels for several years and made in an oxidative style. Both styles show the aromatic nature of the Moscatel grape to a greater or lesser extent. PX and Moscatel wines can range from inexpensive to premium in price and good to outstanding in quality.

Both of these wines can be used as blending components for sweetened Sherries.

SWEETENED WINES

Not all Sherries with some degree of sweetness are made in the above way. Sweet Sherries are also made from Palomino that has been fermented dry, fortified, aged and then sweetened using a sweetening component.

Inexpensive wines are likely to be made from relatively young wines that are sweetened just prior to bottling. For mid-priced and premium wines, the sweetened wine may be further matured in its own solera system. For example, Gonzalez Byass' Matusalem VORS Cream Sherry remains 15 years in a solera system after the dry and sweet Sherries (already aged for 15 years) have been blended.

Pale Cream

These wines must have undergone a period of biological ageing prior to sweetening. Rectified concentrated grape must (RCGM) is generally used as the sweetening component so that it does not add colour or its own flavours to the wine. These wines frequently have a very light *flor* character. They will often not be aged for very long and the sweetening component dilutes some of the *flor*-derived characteristics. They can be medium-sweet to sweet. Most Pale Cream wines are inexpensive and acceptable to good in quality.

Medium and Cream

In the past, Medium wines used to have to show characteristics of both biological and oxidative ageing, whereas Cream wines would have oxidative characteristics only. Under new legislation, these wines can now both be made from blends of biologically and oxidatively aged wines or exclusively one or the other (though, in practice, sweetened wines made exclusively from biologically aged wines will be labelled Pale Cream). Both Medium and Cream wines are usually blended with PX for sweetening. Medium Sherries can range from off-dry to sweet (less than 115 g/L residual sugar), whereas Cream Sherries are sweet (above 115 g/L residual sugar). These wines can range from inexpensive to premium in price, and acceptable to outstanding in quality. As with the dry styles of Sherry, the cheapest wines tend to be made from younger wines, whereas premium examples will be made from a high proportion of well-matured Amontillado, Oloroso and PX wines.

SHERRIES WITH AN INDICATION OF AGE

There are various categories that can be used to denote Sherries that have been aged for long periods of time.

VOS and VORS

The term VOS (Vinum Optimum Signatum / Very Old Sherry) denotes wines with an average age of 20 years or more. The term VORS (Vinum Optimum Rare Signatum / Very Old Rare Sherry) denotes wines with an average age of 30 years or more. Each batch of these wines released from the bodega is assessed for typicity by a tasting panel and also sent for laboratory analysis to provide evidence of the age of the wine (e.g. carbon-14 testing). As these very old dry wines can taste a little astringent, producers can blend in a little sweet wine, usually PX, as long as it does not mask the original dry wine (as judged by the tasting panel). These wines are produced in very small quantities, and their very good or outstanding quality, together with their relative rarity, means they sell at premium and super-premium prices.

12- and 15-year-old Sherries

These are categories for wines with a slightly lower average age. The wines must still undergo a tasting and laboratory analysis; however, this is carried out on a yearly basis rather than for every individual batch of wines released.

2.4. Wine Law and Wine Business

TYPES OF BUSINESSES ENGAGED IN PRODUCTION

The total area of vineyards planted within the *Zona de Producción* was 7,142 ha in 2020.[6] Average vineyard holdings are small (just over 3 ha). Members of co-operatives own 47 per cent of the vineyards, with the shippers owning 31 per cent and independent growers 22 per cent.[7] Although many shippers, such as Gonzalez Byass, Barbadillo and the Estevez Group, have large vineyard holdings, they are usually not self sufficient and need to buy from independent growers.

Companies involved in the production of Sherry wines are registered within three different categories. A company may belong to only one of these registers or to multiple registers.

Bodegas de la Zona de Producción (Production bodega)

These bodegas, which are usually large co-operatives, press grapes and ferment the must into base wine. They are often owned by a company within one of the other registers, but can be independent and will sell the base wine to either of the ageing bodegas. They may sell their own wines, but these cannot qualify for DO Jerez-Xérès-Sherry or DO Manzanilla – Sanlúcar de Barrameda.

Bodegas de Crianza y Almacenado (Ageing and storage bodegas)

These bodegas, also called *almacenistas*, mature wines. They tend to be relatively small in the amount of wine they mature. The wines must then be sold to *Bodegas de Crianza y Expedición*.

Bodegas de Crianza y Expedición (Ageing and shipping bodegas)

These bodegas, also called 'shippers', are the only ones permitted to export or sell DO Jerez-Xérès-Sherry or DO Manzanilla – Sanlúcar de Barrameda wines to the market. As well as selling the final wine, they are also permitted to mature the wines, which may come as young wines straight from the *Bodegas de Producción* or may come as matured wines from the *Bodegas de Crianza y Almacenado*. The wines from the *almacenistas* may be blended with

the shipper's own stocks of wines to make up volumes and add complexity. The wines are then generally sold under the shipper's own brands; however, the shipper Lustau has long had an *almacenista* range that, although branded by Lustau, features wines by individual *almacenistas* and includes their name on the wine label.

Almacenistas, in particular, have suffered from the declines in Sherry sales. As demand reduced, the shippers survived using their own stocks, not needing extra wine from the *almacenistas*, and consequently many *almacenistas* went out of business. In 1996, the Consejo Regulador lowered the minimum stockholding for companies to register as a shipper from 12,500 hL to 500 hL. This meant that a number of the biggest *almacenistas*, such as El Maestro Sierra and Bodegas Tradición, became shippers and therefore now market their own wines under their own brands.

THE CONSEJO REGULADOR

Sherry's Consejo Regulador was the first to be registered in Spain, in 1933. It maintains all the vineyard registers and sets parameters such as maximum yields and minimum alcohol levels for base wines. It also oversees the rotation of stock in the bodegas and verifies the authenticity of age-dated Sherries. The Consejo Regulador is a major promotional body, engaging in many forms of marketing that range from the organisation of events during International Sherry Week to running educational courses for wine professionals.

Sherry used to be used as a generic term for fortified wine made with white grapes. In the mid-1990s, the Consejo Regulador successfully campaigned for this term to only be used (at least within the EU) for the wines of DO Jerez-Xérès-Sherry and DO Manzanilla – Sanlúcar de Barrameda.

Wine legislation and labelling terms as set by the Consejo Regulador have been covered throughout the previous sections.

SHERRY SALES

Sales volumes of Sherry have been in sharp decline for the last four decades. Peak sales in the late 1970s were around 150 million litres. This decline has continued in the last decade. In 2019[8], global sales of Sherry were 31 million litres, down from 46 million litres 10 years earlier.

Sales of sweetened Sherries have declined dramatically. Sales of Cream Sherries, which used to be the largest category by volume, declined from 12.5 million litres in 2006 (the first year for which detailed figures are available) to 6.9 million litres in 2019, and Medium Sherry from 11.8 million litres to 5.7 million litres in the same period. Pale Cream sold 2.2 million litres a year in 2019 (4.1 million litres in 2006), and 90 per cent of that is shipped to the UK.

Sales of Fino have also decreased (14.0 million litres in 2006 to 6.4 million litres in 2019); however, Manzanilla sales declined less rapidly (8.5 million litres in 2006, 7 million litres in 2019), being the most consumed style in the domestic market (see further below).

Volumes of Palo Cortado, Pedro Ximénez and age-indicated Sherries are small, but all of these now represent a profitable part of most shippers' portfolios.

Spain is the biggest market, with sales of 11.5 million litres in 2019 (38 per cent of total sales), and has remained stable in the five years to 2019; the most popular products are Manzanilla, followed by Fino. The UK is the largest export market (8.2 million litres; the majority of the market is sweetened Sherries), followed by Holland (4.7 million litres), Germany (1.7 million litres) and the USA (1 million litres). Each one of these export markets has seen decline in sales volumes over the last decade.

The Consejo Regulador does not publish value data; however, it is reported that, at least in some markets, such as the UK, sales of premium-priced Sherries are increasing. These sales are reported to be primarily driven by the hospitality sector (modern tapas bars, use of Sherry in cocktails) and younger drinkers. Some winemakers have diversified into producing unfortified wines, often from Palomino or PX, in a range of styles: fresh and youthful; biologically aged; partially oxidative. It is hoped that this move will also attract new consumers.

References

1 Rowles, P., 2017, Sherry: A Life's Journey, Melton Mowbray: Rowles Partnership.

2 Consejo Jerez (private communication, email, January 2022).

3 As above.

4 *Ageing*, Sherry Wines Vinos de Jerez (retrieved 3 April 2020).

5 Legislation of November 2011, quoted and translated by Rowles, 2017, p. 88.

6 *Sherry Wines Annual Reports*, Sherry Wines Vinos de Jerez (retrieved 12 March 2020).

7 *Memoria de Actividades 2020*, Consejo Regulador de las Denominaciones de Origen Jerez-Xérès-Sherry, p. 15, Sherry Wines (retrieved 22 December 2021).

8 In this study guide, the most recent sales figures given are from 2019, the last year that was not affected by the Covid-19 pandemic.

3 Port

Port is a sweet, fortified wine hailing from the Douro region of Portugal. It originates from trade wars between England and France in the 17th century, causing England to increase trade with Portugal. The powerful red wines became popular in England, and brandy started to be added to stabilise the dry wines and make sure they arrived in England in good condition. The practice of fortifying the wine during fermentation started when two British merchants visited the Abbot of Lamego and found the sweet wines made there were of a higher quality than the dry wines they had seen anywhere else and shipped the entire stocks to England.

At the same time, a number of the famous Port shippers were established including Kopke, Warre, Croft, Quarles Harris and Taylor's. Traditionally, shippers were agents that took a commission for shipping Port abroad or acquired Port from brokers in the Douro and then stored them in 'lodges' (wine cellars/warehouses) in Vila Nova de Gaia (located on opposite side of the mouth of the River Douro to Porto), prior to onward shipment overseas. However, most shippers have since become producers and have become dominant players in the production of Port, with their own vineyards, wineries and bottling facilities.

The signing of the Methuen Treaty in 1703 ensured that Portuguese wines received lower rates of duty in England than those of any other country. Port's popularity led to the production of large amounts of poor quality Port-style wines (using poor quality spirit, thin wines and bolstering colour with additions such as elderberry juice). Poor quality meant that demand slumped, leading to oversupply and falling grape and wine prices. In action against this, in 1756, the Port vineyards were officially demarcated, and production regulations drawn up by the prime minister of the time, the Marquês de Pombal. At the same time, Pombal created the *Companhia Geral da Agricultura das Vinhas do Alto Douro*, often referred to as *Real Companhia Velha*, from which all Ports for export had to be bought. The *Companhia* was also empowered to fix prices and was given the exclusive right to supply the spirit used in fortification. Although a number of the decrees passed by the Pombal were far from popular, sales volumes and prices of Port began to rise once again.

The early 19th century was challenging as the Douro and wider Portugal suffered through the Peninsular Wars and Portuguese Civil War. Later in the century the vineyards were hit by both mildew and then phylloxera, and many small growers and producers needed to sell their land and properties in order to survive. The shippers took advantage of low prices and started to own vineyards and *quintas* (estates).

The first half of the 20th century saw the creation of the *Instituto do Vinho do Porto* (IVP, 1933) responsible for the administration and supervision of the Port industry and the Casa do Douro (1932), a secondary authority to supervise the growers within the Port demarcation. Just after this time, vineyard parcels in the Douro were rated A through to I based on their suitability for producing Port; a classification that remains today (see The *Beneficio* in Wine Law and Wine Business). The Casa do Douro and then the IVP also controlled the purchase of the spirit (*aguardente*) with which producers could fortify their wines.

A number of other influential developments occurred at the end of the 20th Century and start of the 21st. In the early 1980s, the World Bank Scheme offered low-interest loans to Douro growers who could plant or replant up to 10 hectares of vineyard provided that the

land was classified as being of either A or B grade and that only five prescribed varieties were used. Some of the major shippers, including Cockburn's, Ferreira and Ramos Pinto, together with the local university joined to fund a vineyard research programme. Around 2,500 ha of vineyards were planted on wider terraces called *patamares*, and with blocks of the prescribed varieties (compared to the usual field blend).

In 1986, Portugal entered the EU and as a consequence by 1991, producers were permitted to source and buy their own *aguardente* on the open market, leading to a rise in quality in the spirit used and hence of Port overall.

In 1990, the Casa do Douro controversially bought 40 per cent of the shares in one of the largest shippers of the time, Royal Oporto. Although it was claimed that this would allow growers to trade their own products, the venture was not a success and a few years later the Casa do Douro became bankrupt. In 2003, a new interprofessional body the Instituto dos Vinhos do Porto e do Douro (IVDP) was created to supervise both Port and Douro wine producers, reflecting the growing importance of dry Douro wines alongside Port.

In the first decades of the 21st century, developments have continued to be made. An improved version of the *patamares* has been developed. Despite a continued focus on the five prescribed varieties, other local grape varieties are increasingly being noted and used for the characteristics they can bring to a blend. Depopulation in the vineyard areas has meant that the labour intensive traditional practice of foot treading in the winery has been largely superseded. As the new technology has been improved, it is now used for wines of all levels of quality.

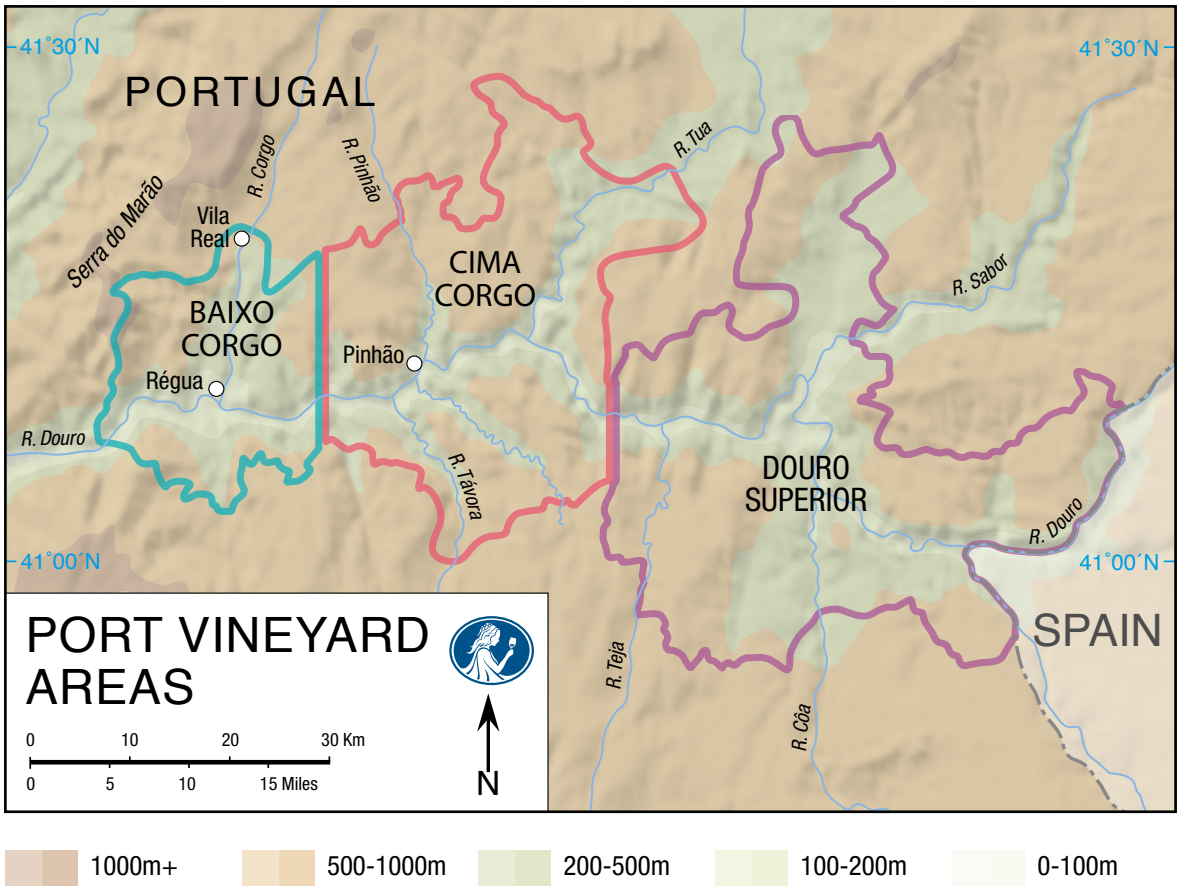
3.1. The Growing Environment and Grape Growing

LOCATION AND CLIMATE

The Douro region is located in the north-east of Portugal. The total area of the appellation covers 250,000 ha, of which around 43,000 ha are planted and 32,000 ha of these register for DO Porto (the production of Port wines).[1] It has a warm continental climate, with temperatures easily reaching 40°C (104°F) in the summer and freezing temperatures not unusual in the winter. Distance from the Atlantic Ocean combined with shelter from the Serra do Marão to the west of the region, mean that the vineyard area is much warmer and drier than the cities of Porto and Vila Nova di Gaia on the coast (70 km from the western end of the vineyard area).

The vineyard area follows the path of the River Douro and is divided into three sub-regions: Baixo Corgo, Cima Corgo and Douro Superior. The most westerly of the regions, the Baixo Corgo, is the coolest and wettest (900 mm rainfall per annum), being nearest the cold Atlantic coast. With its cooler climate, the Baixo Corgo tends to produce fruit for many of the inexpensive Ruby and Tawny Ports. The Cima Corgo is warmer and drier (around 700 mm rainfall per annum), and most of the well-known producers have vineyards in this region, which are used to produce age-indicated Tawny Port and Vintage Ports. By comparison, the Douro Superior, which is furthest from the coast, is the hottest and driest sub-region (450 mm rainfall per annum) and drought is a frequent issue. The Douro Superior is still relatively sparsely planted, but as it contains some flatter land which allows mechanisation, plantings are increasing.

Although the region is divided very generally into these three areas, the winding River Douro and its tributaries provides a range of microclimates. Vineyard sites vary widely in altitude and aspect meaning that there can be differences in average temperature and sunlight exposure even within a single vineyard.


41°30´N
PORTUGAL
41°30´N
R. Corgo
R. Pinhão
R. Tua
Serra do Marão
Vila Real
CIMA CORGO
BAIXO CORGO
R. Sabor
Pinhão
Régua
R. Douro
R. Távora
DOURO SUPERIOR
R. Douro
41°00´N
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SPAIN
PORT VINEYARD AREAS
0 10 20 30 Km
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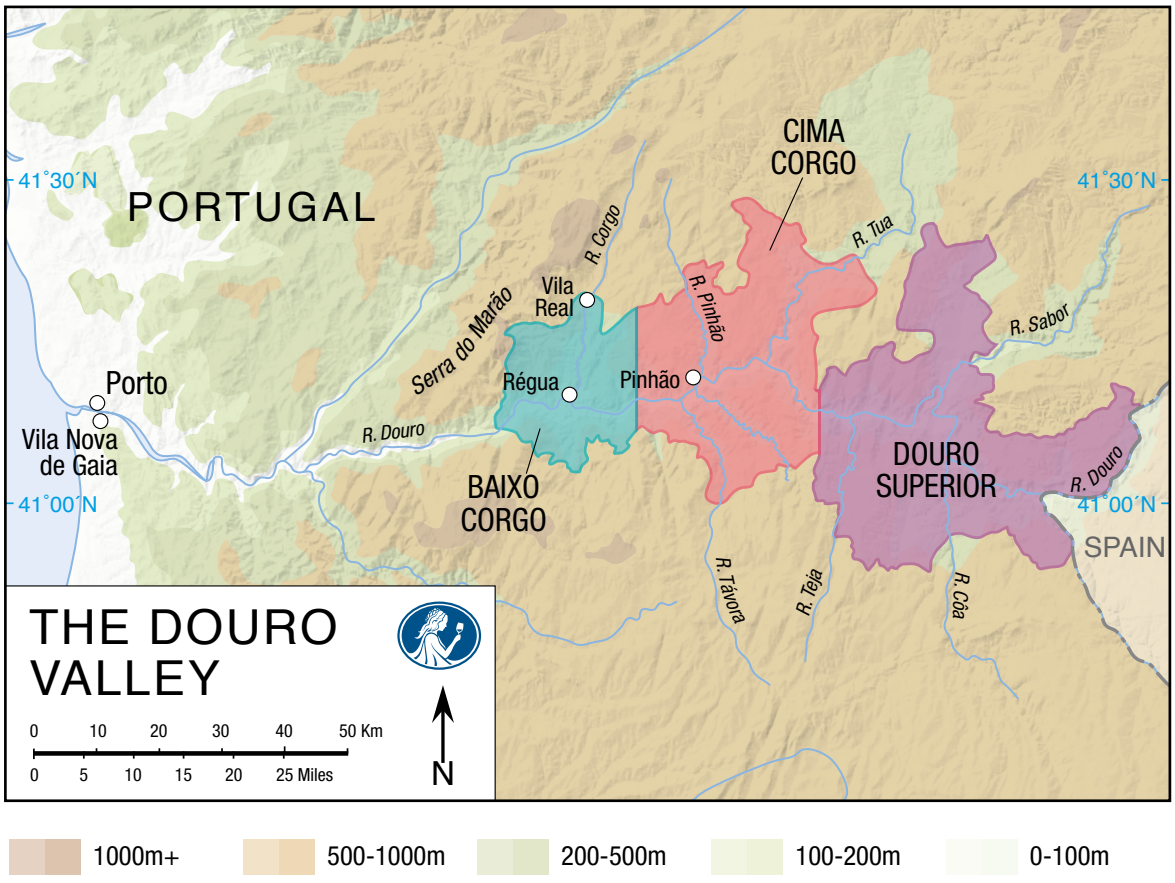
R. Tejo
R. Côa
1000m+
500-1000m
200-500m
100-200m
0-100m


CIMA CORGO
41°30´N
PORTUGAL
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R. Corgo
R. Tua
R. Pinhão
Vila Real
Serra do Marão
R. Sabor
Porto
Régua
Pinhão
Vila Nova de Gaia
R. Douro
BAIXO CORGO
DOURO SUPERIOR
R. Douro
41°00´N
41°00´N
SPAIN
R. Távora
R. Tejo
R. Côa
THE DOURO VALLEY
0 10 20 30 40 50 Km
0 5 10 15 20 25 Miles
N
1000m+
500-1000m
200-500m
100-200m
0-100m

SOILS

The stony, shallow soils of the Douro are free-draining and poor in nutrients, which limits vigour. The underlying bedrock is schist, a type of rock that crumbles into layers relatively easily. Due to ancient tectonic movements, the schist in the area splits into vertical layers (rather than the more typical horizontal) and therefore vine roots are able to penetrate deep into the bedrock to find water. Irrigation is only permitted in exceptional circumstances, for example, periods of drought under which the vine could be in extreme hydric stress.[2] Therefore, what little natural water there is, is the main source of water for the vine. The schist is so important in the viability of grape growing in this region that the boundary of the demarcated Port region mostly follows the outline of the schist. It is very difficult for vines to survive if planted above the impenetrable granite bedrock that is common in the wider area.

VINEYARD LAYOUT AND MANAGEMENT

The steep slopes of the Douro Valley (many with gradients over 30 per cent) mean that viable vineyard layouts are limited. Three types of vineyard layout are in place in the Douro:

Socalcos

This is the traditional method. *Socalcos* are narrow terraces, supported by walls of dry rock. They allow for planting densities of around 6,000 vines per hectare. This layout is typically not suitable for mechanisation (plus labour is required to maintain the walls), and for this reason *socalcos* are not usually considered when planting a new vineyard. The *socalcos* of the Douro

Terracing: *socalcos* in the foreground, *patamares* in the background.

are protected by UNESCO, and for that reason cannot be converted to any other layouts. The vines on the *socalcos* can be planted at lower densities to allow for a small tractor to enter the terraces to reduce so much need for labour.

Patamares

These are terraces supported by a steep earth ramp, rather than a stone wall. Small tractors are able to run up and down the slopes by the use of tracks that run diagonally up the slope. *Patamares* are cheaper to implement and maintain than *socalcos,* however, erosion and the growth of weeds on the ramps can be problematic. Planting densities are relatively low, around 3,000 to 3,500 vines per hectare, as the ramps take up a lot of space. There are two kinds of *patamares*:

- Large, wide *patamares* that support two rows of vines on each terrace. These were the original form of *patamares*, constructed when the bulldozers that create the terraces were large and bulky. Although growing two rows of vines on each terrace makes efficient use of vineyard land, uneven ripeness can be an issue, with the exterior row of vines gaining more sun exposure.
- Narrow *patamares* that only support one row of vines. These are a more modern version, carved by newer, smaller bulldozers and often laser technology ensuring precise construction. These *patamares* are often tilted very slightly towards the slope and also from one side of the terrace to the other, both of which improve water absorption and drainage and reduce erosion. With only one row of vines per terrace, uneven ripeness is less of a problem.

Vine rows divided by an earth ramp on *patamares*.

Vinha ao Alto

In this layout option, the vines are planted in vertical rows up the slopes. It is the least expensive option to plant and maintain and allows for relatively high-density planting (around 5,000 vines per hectare), and hence efficient use of land. However, above a 40 per cent incline, mechanisation cannot be used, and therefore *patamares* are more likely to be used in these cases. Water run-off and erosion can also be significant problems. Use of this vineyard layout is currently relatively limited.

Vines are cordon-trained and spur-pruned or head-trained and cane-pruned, and VSP trellised, to promote even sun exposure and ripening, and allow for mechanisation where viable. Summer pruning, such as leaf removal, may be used to ensure sun exposure throughout the growing season, especially for late-ripening varieties. Rootstocks that are tolerant of drought (generally 110R and 1103P both of which are hybrids of *V. rupestris* and *V. berlandieri*) are widely used.

When vineyards are replanted key focuses are increasing vine density, vineyard layouts that allow mechanisation and selecting the best planting material (grape variety, rootstock etc.) for that area of land (this may even mean planting different grape varieties on the same terrace).

The maximum yield permitted for Port wine production is 55 hL/ha, but due to limited water availability, and, in some years, the hazards and diseases described below, yields are more likely to be around 30 hL/ha.

Young vines planted to *Vinha ao Alto*.

Viticultural hazards can include late spring frosts in the highest altitude vineyards and in some years cool, wet weather from the west during the early summer, which disrupts flowering and fruit set. Downy mildew and botrytis bunch rot can be issues, especially in the wetter Baixo Corgo. These are combatted by canopy management techniques and spraying with fungicides.

Fertilisers may be used as necessary to improve the poor nutrient status of the soil. Herbicides may be required to control weeds that grow on the slopes of the *patamares*, which can compete with the vines for water and nutrients. However, if there is enough space a small mower may be used. Cover crops may be grown on *vinha ao alto* slopes to prevent erosion, improve soil structure and nutrition, and reduce the presence of weeds. A number of the largest growers and producers are increasingly farming using sustainable or organic techniques where and when it is possible to do so.

Harvesting is carried out by hand; much of the vineyard topography is not suitable for machine harvesters. An ageing regional population (and continuing depopulation) is fast catching up with growers who each year face increasing difficulty in finding enough people to pick. Symington Family Estates, itself the largest single grower in the region, has been developing (since 2015) a suitable machine harvester to ensure that, if labour sourcing becomes too difficult, they will still be able to harvest their fruit. The harvest tends to start in the Douro Superior and end in the Baixo Corgo. The various microclimates within the valley, the use of different grapes and the prevalence of hand-harvesting (relatively slow) means that harvest can be spread over several weeks.

GRAPE VARIETIES

There are over 100 grape varieties permitted for the production of Port. Since the 1980s five prescribed varieties have been the focus of replanting efforts and clonal research; Touriga Franca, Tinta Roriz, Tinta Barroca, Touriga Nacional and Tinto Cão.

However, many small vineyard owners continue to plant in the ways that have been carried out for centuries, and therefore the many of vineyards in the Douro are planted with a field blend. Furthermore, a number of producers are looking at varieties outside the prescribed five, particularly if they can make valuable contributions to the blend such as colour and acidity, and research is focused on maintaining the diversity of indigenous plantings and investigating their future potential, with the effects of climate change particularly in mind.

The vast majority of Port wines are made from a blend of varieties to make use of their differing characteristics and reduce vintage variation (e.g. cool, wet years may disrupt some grape varieties more than others). As stated above, a number of vineyards are made up of a mix of grape varieties (field blend). As the various grape varieties planted in the Douro have different ripening times, a field blend can provide a different character to blocks of different varieties that are all picked at optimum ripeness and then blended.

The fruit from old vines (*vinha velha*) is generally a key part of the blend in premium and super-premium Port wines, and some Port shippers make wines exclusively from old vine fruit.

Black varieties
The most important varieties (for volume and/or quality) are listed below.

Touriga Franca – A late ripening variety, making it suitable for growing in the warmest sites (low altitude, south-facing). It has tight bunches of thick-skinned grapes, which makes it relatively resistant to fungal diseases. However, it can be vigorous and this needs to be managed, usually by summer pruning. It contributes colour, tannin and acidity as well as juicy red and black fruit flavours and floral aromas to a blend. For these reasons it is popular with growers and Port producers and is by far the most grown variety.

Tinta Roriz – (Tempranillo in Spain and Aragonez elsewhere in Portugal). An early ripening variety, that is best grown in relatively cool sites as otherwise it can suffer from water stress. It can lend body and deep colour to the blend. It is capable of producing high yields, but these need to be limited otherwise the wines can lack concentration.

Tinta Barroca – An early ripening variety that is best planted coolest sites (high altitude or north-facing slopes, generally in the Baixo Corgo and Cima Corgo) otherwise it is prone to heat damage and grape shrivelling. It is not as floral as some of the other grapes, with flavours that tend to be more earthy. Unless planted in the coolest sites, it can lack acidity, and its colour also tends to fade more quickly than wines from Touriga Nacional and Touriga Franca. It is capable of producing high yields of grapes.

Touriga Nacional – A mid-ripening variety with thick-skinned grapes, producing wines with deep colour intensity and high levels of tannins. It retains acidity well and displays concentrated flavours of black fruit and floral aromas. Its wines are said to have long ageing potential and hence it is often a component of the premium, long-matured wines. It can suffer from excess vegetative vigour, which needs to be managed through summer pruning, and is susceptible to coulure, which can lower its yields substantially and cause vine imbalance.

Tinta Amarela – (Trincadeira in other parts of Portugal) Prone to fungal diseases due to its tight bunches of grapes. Produces full-bodied wines with concentrated black fruits and spicy notes, that are approachable in youth, but are also capable of ageing.

Tinto Cão – A low yielding variety that produces small thick-skinned grapes that are resistant to fungal disease. It ripens late and is very tolerant of heat. It produces concentrated wines with high acidity and the capacity to age well.

Sousão – A thick-skinned variety becoming increasingly popular for its deep intensity of colour and ability to retain high levels of acidity.

White varieties
The key white grapes for Port production are:

Malvasia Fina – (Boal in Madeira). Produces neutral wines with medium acidity, full body and a slightly honeyed characteristic.

Moscatel Galego Branco – (Muscat Blanc à Petit Grains). An aromatic grape; in Port production, often used for unaged styles.

3.2. Winemaking

FERMENTATION AND EXTRACTION

In Port production, fermentation is stopped by the addition of grape spirit to create a sweet wine (usually 80–120 g/L residual sugar). The maceration with the skins lasts for a maximum of two days and therefore extraction techniques need to be very effective. The key methods of extraction during the fermentation include:

Foot treading in *lagares*

Lagares (singular *lagar*) are shallow (around 80 cm deep) square tanks, allowing a large surface area between the must and grape skins. Traditionally, they were made from granite and the extraction would come from foot treading. Foot treading is effective at extracting but at the same time gentle enough not to crush the seeds, which would release bitter tannins. This is still the method used for a small number of premium and super-premium Ports.

Modern *lagares*

Also called robotic *lagares*. More recently, modern *lagares* have been created in which silicon 'feet', attached to a stainless steel gantry, press the grapes against the *lagar* floor and subsequently punch down the cap. The advantage of modern *lagares* is that they reduce the need for a large hired workforce, which can be difficult to obtain and unreliable. However, the initial investment for this equipment is higher. Modern *lagares* can produce wines of equal quality to those that are produced by foot treading, although some producers continue to use foot treading for their most expensive wines.

Pumping over

This technique is the same as that used for non-fortified wines. Although this technique can produce Ports with deep colour and high levels of concentration through frequent pumping over, it is not as effective at extracting as foot treading or modern *lagares*.

Stainless steel pistons

This technique uses open stainless steel vats with pistons that punch down the cap to a programmed schedule. This can be used in conjunction with pumping over, which is usually needed to promote a more-even extraction. This technique is believed to be almost as effective at extracting as *lagares* and seems to produce wines that are very similar in quality to those that have been made by foot treading in *lagares*.

Autovinifiers

These sealed concrete or stainless steel tanks provide a solution to cap management that does not require electricity. The rising pressure of the CO_2 produced from the fermentation pushes the juice up through pipes into a holding tank. When the pressure of the CO_2 reaches a certain level, a valve is automatically released and the wine in the holding tank, no longer supported by the gas pressure, sprays over the cap. The key advantage of this technique is that it does not require electricity and therefore can be one of the cheapest options. However, because the process is reliant on CO_2 released from fermentation, very little extraction occurs before the fermentation starts. This means that the wines that this technique tends to produce are lighter in colour, body and flavour, suitable for basic Tawny, White and Ruby Ports.

Robotic *lagares*. Here, the lagares are made from granite.

One of the 'feet' of the robotic *lagar*.

Modern fermentation vessels (including those used in modern *lagares*) tend to be made from stainless steel. This allows for easy temperature control and means that if necessary, the tank can be cooled to slow the fermentation and therefore prolong the period of extraction. Stainless steel also has the advantage of being easy to clean. Some producers use granite, concrete or old wooden vessels, usually for small-volume wines.

The grapes may or may not be destemmed. Unripe stems can impart bitterness, however, if stems are fully ripe they can aid pressing (reducing compaction of the pomace and enabling better drainage) after the fermentation has been stopped and free run wine drained. Fermentation temperatures for red wines tend to be 28–32°C (82–90°F), warm enough to allow sufficient extraction but not so warm that the fermentation progresses too quickly and reduces the available extraction time before pressing and fortification.

Fermentation temperatures for whites range from around 17–22°C (63–72°F), for further details see White Port. Many producers use ambient yeasts for fermentation as these are sufficient to start the ferment (and completing fermentation to dryness is not a concern for Port production).

FORTIFICATION

Port legislation states that the spirit used to fortify the wine must come from grapes or other grape-derived products and it must be of 77% abv (+/– 0.5%). This spirit is typically called *aguardente*. Most styles of Port must be fortified to an alcoholic strength between 19–22% abv; an exception is made for basic Ruby, Tawny, White and Rosé Port that can be fortified to a minimum of 18% abv.

The alcoholic strength of the *aguardente* is relatively low compared to the 95–96% abv spirits used in many other fortified wines. Whereas 95–96% abv spirit is neutral, 77% abv has more character, and is the reason Port displays spirity aromas. Also, because of its relatively low alcoholic strength, a significant amount of spirit (approximately 1 L of spirit for every 4 L of fermenting must) needs to be added to produce a fortified wine of 20% abv, and therefore it is not surprising that the style and quality of the fortifying spirit has a significant influence on the style and quality of the wine.

From 1967 to 1976, all producers had to buy their *aguardente* from the Casa do Douro. From 1976, the IVP tendered the contract for the spirit. The *aguardente* was the same for all producers, and it was not of particularly high quality (cheap alcohol from southern Portugal, and then France). However, since 1991 producers have been able to source and buy their own *aguardente*. In the years that have passed since this time, Port producers have gained a better understanding of the role of the *aguardente* and many use slightly different spirits in different wines. Although all spirit must be 77% abv, some producers will use relatively neutral spirits to best show the character of the wine, whereas others will use spirits that are more aromatic (have more fruity esters) to add a certain character to their Port. The spirit chosen will also have an influence on the price of the final wine, therefore, high quality spirit will be added to premium wines, whereas less expensive spirit will be used in inexpensive wines.

The fermentation is stopped when the wine reaches around 5–7% abv and depends on the concentration of sugar the producer wants to retain in the final wine, generally 80–120 g/L. This can be a function of ‘house style’. The wine is drained from the skins before the *aguardente* is added. This means that draining must be as efficient as possible, as the must will continue fermenting during this time (until the fortifying alcohol is added), using up sugar that may be desired in the final wine. Modern fermentation vessels (including modern *lagares*)

are generally designed to drain as quickly as possible, compared to traditional granite *lagares*, which can take hours to drain.

The mass of grape skins left after draining will be pressed and much of this press wine will be blended into the fortified free run wine to provide greater colour and tannin, necessary for wines that are to undergo long periods of ageing.

The grapes for Port are picked when the flavours and tannins are ripe. Too much potential alcohol is not an issue for these wines, but acidity can be low and pH high, and therefore acidification is common. Ports do not go through malolactic conversion as lactic acid bacteria are unable to tolerate the high concentration of alcohol in the wine after fortification.

All Ports spend their first winter in the Douro. During the months that follow fermentation the wines are left to clarify before they are racked off the gross lees. A rotary vacuum filter is often used to extract the remaining wine from the lees. In the spring, the wines may be shipped from wineries in the vineyard area to lodges in Vila Nova de Gaia.

Blending is a key part of the production process and may happen at any point. Ports are generally blends of different vineyard parcels, different grape varieties (though co-fermentation of different varieties is quite common), and, depending on the style, different vintages. Lots that have been treated differently in the winery may also be kept separate and used as blending options. For example, Port producers will generally make a range of young wines some with very high levels of sweetness and some that are drier specifically to adjust level of sweetness in the final wine style.

Many Ports are non-vintage products with consumers expecting consistency of style year on year. Blending wines, usually including those from different vintages, is an important process to ensure this consistency. Port producers also tend to have a ‘house style’ and hence blending can be used to achieve this style throughout the wines within the shipper’s range. Blending is also important for producing a wine of the right profile and quality for the style it is to become. For example, wines destined for Vintage Port will have deeper colour, greater concentration of flavours and higher tannins to be able to undergo extensive ageing, compared to a Reserve Ruby or LBV. All of these factors mean that the more stock a shipper holds, the easier it is for them to create a range of different styles. Smaller producers may limit their ranges to certain styles of wines to ensure they can produce such styles with consistency.

MATURATION

The climate of Vila Nova de Gaia is better suited to the maturation of Port wines than the wineries in the vineyard area, with strong Atlantic influence the temperatures are generally cooler and more constant. However, as Vila Nova de Gaia has become more tourist focused and congested, gradually more producers have built well-insulated, humidity-controlled lodges in the vineyard area.

Most styles of Port are aged in oak, even if for a relatively short time. Vessels may vary considerably in size depending on the amount of oxidation desired. The largest, called *balseiros*, are vats that can hold 100,000 litres, these are generally used to store wines and keep them fresh. If gentle oxidation is desired, the wines are usually matured in 600 L barrels called pipes. The aromas of new oak are not wanted, and therefore new vessels will be used to produce unfortified wines for a few years before they are used for Port maturation.

Racking is carried out during the maturation process to remove lees that gradually accumulates at the bottom of the vessel to avoid potential off-flavours. The frequency of racking is another way the producer can control the amount of oxidation, as is the degree to which the vessels are topped up with wine.

Large and small vessels for the storing and maturing of Port.

The maturation process is key to the style of Port produced, and therefore more on maturation will be covered in Styles of Port.

3.3 Styles of Port

Port is available in a diversity of styles, qualities and prices, mainly determined by the quality of the base wine and the form of maturation. Minimum amounts of ageing are often legally defined, and many of the wines in these different categories must be analysed and tasted by the IVDP before being permitted to specify the wine style on the label.

Quality-minded producers will often start making decisions on what grapes will be used in particular styles of wine during the growing season. Much is dependent on the weather, but the producers can also have an impact on ripeness and concentration of the grapes through canopy management techniques and harvesting dates. Once in the winery, the different parcels of grapes may be treated differently depending on the style of wine to which they are suited. For example, extraction will usually be relatively gentle on the least ripe grapes so as not to extract any under ripe tannins or flavours, and this wine is therefore best suited to less concentrated styles such as basic Tawny.

RED PORTS

Basic Ruby

Basic Ruby Port is medium bodied, with medium tannin levels and often mixture of red and black fruit flavours. It is generally the product of wines that are suitable for drinking early

and have not suitable ageing potential, for example, they may be fruity but without much tannin. Basic Ruby Port is usually produced using protective winemaking techniques to retain primary fruit flavours. This includes fermenting in stainless steel or concrete and ageing the wines in bulk (usually in stainless steel or concrete vessels, or sometimes large old wooden vessels) for a maximum of three years. The wine is generally a blend of more than one year and is expected to have the same consistent taste year on year. These wines are generally acceptable to good in quality and inexpensive to mid-priced. Due to limited ageing and use of cheap spirit (both of which mean that it can be made at low price points) the wines often have simple fruity flavours and can have slightly harsh alcohol.

Basic Tawny

These wines may show some lightness and browning of colour in common with other Tawny Ports, however this does not tend to come from long periods of oxidative ageing. These wines are often aged for no longer than Ruby Ports. They are often made by light extraction during fermentation (similar to Rosé Ports) to give them a paler colour reminiscent of an older wine. The fermenting must for basic Tawny may be drained early, concentrating the remaining wine which can be used to add more colour and flavour to Ruby Port.

Reserve Ruby and Reserve Tawny

Reserve Ruby and Reserve Tawny are higher quality wines than basic Ruby and Tawny. Reserve Tawnies must be aged in wood for a minimum of six years.

There is no minimum ageing period for Reserve Ruby Ports, however they must be tasted and approved by the IVDP's tasting panel. They tend to be more concentrated and of a higher quality and price than basic Ruby.

Tawny with an Indication of Age

These Ports have been aged for long periods of time in wooden barrels. The barrels typically used and hold 620–640 litres. These vessels permit a controlled exposure to oxygen and over time tannins soften, alcohol becomes more integrated, and primary flavours of fruit develop into tertiary flavours from fruit development (e.g. dried fruit) and oxidation (e.g. coffee, caramel and walnut). The barrels are old and therefore do not contribute flavours of oak. Due to the long ageing period, clarification and stabilisation occurs naturally in barrel and therefore these wines tend not to need filtration before bottling.

An age of 10, 20, 30 or 40 years (and from 2022, 50 years) can be stated on the label. The age specified is not the minimum amount of time the wine must be aged. Indeed, these wines are usually blends of more than one vintage and this blend can be made up of wines that are younger and older than the age specified. Instead, the wine will be tasted by a panel within the IVDP and must be deemed to have the characteristics of a wine of that age.

Within their long ageing, the barrels need racking and topping up (due to gradual evaporation of the wine) and this makes the production of age-indicated Tawny Ports relatively expensive compared to other styles of Port. Age-indicated Tawny Ports have seen increased sales in the last few years and as stocks of these wines are decreasing, prices are rising.

In recent years, a sub-category has arisen, namely very old (non-age-indicated) aged Tawny. This started with the launch of Taylor's Scion, a Tawny Port of more than 150 years old. Some other shippers have now launched their own versions, such as Graham's Ne Oublie

(dating from 1882). Given their rarity and long maturation, these wines sell at super-premium prices.

Colheita

Tawny Ports that are made from the grapes from one vintage are called Colheita Ports. They must be aged in small barrels for a minimum of seven years before being bottled. The label must state the vintage of the wine as well as the year the wine was bottled. The shipper could bottle part of their Colheita wine in one year (providing it is at least seven years old) and then bottle more in the following years according to demand. The wine in barrel can be topped up with other wines or spirit to avoid ullage. Colheita Ports do not tend to be as expensive as Vintage Port, however, there are some shippers that hold small stocks of very old Colheita wines that can sell for super-premium prices.

Vintage

Vintage Ports are wines from one 'declared' vintage. Producers must register their intention to release a Vintage Port in the second year after harvest and the young wine is approved by an IVDP tasting panel. Producers usually only declare a Vintage Port in years where their grapes and young wines are of exceptional quality. There are some years where the vast majority of Port shippers will declare a vintage (e.g. 2011, 2016) whereas in other years, the decision is more mixed (e.g. 2015). As well as considering quality, producers will decide to release according to market conditions. If there are two exceptional vintages in a row (very rare) the producer must decide whether to declare both vintages, the second of which could take sales away from the first.

As well as being the product of a very good vintage, the grapes will come from high quality plots, often from the shipper's own vineyards. Some shippers create super-premium wines from very select plots, usually of old vines; the original in this category being Quinta do Noval's Nacional, produced from the fruit of old, un-grafted vines.

Touriga Franca and Touriga Nacional are usually key components in the blend, giving colour, tannin and flavour concentration suitable for long-term ageing. The level of extraction during fermentation will also reflect this aim. Various lots (batches) of these wines are then stored in large old wooden vessels to avoid too much oxidation. The wines will be tasted over the period of the next two years to determine if a vintage can be declared and which lots may be suitable for Vintage Port. Wines that do not become Vintage Port after this period may become Single Quinta Ports, LBV, Crusted Port or even possibly a form of Tawny Port.

Vintage Ports undergo a maximum of three years in large old wooden vessels before extensive bottle ageing, although the majority are bottled during the second spring after the harvest, hence after 18–20 months in wood. The small amount of oxygen exposure during this time ensures that stability of the colour of the wine (through anthocyanin-tannin bonding) over its long ageing. The wines are bottled without fining or filtration, which results in a heavy deposit of sediment on opening and pouring.

Young Vintage Ports tend to be deep in colour and full-bodied with high levels of tannins and a pronounced intensity of ripe black fruit and sometimes floral notes. As they age, they gradually develop flavours of dried fruit and forest floor. The tannins and alcohol become better integrated in the wine. They tend to be very good to outstanding in quality, and due to this quality sell for premium and super-premium prices. Given their limited time in wooden

vessels and early release from the winery, these tend to be highly profitable wines for the producer.

Single Quinta

In years when the producer does not produce a Vintage Port (e.g. the weather has not been suitable to produce grapes of sufficient quality), they may to produce a Single Quinta Port. This is a wine from one year that is made only from the grapes of one estate (*quinta*) that is stated on the label e.g. Taylor's Quinta de Vargellas and Graham's Quinta dos Malvedos.

Crusted

This is a non-Vintage Port that is aged in wood for up to two years before being bottled without fining or filtration, and hence a deposit or 'crust' forms in the bottle. The bottling date must appear on the label. Crusted Port can be released at any time after bottling, however, after three years of bottle age it can include the term 'bottle matured' on the label. These wines can be similar in style to Vintage Port and have considerable ageing potential. They are usually good to very good in quality and mid-priced to premium.

Late Bottled Vintage (LBV)

LBV Ports are wines from a single year and must be bottled between four and six years after harvest. The fruit used for LBVs does not tend to be of the same quality as that for Vintage Ports, and this, together with longer ageing before bottling means that they are bottled ready to drink. Before bottling the wine is usually stored in large old wooden vessels or stainless steel vats to avoid oxidation. Many LBV Ports are filtered on bottling and therefore can be drunk without decanting being necessary. LBV Ports tend to be good to very good in quality, and usually mid-priced. They tend to have a little more intensity, body and tannin than Ruby and Ruby Reserve.

Some LBV wines are not filtered before bottling. These wines tend to be more full-bodied than filtered LBVs and benefit from bottle maturation. Many spend four to five years in wood followed by a further few years in bottle before release. They tend to say 'unfiltered' on the bottle to distinguish them from filtered LBVs (which is the more common category). Similar to Crusted Port, wines that have been aged for three years in bottle before release from the winery can be labelled with the term 'bottle matured'. These wines tend to be very good quality and the highest quality wines can taste similar in style to young Vintage Ports. They are usually mid-priced.

ROSÉ PORT

Rosé Port (also called Pink Port) was invented by Croft in the late 2000s. It is made from black grape varieties, with grapes that tend to come from the coolest areas, high altitudes or from the Baixo Corgo. The must is left to macerate for only a few hours, before draining the free run juice and clarification (some of the lightest press juice may also be used). Fermentation takes place at around 15–16°C (59–61°F) to retain red berry fruit aromas. The *aguardente* used must be as neutral as possible and of a high quality so as not to stand out given that this style has less intense flavours and usually little tannin compared to red Ports. The wines are bottled soon after the fortification and released from the winery within a year. They tend to be inexpensive to mid-priced, and colour and flavour profile depends on the producer (they range from pale pink-orange to deep pink).

WHITE PORT

The varieties for White Port are often scattered within mixed vineyards and therefore will be harvested at the same time (albeit separated from the black grapes). Where vineyard parcels are planted entirely to white varieties, these may be harvested first.

White Ports are made in a range of styles, with varying degrees of sweetness and oxidation. Some White Ports are made in a fruity, unoxidised style. Muscatel tends to be one of the key grape varieties in the blend, lending aromatic fruity and floral notes. Once at the winery, the grapes are crushed, SO_2 is added and maceration may last a couple of hours at chilled temperatures to limit oxidation. The must is then drained and pressed and the juice fermented off the skins at temperatures similar to those used for unfortified white wines (typically 17–18°C / 63–64°F) to enhance and retain fruity aromas. The wine may be stored in either stainless steel or in very large old oak casks for a short period. These White Ports are often lemon in colour, tend to be medium bodied and have flavours of stone fruits or floral notes.

At the other end of the spectrum, there are White Ports that are made in a highly oxidised style. It is typical for Malvasia to be a key part of the blend, with its subtle flavours in youth becoming honeyed and nutty with age. These wines may spend slightly longer on their skins and be fermented at slightly warmer temperatures (20–22°C / 68–72°F) to extract more phenolics that will support the wine during the ageing process. The wines are aged for several years in small casks (like premium Tawny Ports). These wines can be amber or even brown in colour and tend to show flavours of caramel, citrus peel, dried stone fruits and nuts.

White Ports can also be made with some slight oxidation from more limited ageing in oak. They tend to still show fresh fruit but can gain a slight nuttiness.

White Ports can qualify for the same labelling terms as Tawny Ports; they can be labelled with the term ‘Reserve’ if they have been aged in wood for a minimum of seven years. They can also be labelled with an indication of age of 10, 20, 30 or 40 years old if it is deemed to have the characteristics and taste of that age by the IVDP tasting panel. The wines can classify for Colheita if the wine comes from a single vintage and is aged for a minimum of seven years.

VERY OLD WINES

In 2022, new categories for very old wines were approved: 50 years old (for White and, as noted, for Tawny) and 'Very Very Old' or 'VVO' or 'W' for wines over 80 years of age (for White and Tawny).

3.4. Wine Law and Wine Business

TYPES OF BUSINESSES ENGAGED IN PRODUCTION

Land ownership in the Douro is very fragmented. There are around 20,000 vineyards owners with an an average of only 2.2 ha each.[3] Most sell their grapes to one of the medium or large producers or to a co-operative.

Co-operatives produce around 20 per cent of the wine in the region. Although they are permitted to sell wine under their own brands, the prominence of many shippers’ brands means that most co-operatives sell their wines to the producers. Brokers are often employed as part of the trading of grapes and wine.

There are far fewer producers than there were, with only 30–35 producing significant volumes. There are five main groups of producers that make up 80 per cent of sales by volume. Porto Cruz is the largest producer and owns the largest single brand (Gran Cruz),

followed by Symington Family Estates which owns Cockburn's, Dow's, Graham's and Warre's among others. Sogrape, Portugal's largest wine producer, is the third largest. It owns Sandeman, Offley and Ferreira, as well as many non-Port brands in Portugal and other countries. Next is The Fladgate Partnership that owns Taylor's, Fonseca, Croft and Krohn, and fifth is Sogevinus that owns Burmester, Barros, Cálem and Kopke.

THE IVDP

The IVDP (Instituto dos Vinhos do Porto e do Douro) was formed in 2003, succeeding the earlier IVP, to govern and represent the interests of wine producers in the Douro. This inter-professional body controls and supervises the production and trade of wines in the Douro (both unfortified wines and Port). The IVDP has several responsibilities. Among these, it regulates the amount of Port that can be produced in any one year (the *beneficio*) and holds the register of vineyards as well as companies involved in wine production and shipping. It also controls the volume of Port that can be released onto the market in a year. This is set at a maximum of one-third of a shipper's total stocks. The IVDP also analyses and tastes Port wines to ensure they meet the specifications of the different legally defined Port styles and has a role in the promotion of Port and unfortified wines from the Douro Valley.

THE *BENEFICIO*

The amount of Port must (i.e. grape juice designated for Port) that can be produced in a year is highly regulated in a system called the *beneficio*. (Note that the term *beneficio* refers to both the amount of Port must that can produced and the system itself.) Each vineyard parcel is classified in terms of its capacity to produce quality grapes for Port, considering factors such as location, altitude, aspect, soil and grape varieties planted. The vineyard parcel receives a numerical value for each one of these factors, and the final total is used to give the parcel

The topography of the Douro Valley is very varied and differences in aspect and altitude can mean that neighbouring vineyards will be awarded different ratings.

a letter. This means that two vineyards in neighbouring locations but planted with different grape varieties would likely gain different scores and possibly different letters. The parcels are given the letters A to I and the letter awarded determines the amount of Port wine that can be made from the parcel; with 'A' denoting the vineyards of the highest quality and therefore those that can produce the most Port wine. Vineyards with a rating below F cannot make Port wine, but can be used to make unfortified wine or distilled into spirits.

The amount of must that can be produced is different every year. It is agreed between the three main bodies: the growers, the producers and the IVDP, and takes into consideration the market demand as well as the current stocks available in the market. The aim of the *beneficio* system is to keep grape and wine prices stable through its influence on the balance of supply and demand.

Each owner of land is given a card or certificate for each parcel of land that they own. Vineyard owners are legally permitted to trade their *beneficio* cards, provided that the grapes from the parcel of land are traded alongside the card. In reality, this does not always happen – the grapes that are traded may not always come from that parcel of land.

The *beneficio* sets the prices of grapes used for Port, and these prices are relatively high (1.20–1.40€ for grapes within the *beneficio* system, 0.25–0.40€ for grapes outside the *beneficio*). As vineyard owners can be certain of a set high price for their *beneficio* grapes, there is much incentive to give lesser quality grapes within any trading of *beneficio* cards, retaining the best quality grapes for selling outside the *beneficio* system (without any controls on price, high quality grapes are likely to receive a higher price than lower quality grapes).

On the other side, sometimes Port producers will substitute the inferior grapes they have received from *beneficio* trading with high quality grapes sourced from their own vineyards (that are not part of their *beneficio* allocation) to raise the quality of their Port wines. The inferior grapes may be used or resold for unfortified wines.

Many growers do not make their own Port and make their money purely through *beneficio* trading. This means that a large amount of *beneficio* trading is conducted each year. All transactions and payments must be recorded by and made through the IVDP, which monitors and controls the process.

The *beneficio* system is a subject of much debate, and a number of producers feel that it does not benefit the current industry. As demand for Port has declined (see below) the volume of Port permitted to be produced has been reduced to avoid oversupply. At the same time, the total area of vineyards has been allowed to grow, leading to oversupply of grapes for unfortified Douro wines compared to market demand. As prices for these grapes are not fixed by the *beneficio* the oversupply has led to very low prices. A number of Port producers therefore feel that they are subsidising the industry for unfortified Douro wines by paying artificially high prices for Port grapes.

PORT SALES

Port production in 2020 was approximately 70 million litres with sales of 68 million litres.[4] After three decades of growth at the end of the 20th century, sales peaked at the millennium and have been steadily declining since. However, there has been an increase in average price, due to increasing sales of premium wines such as age-indicated Tawny Ports, in turn thought to be attributed to increasing quality of production and effective marketing of premium products.

The IVDP separates Port wines into standard Ruby, Tawny, White and Rosé, and 'Special Categories' which includes all wines above this basic standard e.g. Reserve Ruby, Tawny and

Large bottle formats for some of Graham's Tawny Ports.

White, Tawny and White with an Indication of Age, Colheita, Vintage, Single Quinta, Crusted and LBV. Wines in the Special Categories make up approximately 23 per cent of volume sales, but 45 per cent of sales by value.[5]

In 2019, around 87 per cent of Port sales by volume came from export markets.[6] France is the largest market by volume (the domestic Portuguese market is the second largest market) particularly for inexpensive styles of Port, which are drunk as an aperitif. The decline in sales volume of Port is mainly due to dropping demand for inexpensive Port in markets such as France and Holland, as other beverages are increasingly being drank as aperitifs.

A number of Port producers have diversified into still, unfortified wines, including Symington, Quinta do Noval, Ramos Pinto and Niepoort. Whereas, others, such as Taylors, have continued to focus solely on Port. It is hoped that the growing popularity of Douro wines, may introduce new consumers to Port wines particularly in countries which have not been traditional markets for Port.

Rosé and unaged White Ports also aim to bring new drinkers to the category. Rosé Port can be drunk as an aperitif but it is also marketed for use in cocktails. White Port is also sometimes used in cocktails, but is also often mixed with tonic as an aperitif; its lower alcohol concentration than many spirits and mixers (such as gin and tonic) may be a positive attribute for some consumers.

Further potential is also seen for premium red Ports in the hospitality sector. Graham's have launched a number of 4.5 L bottles of various Tawny Ports that can be presented to dining customers as a digestif, a perfect photo opportunity for sharing on social media.

References

1 *Área de vinha e sua composição*, Estatísticas geral, IVDP (retrieved 15 March 2022)

2 Regulations changed in January 2019 so that growers no longer need to seek the permission of the IVDP before they irrigate. However, the IVDP must still be informed each time a grower intends to irrigate.

3 *Instituto dos Vinhos do Douro e do Porto* (retrieved 15 March 2022)

4 *Área de vinha e sua composição*, Estatísticas geral, IVDP (retrieved 15 March 2022)

5 Mayson, R., 2019, *Port and the Douro, Fourth Edition*, Britain: Infinite Ideas Limited

6 *Vendas de vinhos*, Estatísticas geral, IVDP (15 March 2022)

Madeira 4

Madeira is a Portuguese island in the Atlantic Ocean, around 600 km from the coast of Morocco. The fortified wine made on this island is also called Madeira.

The Island of Madeira began to be colonised shortly after 1420 by Portuguese discoverers and then by wealthy settlers who worked the land with their enslaved workers and other labourers. Large areas of forest were burnt to provide room for agriculture and increase the fertility of the soil. Terraces and irrigation channels were built. Although initially sugar, wheat and vines were the main crops and exports, the sugar industry declined during the 16th century mainly due to competition from other countries, and wine became the main export. Exports of wine grew further in the 17th and 18th centuries as British merchants arrived in Madeira and sent the wine to their colonies in North American and the West Indies. It was found that long periods of time in variable temperatures and hot conditions in the holds of ships sailing to and from the tropics improved the quality of the wines, and soon the wines were used as hold ballast on such trips, with the aim of improving the quality of the wine.

The 19th and 20th centuries were more difficult for the Madeira wine trade. Powdery mildew and then phylloxera hit the island in the mid to late 19th century, destroying vines and reducing yields. During the 20th century, Prohibition in the USA, two world wars and the Russian Revolution negatively affected the wine trades in many of Madeira's major markets at the time. Towards the end of the century, sales became more stable, but consumer tastes had changed, and sales were far below their peak in the 18th century.

The Instituto do Vinho da Madeira was founded in 1979 to regulate Madeira production, which was superceded in 2006 by the Instituto do Vinho, do Bordado e do Artesanato da Madeira, IP-RAM (IVBAM). In 1986 Portugal became part of the EU and further regulations were introduced. This, together with EU subsidies, led to improvements in the quality of Madeira wines, and this investment in quality has continued into the 21st century.

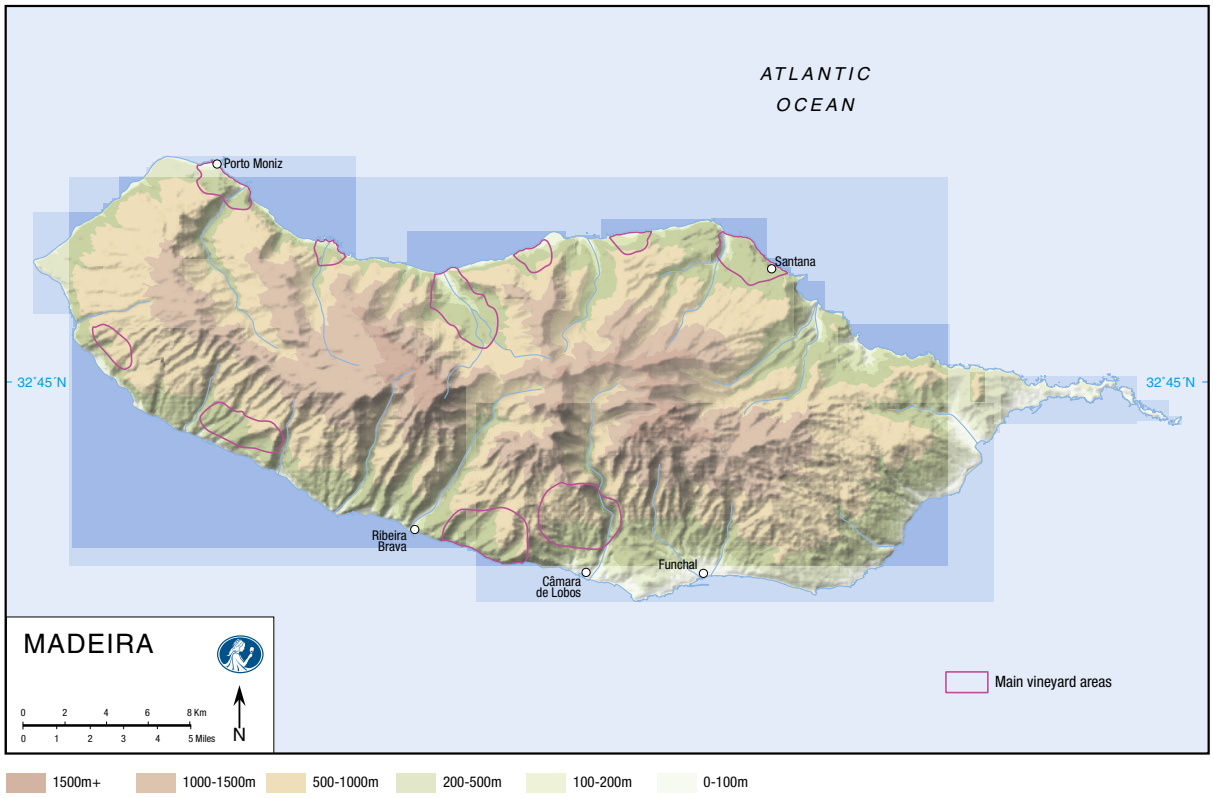
4.1. The Growing Environment and Grape Growing

CLIMATE, VINEYARD LOCATIONS AND SOIL

In general, Madeira experiences warm summers (averages around 20–22°C / 68–72°F) and mild winters (averages around 16–17°C / 61–63°F); lack of winter dormancy can be a problem in the warmest sites. As a mountainous island, there is a range of microclimates, with temperatures becoming cooler with altitude. The mountains, reaching up to 1,800 m, cause moist air in the humid winds arriving from the north to cool and condense into rainclouds, meaning that the north and centre of the island are considerably cooler and wetter (rainfall can exceed 3,000 mm per year in the centre) than the south. The majority of rain falls in the autumn and winter.

Madeira has an area of approximately 74,000 ha, of which only around 450 ha are planted with vineyards.[1] The vineyards can be found up to altitudes of around 800 m and tend to be located relatively near the coast, with forests covering the mountainous centre of the island.

The soils are of volcanic origin and high in nutrients. This, together with plentiful rain, provides fertile conditions and therefore vigorous vines.



GRAPE VARIETIES

The powdery mildew and phylloxera that devastated Madeira's vineyards in the late 19th century dramatically changed the make-up of grape varieties on the island. The wines from varieties such as Malvasia and Terrantez were already highly esteemed, and Verdelho was the most planted grape variety. However, with *vinifera* varieties decimated, producers began to plant American and hybrid vines that were more resistant to pests and disease, and could therefore produce large, reliable crops. Unfortunately, these vines could not produce wines of the same quality as *vinifera* varieties, and hence, with help from EU schemes, a significant proportion of these vineyards has been replanted. (That said, it is still thought that a substantial number of Madeira's vineyards are planted with American vines and hybrids, although these grapes cannot be used to make Madeira.)

Several *vinifera* varieties are permitted for the production of Madeira. These were traditionally categorised into 'noble', 'good' and 'authorised'; the noble category reserved for Sercial, Verdelho, Boal and Malvasia. However, they are now split into 'recommended' varieties and 'authorised' varieties, the latter category mainly made up of varieties that were introduced after phylloxera but have not shown the same potential for quality as the recommended varieties. Tinta Negra is the main *vinifera* variety that has been planted since the arrival of phylloxera, able to produce high yields and being relatively easy to grow. It was at one point categorised as 'good', but now is in the 'recommended' category alongside the traditional varieties of Sercial, Verdelho, Boal, Malvasia and Terrantez. These traditional varieties have remained important for the quality of wine that they can produce, although their plantings are small.

Tinta Negra
This black grape is the most planted variety on the island. It is high yielding and easy to grow. It is only since 2015, that producers have been able to state the grape variety, Tinta Negra, on the label. However, much Tinta Negra is used to make wines where a level of sweetness rather than a grape variety appears on the label (see Styles of Madeira). It is used to produce wines at all sweetness levels.

Sercial
This grape is known for its high acidity and is used in the driest styles of Madeira. It is late ripening and especially in cool sites can be the latest variety to be picked, barely above the minimum level of potential alcohol. It is resistant to powdery mildew but susceptible to botrytis bunch rot and can experience poor fruit set. Plantings are small.

Verdelho
This grape is the second most planted *vinifera* variety. It has high acidity, but slightly lower levels than Sercial. It is susceptible to botrytis bunch rot, coulure, and downy and powdery mildews.

Boal
Boal is an umbrella term for a number of grape varieties. The variety that grows on Madeira is Boal Cachudo, and is also named Malvasia Fina, as is found in White Port. It grows best on the warm, low altitude sites in the south of the island. However, it is susceptible to drought and therefore needs adequate irrigation to thrive. It is typically used to produce semi-sweet wines.

Malvasia
This is an umbrella term for a number of grape varieties. Malvasia Cândida was historically the most important Malvasia, and is still highly prized for its quality. However, it is very susceptible to powdery mildew, which can limit yields, and therefore there are currently only small plantings. Malvasia de São Jorge is the most common Malvasia grown on Madeira. It can produce relatively high yields but is susceptible to botrytis bunch rot.

Terrantez
Plantings of this variety are very limited. It is susceptible to powdery mildew and botrytis bunch rot and is therefore picked soon after it reaches 9% abv potential alcohol.

VINEYARD MANAGEMENT

Madeira is a mountainous island and many vineyards are terraced to make planting on steep slopes viable. Vines are generally trained and trellised into a pergola system, here called *latadas*. This type of trellis allows air circulation above and beneath the vine which helps reduce incidence of fungal disease in the humid climate. It also permits other crops to be grown on the land underneath, making effective use of a small landholding. Vineyards are also planted with cordon-trained, VSP-trellised vines (here called *espaldeira*).

Madeira's warm, humid climate means disease pressure is high. Downy mildew, botrytis bunch rot and phomopsis are all problems, and although canopy management techniques such as shoot positioning and leaf removal may help, fungicide sprays are usually necessary.

Irrigation is widely practised: rainwater is carried from the centre of the island to vineyard areas by *levadas*, small irrigation channels. With lower rainfall, irrigation is more required in the south of the island.

The official harvest date is decided by IVBAM in consultation with producers and growers. It is usually at the end of August or the start of September. Given Madeira's topography, harvesting tends to be done by hand. The minimum potential alcohol at harvest must be 9% abv, and in general the grapes are picked with average potential alcohols of no more than 11% abv. Prices paid for grapes differ based on grape health and grape variety (the traditional varieties of Sercial, Verdelho, Boal, Malvasia and Terrantez fetch much more than Tinta Negra).

The maximum permitted yield varies according to the vintage conditions, but high yields of 150 hL/ha are not unusual. This is easy to reach with fertile soils and plentiful water for irrigation.

***Latadas* on the sloped terrain of Madeira**

4.2. Winemaking

On arrival at the winery the grapes are checked for weight, health and potential alcohol (representatives of IVBAM must be present for the arrival of all grapes), destemmed and crushed.

The use of skin contact varies according to the producer. Wines from Tinta Negra are often fermented on their skins, particularly for medium sweet and sweet styles of wine. Some producers have introduced a period of skin contact for wines made from white grapes.

The fermentation usually takes place in stainless steel vessels with ambient yeasts. The timing of fortification will depend on the style of wine that is being produced, with sweeter styles being fortified earlier in the fermentation to retain more residual sugar; wine for sweet styles may ferment for a little as two days, whereas wine for dry styles may ferment for around a week. The fortifying alcohol must be 96% abv grape spirit (compared to 77% abv in Port), and therefore it will be neutral in style. Producers are free to purchase the alcohol from wherever they choose, but its quality must be checked by IVBAM. After fortification the wines will usually contain 17–18% abv.

Before maturation the wines will be fined (bentonite, gelatine and albumin are commonly used) and filtered (usually with diatomaceous earth) to clarify the wine. The batches of wines will also be tasted and classified according to their style and quality. This will determine their maturation pathway.

MATURATION

The maturation process for modern Madeira replicates the hot, oxidative conditions that the wine was subject to when being shipped in the 17th and early 18th centuries. There are two options:

Estufagem

This process involves the wine being heated in temperature controlled stainless steel vessels called *estufas*. The tanks are heated to 45–50°C (113–122°F; a maximum of 50°C / 122°F is permitted) using a heating coil or water jacket, and the wine must remain in tank for a minimum of 3 months. Representatives from IVBAM seal the vessel at the start of maturation and will break the seal when maturation is complete. Although the tank is sealed, it is usually not filled to the top, permitting some oxidation. The wine is then allowed to cool, it is filtered and then left to rest for 6–12 months. Wines may not be sold until the 31st October of the second year following harvest. Wines produced by *estufagem* used to be described as baked or stewed, however, the process has improved significantly over recent years. That said, this quick ageing process does not produce wines with the same level of complexity as the more gradual *canteiro* process. It tends to be used for 3- and 5-year-old wines made from Tinta Negra.

Wines maturing in the *canteiro* system

Canteiro

This is a longer and more resource-intensive process associated with higher quality wines. The wines are matured in old oak vessels in a warm environment. This may be a loft or warehouse, both of which are heated by the sun. The vessels are usually 400–700 L in size, and left with a small headspace of air, to aid oxidative development. Temperatures usually range from 25–40°C (77–104°F). It is not uncommon for producers to own warehouses that

reach different average temperatures (depending on location and design) and it is also usual for the warehouses to have warmer and cooler areas within them (e.g. vessels stored nearer the roof will be warmer than those nearer the ground). It is typical for young wines to be stored in the warmest conditions, before being moved to cooler parts of the warehouse for extended ageing. Humidity is high, but in these warm conditions, evaporation of water still causes the alcohol to rise very gradually to 19–20% abv. This also causes other compounds in the wine, such as sugars, acidity and aroma compounds to concentrate. Volatile acidity also rises. Madeira is rarely racked, but due to the loss of water, barrels need regular topping up. These wines cannot be sold until three years after the 1st January following harvest, and, as with the *estufagem* system, a representative of IVBAM must seal and unseal the vessels.

Further ageing may be carried out often in larger wooden vessels, stainless steel vats or demi-johns to limit further evaporation. Beyond the minimum permitted time periods for *estufagem* and *canteiro*, producers may apply to IVBAM for an EU subsidy to offset the cost of ageing their wine if they agree to age it for a further five years. The subsidy depends on the volume in hectolitres.

IVBAM will seal the vessel and then unseal it after 5 years. The producer can request permission to check the wine and adjust it as necessary, under the supervision of a representative from IVBAM, within the five years. As the five years comes to an end, the producer can decide whether to apply for another five-year subsidy.

The maturation processes used for Madeira have a significant impact on the style of the wine. Oxidation causes the colour to gradually turn to brown and primary aromas to develop into tertiary notes of dried fruit. The warm ageing conditions speed up oxidation and cause caramelisation of the sugar in the wine. The final wines have a range of flavours dependent on style, age and quality including dried fruits such as apricot and raisin, caramel, chocolate, nuts and often a smoky character.

Most Madeira is a non-vintage product, and therefore blending wines from different vintages and different vineyard locations for consistency of style year-on-year is standard practice. There will also be some variability among different barrels in different areas of the warehouse and therefore this can also help attain a certain style or achieve consistency. Blending can also be used to achieve a certain style or for complexity. Wines in the youngest age categories may be matured mainly in *estufas* but the blend may include some older *canteiro* wines to bring a greater complexity of flavours.

Adjustments can be made as necessary, as well as fining and filtering before bottling. Caramel is used in a number of the inexpensive and mid-priced wines to add colour. By comparison, carbon fining can be used to strip colour. RCGM can be added to increase sweetness if needed, or blending with some drier wine to decrease sweetness.

4.3. Styles of Madeira

There is a number of defined labelling conventions for Madeira wines, usually based on the grape variety, level of sweetness, length of ageing, and whether the wine is from a single vintage or multiple vintages.

Madeira is made in a variety of sweetness levels, and can hence be labelled with one of the following terms to reflect this; extra dry, dry, medium dry, medium sweet (or medium rich) and sweet (or rich). It must be noted that even wines labelled ‘dry’ demonstrate some degree

of sweetness. There is also some overlap between the categories and hence one producer's 'dry' may be another producer's 'medium dry'.

Many Madeiras, especially premium priced wines, are varietally labelled. Each grape variety is associated with the following styles of wine:

Sercial – extra dry or dry. They tend to be the lightest coloured and bodied of the varietal wines, with notes of citrus peel and nuts.

Verdelho – medium dry. Verdelho usually has more residual sugar and therefore more body and a rounder texture than Sercial. The slight sweetness on the palate also gives the impression of sweeter flavours such as candied fruits. It may be slightly darker in colour than Sercial.

Boal – medium sweet. Boal is fuller and sweeter than Verdelho. It is yet darker in colour, with flavours of caramel, chocolate and candied nuts.

Malvasia – sweet. Malvasia, also called Malmsey, tends to be full-bodied, and often brown in colour. It is the sweetest style, but still balanced by refreshing high acidity. The wines can show notes of raisins and caramel.

Terrantez – medium dry or medium sweet. Although these wines can have relatively high levels of sugar there is always a delicacy to them. Aromas include citrus peel, caramel and sometimes even floral notes.

Tinta Negra – Since 2015, can also be varietally labelled and can be made at any level of sweetness.

For varietal wines, an indication of style e.g. medium dry, does not need to appear on the label. As of 2015, all Madeira must be labelled with a bottling date.

FURTHER MADEIRA CATEGORIES

Madeira with an Indication of Age

These are non-vintage products and may be labelled 5, 10, 15, 20, 30, 40, 50 and 'more than 50' years old. The age is an indication of style rather than a minimum or an average. The wine must be verified by IVBAM's tasting panel, accompanied by an account of all wines used in the final blend. The wines may also be labelled according to style and/or grape variety.

Quality and price tend to rise with increased age. Five-year-old wines will tend to be made predominantly from Tinta Negra and most of the wine will have been through the *estufagem* system. They are often good to very good in quality and mid-priced. Wines that are 10 years old or older are often made with one of the white varieties, but some producers use Tinta Negra, especially now its name can appear on the label. These wines will be made from parcels that have all been aged in the *canteiro* system. With increased time spent maturing the oldest wines tend to be increasingly concentrated and complex and have the highest levels of acidity. Wines that are 20 years old or more will often be of outstanding quality and sell at premium and superpremium prices.

Standard blends

Many Madeira wines do not qualify for the age indications specified above. These Madeiras may be sold between 2–3 years after harvest and are categorised as *corrente* by IVBAM.

These wines are sometimes labelled with a brand name of the producer, for example, Blandy's Duke of Clarence, or simply one of the style descriptions, for example, Henriques & Henriques' Full Rich Madeira.

Frasqueira and Colheita Madeira bottles.

Rainwater

This is a wine made in a relatively light style in terms of alcohol, body and concentration of flavours. They are usually around 18% abv, must be medium dry, and can only be associated with a maximum age indication of 10 years. The name is thought to have originated when some casks awaiting shipment were left open outside and the rain diluted the wine.

Frasqueira

Also called Garrafeira. These wines usually represent the flagships of a producer's range. This is the term for vintage Madeira that has been aged in wood for a minimum of 20 years. The wines must be made from a prescribed grape variety, which must appear on the label together with the year of harvest and the year of bottling. Since 2015 the list of permitted grape varieties has been extended to include Tinta Negra. The quality of the wine must be assessed by IVBAM's tasting panel. Frasqueira wines typically command super–premium prices. The exact style will depend on the grape variety from which they are made however, all of these wines are notable for their concentration and complexity of tertiary flavours, with sweetness balanced by high acidity.

Colheita

A Colheita wine is a vintage Madeira, coming from grapes of a single year, that has been aged in wood for a minimum of 5 years. These wines may either include a blend of varieties or be made from a single variety; the grape does not need to appear on the label but the harvest year and year of bottling must be stated. The quality of the wine must be assessed by IVBAM's tasting panel. This is a relatively new category which only emerged in 2000, but the much lower ageing requirement than required for Frasqueira has made it popular and now all producers make Colheita wines.

4.4. Wine Law and Wine Business

STRUCTURE OF THE INDUSTRY

Madeira's vineyard land is highly fragmented, with over 1,000 growers and an average vineyard holding of 0.3 ha.[2] The winemaking and maturation side of the industry is extremely consolidated with only eight producers. The largest three companies are Justino's, Madeira Wine Company and Henriques & Henriques. Only two producers own or rent vineyards (Henriques & Henriques and Madeira Wine Company), which only cover small percentages of each of their production volumes) and therefore all producers buy grapes. A producer will often need to buy grapes from as many as a few hundred growers. To smooth this process, many producers will use agents who will provide consultation for growers during the growing season and coordinate the harvesting.

IVBAM

Founded in 2006, IVBAM is responsible for coordinating and supporting the wine and embroidery industries in Madeira. IVBAM plays an active role in monitoring Madeira stocks and quality control. Representatives must be present at grape reception and at the beginning and end of the ageing process to seal and then unseal the maturation vessel. An IVBAM tasting panel and laboratory check the profile of wines to be labelled with an age indication or a vintage year. Technicians from IVBAM will also pay visits to the growers on the island and give advice and support as needed.

IVBAM also set the regulations as part of the production and labelling of Madeira, many of which have been mentioned in the previous sections.

MADEIRA SALES

Sales of Madeira have remained relatively stable for the past few decades, and in 2019 total sales were 3.2 million litres. The majority of sales volume comes from young *corrente* Madeira wines generally made from Tinta Negra (1.9 million litres in 2019), with 5- and then 10-year-old Madeira being the most common age-indicated categories. The 5- and 10-year-old categories also account for the highest proportion of wines labelled as Sercial, Verdelho, Boal or Malvasia. Most Terrantez is sold as Frasqueira or as 20-year-old wine. In 2019, Colheita and Frasqueira together made up just over 44,000 litres and these vintage products are generally more common than the older age-indicated categories of non-vintage Madeiras (e.g. 20-, to 50-year-old). Sales values of Madeira as a whole have shown a gradual general increase (18.7 million euros in 2019) with Colheita and Frasqueira increasing their share of total sales values.

The largest market for Madeira is France (0.90 million litres in 2019). The second largest market is Madeira itself (0.49 million litres); the tourist trade makes an important contribution. Germany (0.29 million litres) and Japan (0.26 million litres) are the next most important for volume. France and Germany tend to be important markets for inexpensive Madeira, whereas the domestic market and Japan are more important for more expensive wines.[3]

Significant volumes of inexpensive Madeira are used for cooking and/or as part of confectionery. These wines are heated by the *estufagem* and are often released from the winery and can be released for sale on 31 October of the year after harvest. Madeira for cooking purposes, e.g. for the production of sauces, may be modified with the addition of salt and sometimes pepper. Madeira that is used in the food industry, or for other purposes (e.g. it is sometimes used as a flavouring in schnapps) makes up around one–fifth of total volume sales of Madeira.

References

1 Elliott, T., 2019, *The Wines of Madeira – 2019 Update*, Hampshire: Trevor Elliott Publishing

2 As above

3 All data taken from *Estatisticas*, Vinho Madeira (retrieved 12 March 2020)

5 Vins Doux Naturels

The term Vins Doux Naturels (VDN) describes a category of French wines that are made by halting fermentation by the addition of spirit to create a sweet, fortified wine. There are a number of Protected Denominations of Origin (PDO) for these wines, spread throughout Roussillon, Languedoc and the southern Rhône, with the great majority of production coming from Roussillon.

5.1. The Growing Environment and Grape Growing

CLIMATE

The general climate in all the VDN PDOs is Mediterranean. Roussillon is the warmest and driest region and is influenced by the Tramontane wind, all of which leads to greater transpiration from the grapes during the end of ripening and hence a greater concentration of sugar. This can be beneficial, meaning less spirit is needed to fortify a wine to a certain level of alcohol while retaining a certain level of residual sugar (i.e. a grape with a high level of sugar can ferment for longer, producing more alcohol, before reaching the desired level of residual sugar for the final wine). However, it also reduces juice yield.

GRAPE VARIETIES

The majority of VDNs are produced from Muscat or Grenache.

Muscat Blanc à Petits Grains

This variety has smaller grapes than Muscat of Alexandria, and is considered to have a greater intensity of aroma and flavour. It is tolerant of dry weather and hence suited to Mediterranean climates in which rain during the growing season is scarce. It is susceptible to powdery mildew, botrytis bunch rot and mites.

Muscat of Alexandria

This Muscat variety has bigger grapes than Muscat Blanc and achieves high sugar levels. Similar to Muscat Blanc, it is tolerant of dry weather but is susceptible to powdery mildew and botrytis bunch rot. Plantings are in decline as it is often thought to produce wines that are less refined than those from Muscat Blanc.

Grenache

In this section called Grenache Noir to avoid confusion with Grenache Blanc and Grenache Gris. Grenache Noir is a late ripening variety with good drought resistance, making it suitable to Mediterranean climates. It produces high yields, but can be relatively pale in colour unless these are controlled. It accumulates sugar quickly and is therefore suitable for production of fortified wines. It is susceptible to coulure at fruit set, and downy mildew, phomopsis and botrytis bunch rot, all of which can reduce yields.

Grenache Blanc, Macabeu (the same as Macabeo in Spain) and Grenache Gris may also be part of the blend for VDNs in Roussillon.

Grenache vines in Banyuls

VINEYARD MANAGEMENT

The climates for growing grapes for VDNs are generally warm and, particularly for unaged styles of Muscat, a shady canopy is required to reduce the chances of sunburn and excessive grape shrivelling.

Yields for all the appellations are small, the maximum is generally 30 hL/ha. By law, grapes must be picked with a minimum of 14.8% abv potential alcohol. Sometimes the grapes are picked slightly riper but, overall, producers generally want to retain as much acidity as possible to balance the residual sugar in these wines. Grapes tend to be hand-harvested, and there may be several passes through the vineyard depending on the ripeness of the crop. Late harvest or botrytised characters are not desired.

5.2. Winemaking

VDNs are produced by adding grape spirit to stop fermentation early to give a sweet, fortified wine. The minimum concentration of residual sugar depends on the individual appellation, but ranges from 100 g/L to 125 g/L for Muscat-based wines, and 45 g/L for Grenache-based wines (though in practice many Grenache-based wines are around 100 g/L residual sugar). Neutral spirit of 95–96% abv is used so that the character of the spirit does not compete with the character of the base wine and/or maturation. Spirit is added when the fermentation reaches 5–8% abv to makes wines of 15–18% abv. Only approximately 5–10 per cent of the volume of the wine is made up of the fortifying spirit, which is another reason why VDNs do not have a particularly spirity character.

For VDNs made from white grape varieties, the grapes are typically pressed and the must fermented off the skins. A period of skin contact (e.g. 6–24 hours) prior to fermentation may be used to extract greater aroma from the skins of the grapes. The winemaker may choose to blend press juice with the free run juice for extra body and texture, or keep them separate as desired. For unaged VDNs, the must may be chilled and stored for a period of months and then fermented based on demand, to ensure the wines produced are as fresh as possible. For this style, the must and wine will also be protected from oxygen through the winemaking process, again to retain fresh primary aromas.

For VDNs made from black grape varieties, it is typical for the must to be fermented and fortified while in contact with the grape skins. The addition of the fortifying alcohol increases the extraction of colour, flavour and tannins, all of which are important for wines that are to undergo extensive ageing. Maceration on the skins can continue for a couple of weeks past the fortification date to maximise extraction. Cap management techniques such as pumping over and punching down are also used to maximise extraction.

For both red and white wines, stainless steel vessels are used for fermentation to allow for easy temperature control. White wines tend to be fermented cool at around 15°C (59°F) to enhance the production of fruity ester aromas. Red wines tend to be fermented at around 28°C (82°F) to promote extraction but retain fruity aromas.

MATURATION

As with other styles of fortified wines, the decisions made during the maturation process have a significant impact on the style of the wines. VDNs may either be released relatively young or undergo oxidative maturation.

Labelling terms in each of the appellations are used to signify the style of wine produced.

Youthful, unaged wines

These wines will be released for sale a few months after fermentation. The wines will typically be stored in closed stainless steel vessels at cool, constant temperatures, protected from oxygen (for example by blanketing with inert gas). These wines display the primary aromas and flavours of the grape variety or varieties from which they are made. Muscat-based wines will display floral and grapey aromas, and potentially other aromas such as peach, pear and honey. Grenache-based wines often show aromas of blackberries, raspberry and plums.

Wines ageing outside in demi-johns

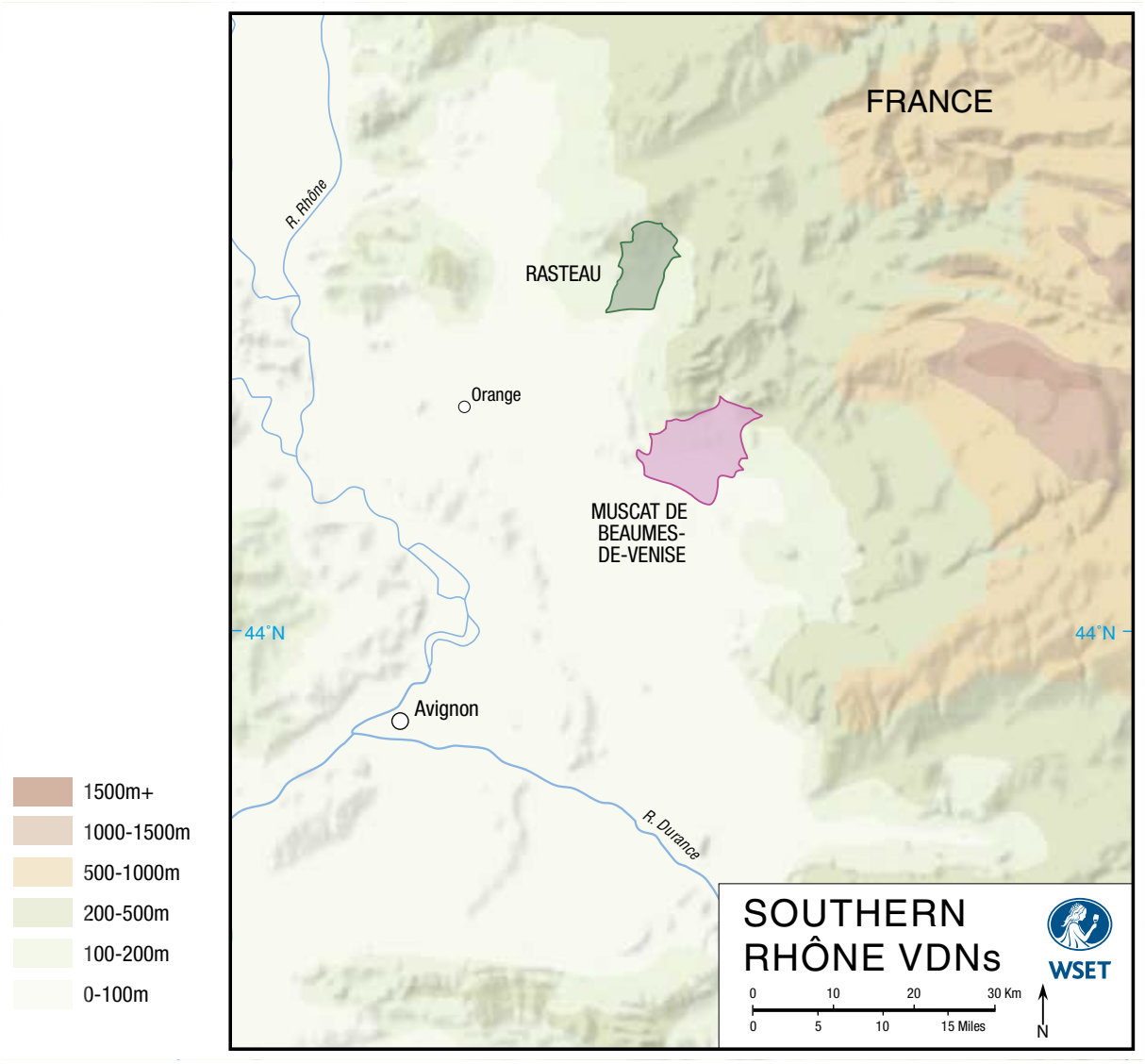
Oxidatively aged wines

These wines can be matured in a variety of vessels over a period of several years. Some of the wines may be kept in old oak barrels. The barrels are typically not topped up during the maturation, which encourages oxidation. Some styles of these wines may be aged in glass demi-johns (also called *bonbonnes*) that are not quite full, un-stoppered and left outside in the sun to speed up the ageing process. The wines from demi-johns may be directly bottled for sale, be transferred and matured further in barrels or be used as a blending component with oxidatively aged wines from barrel.

5.3. VDN Appellations and Wine Styles

RHÔNE

There are two VDN appellations in the Rhône: Muscat de Beaumes-de-Venise and Vin Doux Naturel Rasteau. The vines of Muscat de Beaumes-de-Venise are planted on terraces on the south-east facing slopes of the Dentelles de Montmirail, which provides shelter from the



Mistral and aids ripening. The vast majority of production is white VDN made from Muscat Blanc à Petits Grains. Muscat à Petits Grains Rouge, a dark-skinned mutation (Brown Muscat in Australia), is allowed for the production of red and rosé VDN wines. These wines are always made in an unaged style. White Muscat de Beaumes-de-Venise is generally medium bodied, with medium acidity and low alcohol for a fortified wine (around 15% abv). Due to protective winemaking the wines usually show primary aromas and flavours including blossom, grape, peach and honey. Significant producers include Domaine des Bernardins.

Vin Doux Naturel Rasteau can either be red, rosé (made by *saignée* method and fortified off the skins) or white, and can be made in unaged or oxidative styles. In practice, only a tiny proportion of white is made, and most of the production is red. The red wines must be made with a minimum of 75 per cent Grenache Noir; Grenache Gris and Grenache Blanc as well as a number of other southern Rhône varieties can also be blended in. The appellation's location on gentle south-facing slopes, providing maximum exposure to sunlight and some protection from the cool Mistral, means that grapes easily become very ripe, suitable for the production of sweet fortified wines with juicy, almost jammy fruit flavours. Unaged wines can show notes of cherries and plums, with oxidative styles showing more dried fruit and nutty hints. Levels of alcohol are generally low to medium, with 16–18% abv being typical.

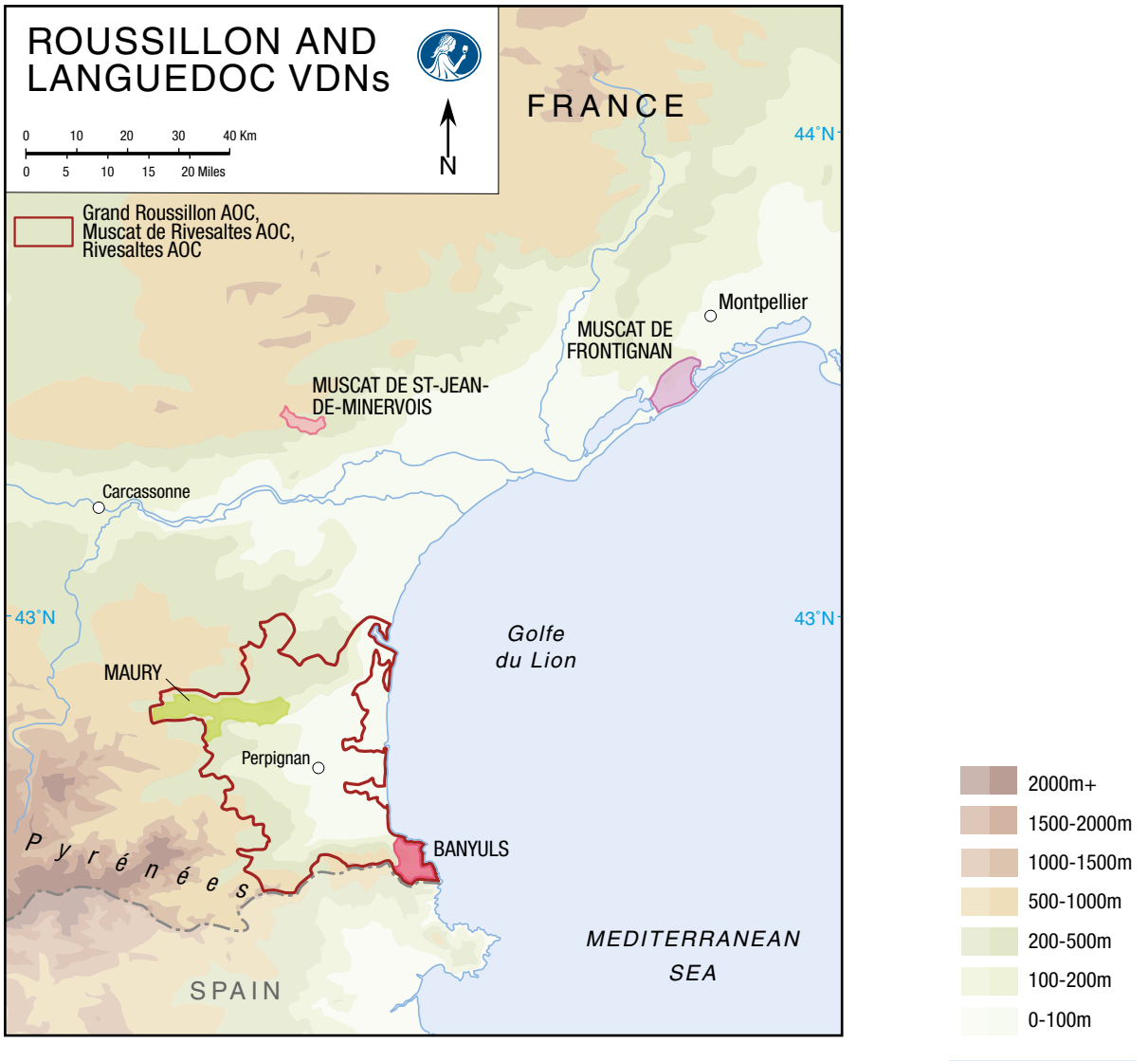
LANGUEDOC

There are two main VDN appellations in the Languedoc. All of the wines must be made from Muscat Blanc à Petits Grains and made in an unaged style with subtle differences according to the location of the appellation. For example, the largest appellation, Muscat de Frontignan, is based south-west of Montpellier at low altitude, and is hence relatively warm. It produces wines with a fuller body than many of the other appellations and displays aromas of tropical fruits. By comparison, Muscat de St-Jean-de-Minervois is located in the north-east corner of Minervois at 250–300 m elevation and the climate is more continental. The cooler climate gives wines with higher acidity, lighter body and more stone fruit and floral aromas.

ROUSSILLON

VDN wines make up a tiny proportion of production in the Rhône and Languedoc, but play a much more significant role in Roussillon. VDNs represent 30 per cent of all Roussillon PDO and PGI wine production by volume.[1] The wines of each appellation are made in a range of styles:

- **Grenat/Rimage** – denotes unaged styles of red wines. Grenat is the term used in Maury and Rivesaltes, Rimage in Banyuls. Blanc: denotes unaged styles of white wines.
- **Tuilé /Traditionnel** – denotes a red wine that has been matured oxidatively. Tuilé is the term used in Maury and Rivesaltes, Traditionnel in Banyuls.
- **Ambré** – denotes a white wine that has been matured oxidatively.
- **Hors d'âge** – denotes a wine that has been matured oxidatively for a longer period than Tuilé or Ambré wines. The wines can be red or white.
- **Rancio** – denotes a wine with 'rancio' character (see Rancio in Key Choices Affecting Style, Quality and Price in Fortified Wines). The wines can be red or white.



The **Grand Roussillon AOC** covers a wide yet specifically delineated area for VDNs produced outside the five leading AOCs described below but can include declassified wines from those AOCs.

Banyuls AOC

This appellation is located at the eastern end of the Pyrenees, bordered by the Mediterranean to the east and Spain to the south. The red wines must be made of a minimum of 50 per cent Grenache Noir, but can also include Grenache Blanc and Grenache Gris. The vineyards are planted on steep terraced schist slopes. A small amount of white VDN is also made. Significant producers include Domaine Vial-Magneres.

Banyuls Grand Cru AOC

This appellation covers the same area as Banyuls, but the wines can only be red, must be made of a minimum 75 per cent Grenache Noir and must be matured for a minimum of 30 months. Wines that have been aged longer may qualify to be labelled as Hors d'âge or Rancio.

Grenache vines in Maury

Maury AOC

This appellation is located in the north of Roussillon. The vines are planted at 100–400 m in the foothills of the Pyrenees on dark-coloured schist soils that store heat from the day and release it at night, aiding ripening. The red VDNs must be made from a minimum of 75 per cent Grenache Noir. A small amount of white is also made, usually in an unaged style. Dry, unfortified wines can also be made in the same area, but these must be labelled as Maury Sec AOC.

Muscat de Rivesaltes AOC

This is by far the largest appellation in Roussillon in terms of production. It is often made from a blend of Muscat Blanc à Petits Grains and Muscat of Alexandria, and only made in an unaged style.

Rivesaltes AOC

This appellation, in the north of Roussillon close to the Mediterranean coast, encompasses a range of VDN styles. Both red and white VDNs are made in Grenat, Tuilé, Ambré, Hors d'âge and Rancio styles. The whites can only be made with a maximum 20 per cent Muscat varieties, with the balance coming from Grenache Blanc, Grenache Gris, Macabeu and Malvoisie. The reds are mainly made from Grenache Noir. Significant producers include Domaine Cazes.

References

1 *Vins de Roussillon Press pack 2021*, Conseil Interprofessionnel des vins du Roussillon (retrieved 6 April 2022)

Rutherglen Muscat

6

Australia makes a variety of fortified wine styles, including some inspired by Sherry and Port. However, it is arguably one of Australia's own styles of fortified wines, Rutherglen Muscat, that has become the most well known from a global standpoint.

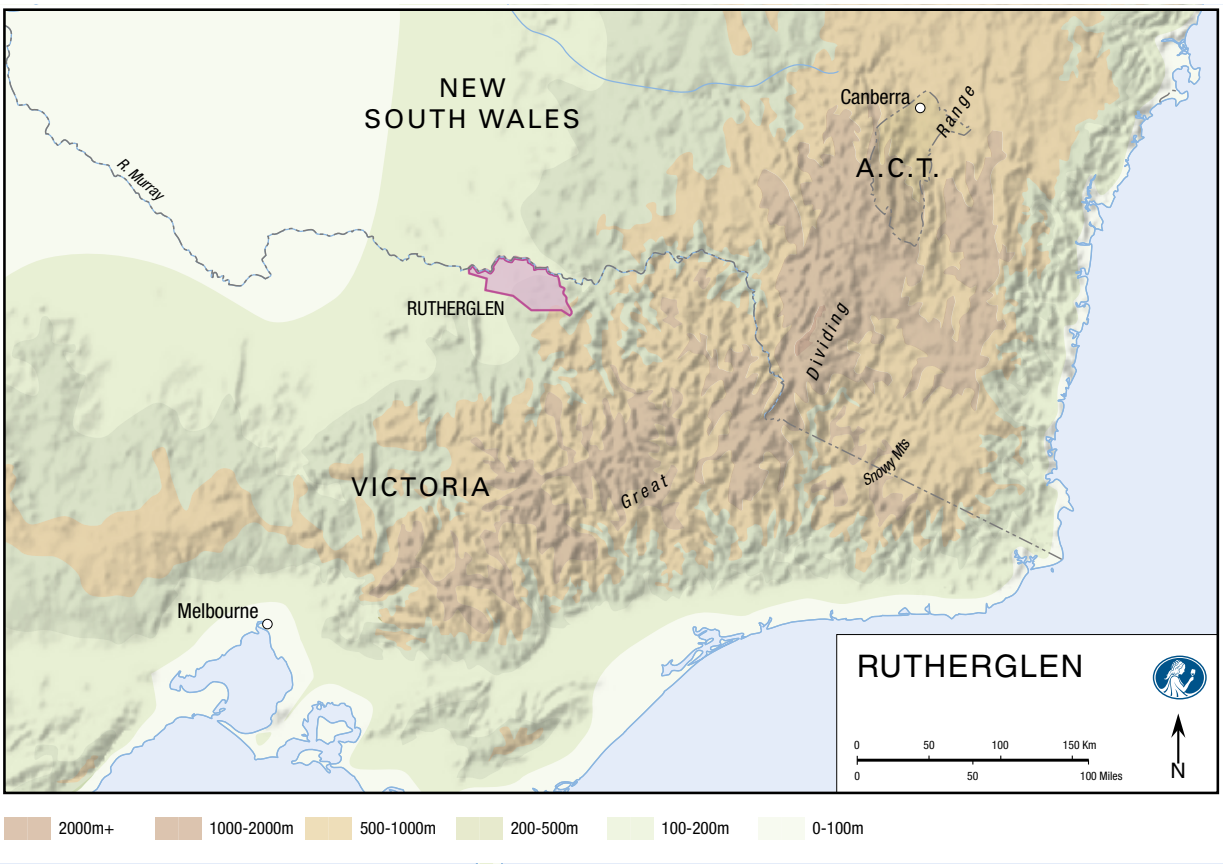
Vines were first planted in Rutherglen, Victoria in the 1850s. When gold was discovered in 1858, the population boomed and investment in the region increased. By 1890, Rutherglen produced around 25 per cent of Australia's wine, much of which was exported to the UK. Sources are unclear on what styles of wine Rutherglen was producing at that time, though very old stocks of wines suggest some sweet, fortified wines were being made.

At the end of the 19th century, parts of Victoria, including Rutherglen, were decimated by phylloxera. By the time the region recovered by replanting on resistant rootstocks, it found it difficult to compete with more productive regions in South Australia. It nevertheless continued producing full-bodied red wines and also its unique fortified wines as a point of difference. In recent times, around 70 hectares of vines are planted for Rutherglen Muscat.[1]

Many of the wineries that produce Rutherglen Muscat are family run and have been making this wine for several generations. Due to this, 'house styles' have developed and been maintained based on fruit selection, winemaking, maturation and blending choices. For example, Pfeiffer Wines is known for producing a lighter, fresher style whereas All Saints and Morris are known for their more intense and luscious styles of wine.

Vineyards in Rutherglen.

6.1. The Growing Environment and Grape Growing



Rutherglen is situated inland in the north-east of Victoria. It has a continental climate with warm days but moderated by cool air flowing down from the Victorian Alps during the night. Warm days in the growing season and long, dry autumns mean that large amounts of sugar can accumulate in the grapes, which is required for these syrupy, very sweet styles of wine. Grapes are often left on the vine until they become extra ripe and start to shrivel. This increases the sugar concentration (it is not unusual for grapes to reach potential alcohol levels of 20% abv) and leads to the development of some dried fruit characteristics e.g. raisin. The producer will decide the time at which to harvest according to the weather and the degree of ripeness they desire, but it will usually be between mid-March and May. Many producers pick different vineyard blocks at different times to gain a combination of earlier harvested fruit with fresh Muscat aromas, and extra-ripe,

Grapes are left on the vine and they start to shrivel.

shrivelled grapes with more sugar and dried fruit characters. The weather at harvest-time can influence which of these alternatives will predominate.

Although autumns are generally dry, rain can occasionally be a problem, increasing the risk of fungal diseases. The orange marmalade aromas that botrytis can give are not desired in the production of these wines, where even despite a long ageing process, the grapey aromas of Muscat should still be identifiable.

Rutherglen Muscat is made from Muscat à Petits Grains Rouges, also known locally as Rutherglen Brown Muscat. This is a red-skinned mutation of Muscat Blanc à Petits Grains and, similar to the white version, displays pronounced grapey and floral aromas.

A variety of training and trellis systems is used. Vines tend to be trained to double cordons, with the canopy sprawling over a single foliage wire or held by more wires into a VSP system. A key concern, however, will be to provide some shading for the grapes, which are likely to otherwise become sunburnt. Rutherglen has considerable plantings of old vines. These old vines are said to produce bunches of smaller grapes with a higher skin to juice ratio, which can produce deeper coloured, more concentrated wines. The proportion of old vine fruit used can be an element of house style.

6.2. Winemaking

FERMENTATION AND FORTIFICATION

Muscat grapes are partly shrivelled when picked making it hard to extract the dense juice through immediate pressing. Crushed Muscat grapes therefore ferment briefly on their skins to break down the pulp and release sugar and flavours. Enzymes may be added to the juice and various cap management techniques (punching down, pumping over, rotary fermenters) employed to aid extraction.

Once the juice gains 1–2 per cent of alcohol, it is quickly drained off the skins, which are pressed and the combined juice then fortified to reach around 17.5% abv. Fortifying spirits of at least 96% abv are usually chosen; most producers aim to retain Muscat character in the wine and therefore want a spirit that is neutral. A lower strength spirit would need to be added in greater volume and would further dilute the flavour intensity of the wine.

The wines are clarified by racking off lees or by light filtration. Winemakers may now make adjustments to pH and perform light fining for protein stability. The aim is to avoid deposits that might cause off-flavours during maturation.

MATURATION

The wines are matured in very old oak vessels, often in warm conditions. Classically, the wines are matured in warehouses with tin roofs, which become hot in the summer. The positioning of barrels is important; those nearer the top of stacks are subjected to warmer temperatures and mature more quickly. Some producers also have sections of their warehouse facilities that are insulated to retain more-even, cooler temperatures throughout the year, which generally slows the maturation and can be used to retain greater freshness.

The vessels consist of large round or oval casks of the capacity of 1,300 to 9,000 litres and smaller barrels of 180 to 500 litres. Small vessels promote greater concentration through evaporation, more oxidation and generally a quicker maturation. The wood is often very old as the flavours and tannins from new oak are not wanted in these wines.

During maturation, water evaporates gradually from the oak vessels, causing alcohol, sugar and acidity levels to rise gradually over time. The speed of this process is affected by the heat, the size of the vessel and humidity, with warm, dry conditions leading to a quicker rate of evaporation. Some producers will aim to reduce ullage by topping up the barrels frequently, maintaining a fresher, less oxidative style of wine. Others will top up barrels less frequently to encourage oxidative flavours to develop.

Overall, during maturation the wines turn gradually from pale pink, ruby or garnet to deep brown, increase in sweetness, alcohol and acidity levels, become fuller-bodied and more syrupy and develop more tertiary flavours.

Most Rutherglen Muscat wines are non-vintage products and an important aspect in the production of the wine is the blending of younger and older wines to gain the optimum balance between freshness and complexity and to retain a consistency of style year on year. Some producers may use a modified *solera* system (removing some wine from barrel and replacing it with younger wine, although often not in quite the same systematic way used in Sherry *solera* systems). Blending helps producers to achieve their house style. For example, blending in a high percentage of wines that were made from less-ripe grapes (note, not under ripe) that have been stored in cooler conditions or that have been matured for less time can help to create a fresher, fruitier style. Blending wines that have been purposely made with different levels of residual sugar can fine-tune the perception of sweetness in the final wine.

6.3. Wine Classifications

The Muscat of Rutherglen Network was founded in 1995 to promote sales of Rutherglen Muscat. This network introduced a classification system of four descriptions based on richness, complexity and intensity. The wines are classified on taste, rather than age – although age is a major factor that determines style. As the level of classification increases, the number of vintages in the blend and the span of age between the oldest and youngest component wines will generally be greater. Although many producers of Rutherglen Muscat will produce each of the following styles, Rutherglen Muscat and Classic Rutherglen Muscat are produced in much greater volumes than Grand or Rare. (Producers of Rutherglen Muscat also generally produce a range of other fortified and non-fortified wines.)

- **Rutherglen Muscat** – is the basic style with an average age of 3–5 years. Residual sweetness 180–240 g/L.
- **Classic Rutherglen Muscat** – displays a greater level of concentration, complexity and tertiary flavours. Average age 6–10 years. Residual sweetness 200–280 g/L.
- **Grand Rutherglen Muscat** – displays even greater concentration and complexity from blending both young and very mature wines. Average age 11–19 years. Residual sweetness 270–400 g/L.
- **Rare Rutherglen Muscat** – these wines are bottled in tiny volumes and represent the pinnacle of Rutherglen Muscat. Minimum average age is 20 years, but wines in the blend can often be much older. Residual sweetness 270–400 g/L.[2]

Although individual producers have their house styles, generally wines in the Rutherglen Muscat classification are medium amber or tawny in colour and have pronounced aromas of raisins, figs, dates and sweet spices. They are sweet on the palate and full-bodied with

medium (+) acidity, medium alcohol for a fortified wine and a pronounced intensity of flavours. They are usually of very good quality and mid-priced. 'Classic' generally has a deeper colour, more concentration and greater complexity. Their quality and price is often between those of Rutherglen Muscat and Grand and Rare.

By comparison, wines in the Grand and Rare classifications are usually brown in colour, with more of a nutty, treacle, liquorice character. They are even sweeter and fuller-bodied than younger Rutherglen Muscats but with higher acidity and still some degree of fruit to provide balance. They are typically of outstanding quality and can reach super-premium prices.

Rutherglen Muscat is fully mature on release and does not improve further from ageing in bottle. It should be drunk within a year or two after bottling to taste at its freshest.

6.4. Wine Business

The production of Rutherglen Muscat is in the hands of only a few wineries, the majority belonging to the Muscat of Rutherglen Network. Most wines are made entirely from estate-grown fruit, but some winemakers buy in a small amount from growers.

Today, fortified wines (not just Rutherglen Muscat) account for two per cent of Australian wine sold globally (20 million litres). The vast majority of volume sales (19 million litres) are to the domestic market.[3] The top export market is the UK.[4] Significant producers include Campbells and Chambers Rosewood.

References

1 Wine Australia (private communication, December 2021).

2 Classification summarised from *Muscat of Rutherglen*, Winemakers of Rutherglen (retrieved 3 April 2020).

3 *Australian wine: Production, sales and inventory report 2018–19*, Wine Australia, p.3–4 (retrieved 12 March 2020).

4 Wine Australia (private communication, December 2021).

7 D5 Fortified Wines: Recommended Further Reading List

The Diploma reading provided by the WSET gives students the study materials they need for successful study.

If students wish to extend their studies, the following are recommended but are **not required**. You do not need to buy any additional books. In the case of conflict between the WSET study guide and other sources, students should follow the WSET study guide for the purposes of the examination.

General

Johnson, H. and Robinson, J., 2013, *The World Atlas of Wine*, 7th edition, London: Mitchell Beazley

Robinson, J. and Harding, J., 2015, *The Oxford Companion to Wine, 4th edition*, Oxford: Oxford University Press (5th edition due to be published in September 2023)

Robinson, J., Harding, J. and Vouillamoz, J., 2012, *Wine Grapes: A Complete Guide to 1,368 Vine Varieties, Including Their Origins and Flavours*, London: Penguin Books

Fortified Wine

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Lutyen, R., Sherry Notes blog

Mayson, R., 2022, *Madeira: The Islands and Their Wines*, 2nd edition, Oxford: Infinite Ideas Limited

Mayson, R., 2019, *Port and the Douro,* 4th edition, Oxford: Infinite Ideas Limited

Rowles, P., 2017, *Sherry: A Life's Journey*, Melton Mowbray: Rowles Partnership

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