

# Hot climate wine growing, making and marketing in Southern Italy and its application in Australia.



## **Kim Chalmers**

2011 AgriFoods Skills Australia Overseas Fellowship

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# i. Executive Summary

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Injecting more diversity, excitement, eco-friendliness and unique regional stories into Australian wine is critical for the industry's future success. This study looks at some of the ways this could be done.

In the early 21st century, the Australian wine industry was a strong international player, especially in the United Kingdom and United States of America. Those wines were bold, juicy, fruit forward, approachable and fun. And most importantly represented value for money. Today's landscape is very different. Countries such as Argentina and Chile have surpassed Australia's proficiency in delivering consistent quality at a much lower price-point. Wine Australia's Senior Information Analyst Peter Bailey states "in the United Kingdom off-trade market, the Australian share of the \$5.00-\$6.65 (£3-£4) per bottle segment has fallen from 24% in 2007-08 to 15% in 2012 as it has become increasingly difficult for many Australian wine producers to supply at that end of the market profitably."

Wine Australia data shows that since the peak export of 786 million litres of wine in 2007, volumes have dropped by only 8% to 2012, however, the value of exports in the same period has decreased by 38%<sup>1</sup>. Australian producers must rethink how they make wine and how they sell it domestically and internationally to ensure businesses and the environment thrive in the future. More so, they must create wines of distinction that will raise the international profile and price point of Australian wine.

At the same time, the Australian wine industry is at an important turning point in how it adapts and becomes more environmentally and economically sustainable. And all that to ensure its long-term future in a world affected by anthropogenic climate change.

On this, the world's driest inhabited continent, the largest volume grape growing regions are in areas where the average rainfall is less than 300mm per annum and summer day time temperatures regularly soar past 40 degrees (Mean annual rainfall: Mildura 1946-2012 = 291mm; Renmark 1884-2012 = 252mm: Australian Bureau of Meteorology). Growing grapes in such climates requires irrigation and careful nutritional input management. Doing so in a sustainable way means using less water, less applications and less labour, therefore less expenditure, to grow better quality grapes. For these reasons, there is much to learn from the hot dry Mediterranean, a region that has been making wine for thousands of years.

This study researches hot climate grape growing and winemaking on Italy's southern mainland and Sicily. Australia should gain knowledge from these regions for two reasons. First, they have extreme high summer temperatures and in many cases low rainfall; such conditions are similar to Australia's hot climate viticulture areas. Second, these southern Italian regions have traditionally produced bulk basic quality wine but in the last decade or so have begun to focus on quality and are now making and marketing more premium wines.

The Fellowship research trip was undertaken in Europe's mid-summer 2012 to best observe vineyards and crops at the peak period of water and heat stress. The Fellow visited 21 wineries across Sicily, Basilicata and Puglia to better understand techniques, varieties and terrains as well as wine styles and their market application.

The varieties discussed in this report include grillo, catarratto, nero d'Avola, nerello mascalese, aglianico, greco, nero di Troia and negroamaro because all have enormous potential in Australia, not just from a viticulture perspective but also from a wine style and drinkability perspective. The techniques for setting up vineyards, irrigation, training systems, winemaking and marketing are also examined as they have relevance for Australia.

In conclusion, this report identifies that while Australian growers and producers have many of the tools needed to revolutionise the way hot climate viticulture is perceived and approached, there is still much to discover and fine-tuning to be done. Ideally this report will inform and inspire a host of industry run projects to import, grow and test new varieties that may be better suited to inland Australia. However, the ultimate measure of success is if the results of that work help revitalise the wine sector, create more sustainable businesses, relieve pressure on our natural resources and entice new domestic and international consumers to enjoy and respect the diversity of Australian wine.

1 31st Annual Edition Australian and New Zealand Wine Industry Directory, Winetitles; 2013 (data sourced from Wine Export Approval Report, Wine Australia, December 2012)

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## ii. Abbreviations/Acronyms

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|              |   |
|--------------|---|
| <b>AAVWS</b> | Australian Alternative Varieties Wine Show                      |
| <b>ASVO</b>  | Australian Society of Viticulture and Oenology                  |
| <b>AWRI</b>  | Australian Wine Research Institute                              |
| <b>CSIRO</b> | Commonwealth Scientific and Industrial Research Organisation    |
| <b>DOC</b>   | Denominazione Origine Controllata (see definitions)             |
| <b>DOCG</b>  | Denominazione Origine Controllata e Garantita (see definitions) |
| <b>GWRDC</b> | Grape and Wine Research and Development Corporation             |
| <b>Ha</b>    | Hectare   |
| <b>TA</b>    | Total Acidity or Titratable Acidity (see definitions)           |
| <b>VSP</b>   | Vertical Shoot Positioning                                      |

# iii. Definitions

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## **140 Ruggeri**

A vigorous rootstock originating in Sicily suited to dry calcareous soils.

## **420A**

A rootstock used in quality vineyards for its lower vigour that hastens maturity.

## **Alberello**

Bush vines or a vine training system producing stand alone vines either free standing or on individual posts.

## **Alternative Varieties**

A term used in Australia to describe grape vine varieties outside the wide spread mainstream international varieties like cabernet, chardonnay, shiraz, sauvignon, riesling etc. Often referring to Mediterranean varieties but also used to describe any variety which is rare or unusual.

## **Amphora (plural amphorae)**

A large baked clay or concrete vessel based on wine and water carriers produced in the Mediterranean from Neolithic to Roman times.

## **Batonnage**

A French term for the stirring of the lees in a vessel of wine. This process can reduce the development of sulphide smells and improve mouthfeel of a wine.

## **Baume**

A scale of measurement of the density of various liquids. Used in wine production to test sugar concentration in grape juice.

## **Botte**

Italian word for a large wooden cask, usually round or oval shaped, used for ageing wine.

## **Cerasuolo di Vittoria**

A wine of DOCG status from the Vittoria region of south-eastern Sicily, a blend of nero d'Avola and frappato.

## **Clone**

A specific sub-type of a particular grape variety obtained by clonal selection and vegetative propagation.

## **Cordon**

Part of a vine's structure, usually an arm or arms that have been trained horizontally along a trellis wire.

### ***iii. Definitions***

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#### **Denominazione di Origine Controllata**

Controlled denomination of origin. A system for recognising Italian wines for their adherence to regional guidelines of production including specific varieties, growing techniques, yields and winemaking techniques.

#### **Denominazione di Origine Controllata e Garantita**

Controlled and guaranteed denomination of origin. A system for recognising the highest quality Italian wines for their adherence to regional guidelines of production including specific varieties, growing techniques, yields and winemaking techniques.

#### **Downy Mildew**

A fungal disease that thrives in warm, moist, humid environments.

#### **Espalier**

The process of controlling plant growth by pruning and attaching to a frame or trellis, usually in a flat fashion.

#### **Gambero Rosso**

An Italian food and wine rating guidebook.

#### **Guyot**

An annual long cane pruning system where a new cane is wrapped down and the old one cut and discarded each season. Named after 19th Century French scientist Jules Guyot.

#### **Hen and Chicken**

A condition where a bunch of grapes contains large fully formed berries and small hard green ones at the same time. Can be caused by deficiencies and other environmental factors.

#### **Lees**

A term for the spent yeast cells and other solids that settle to the bottom of a wine during fermentation. If left in the wine rather than being removed immediately, lees can add complexity.

#### **Maceration**

An important process in wine making, usually for red wines, which involves extraction of the phenolics from the grape skins, seeds and stem fragments into the juice and wine.

#### **Malolactic Fermentation**

A secondary fermentation process, mostly used in red winemaking, which converts the strong malic acid to softer lactic acid and carbon dioxide.

#### **Marsala**

A fortified wine from the region of Marsala in Western Sicily made by oxidising and fortifying white wine and sometimes sweetening it with cooked grape juice.

#### **Old World/New World**

Old world is used to describe the traditional European winegrowing areas such as France, Germany, Italy, Spain, Portugal and the Mediterranean basin while the new world is made up of European colonised nations who began viticultural pursuits more recently such as Australia, New Zealand, USA, South Africa and various South American countries.

#### **Passito**

Italian term for a dessert style wine made by semi-drying the grapes prior to pressing to concentrate the sugar levels.

#### **pH**

A scale of measurement of acidity/alkalinity which runs from 1 to 14, where 7 is neutral, less than 7 is acidic and greater than 7 is basic.

#### **Plunging**

A winemaking technique used during the fermentation of red wine. The act of manually pushing down the cap of skins that rises to the top of the vessel due to the carbon dioxide produced during ferment. The cap of skins is plunged into the fermenting grape juice to break up the cap and wet the drying grape skins.

#### **Polyphenols (also polyphenolics/phenolics)**

Polyphenols in wine include a large group of several hundred organic chemical compounds that affect the taste, colour and mouthfeel of wine.

#### **Powdery Mildew**

A fungal disease thriving in humid conditions and moderate temperatures.

#### **Pump-over**

Winemaking technique used during fermentation of red wine. The act of removing the fermenting grape juice from under the cap of skins and pumping it back on top to wet the skins and add oxygen to the ferment.

#### **Reductive/Reduction**

A wine characteristic resulting from anaerobic winemaking, or lack of oxygen exposure of the wine. It exhibits as stinky or sulphury smelling wine, in extreme cases it can also affect the taste of the wine. Some grape varieties are more prone to reduction during the winemaking process than others.

#### **Rootstock**

Root system of a vine onto which the fruiting part or scion is grafted. Usually an American vine is used because of its inherent resistance to phylloxera.

#### **Scion**

The top or fruiting part of a grafted grapevine, usually *Vitis vinifera*.

### ***iii. Definitions***

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#### **Spur Pruning**

An annual winter pruning system where a permanent cordon is trained along a horizontal trellis wire with short spurs left along the cordon each season as the fruit bearing wood.

#### **Tannin/Tannic**

An astringent compound present in grape skins and seeds creating the sensation of 'dryness' of a wine.

#### **Terroir**

A French term referring to a special set of geographical, geological and climatic characteristics of a particular place which interact with the biology of a plant to express in the product; in this case wine.

#### **Total/Titratable Acidity**

The measurement of all acids present in grape juice or wine, measured by a process of titration and expressed in grams per litre (g/L TA). Also referred to Volumetric Analysis.

#### **Tufo**

A term used in Southern Italy for solid limestone rock.

#### **Vitis Vinifera**

The European species of Vitis genus of vine most commonly used for wine production.

# 1. Acknowledgements

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Kim Chalmers would like to thank the following individuals and organisations who gave generously of their time and their expertise to assist, advise and guide her throughout the Fellowship program.

## **Awarding Body – International Specialised Skills Institute (ISS Institute)**

The International Specialised Skills Institute Inc is an independent, national organisation that for over two decades has worked with Australian governments, industry and education institutions to enable individuals to gain enhanced skills and experience in traditional trades, professions and leading-edge technologies.

At the heart of the ISS Institute are our Fellows. Under the **Overseas Applied Research Fellowship Program** the Fellows travel overseas. Upon their return, they are required to pass on what they have learnt by:

1. Preparing a detailed report for distribution to government departments, industry and educational institutions.
2. Recommending improvements to accredited educational courses.
3. Delivering training activities including workshops, conferences and forums.

Over 200 Australians have received Fellowships, across many industry sectors. In addition, recognised experts from overseas conduct training activities and events. To date, 22 leaders in their field have shared their expertise in Australia.

According to Skills Australia's 'Australian Workforce Futures: A National Workforce Development Strategy 2010':

Australia requires a highly skilled population to maintain and improve our economic position in the face of increasing global competition, and to have the skills to adapt to the introduction of new technology and rapid change.

International and Australian research indicates we need a deeper level of skills than currently exists in the Australian labour market to lift productivity. We need a workforce in which more people have skills, but also multiple and higher level skills and qualifications. Deepening skills across all occupations is crucial to achieving long-term productivity growth. It also reflects the recent trend for jobs to become more complex and the consequent increased demand for higher level skills. This trend is projected to continue regardless of whether we experience strong or weak economic growth in the future. Future environmental challenges will also create demand for more sustainability related skills across a range of industries and occupations.

In this context, the ISS Institute works with Fellows, industry and government to identify specific skills in Australia that require enhancing, where accredited courses are not available through Australian higher education institutions or other Registered Training Organisations. The Fellows' overseas experience sees them broadening and deepening their own professional practice, which they then share with their peers, industry and government upon their return. This is the focus of the ISS Institute's work.

For further information on our Fellows and our work see <http://www.issinstitute.org.au>.

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## 1. Acknowledgements

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### Fellowship Sponsor

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- » Tony Battaglione, General Manager, Strategy & International Affairs, Winemakers Federation of Australia
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### Employer Support

Many thanks go to Chalmers Wines Australia who granted leave to the Fellow for the international travel and supported the subsequent report writing and dissemination activities.

Benefits to other Organisations from this Fellowship

#### Government

- Grape and Wine Research and Development Corporation
- Australian Wine Research Institute

#### Industry

- Nurseries
- Grape Growers
- Wineries
- Vine Improvement Associations

#### Professional Associations

- Australian Society of Viticulture and Oenology

#### Other

- Australian Alternative Varieties Wine Show

# 2. About the Fellow

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**Name** Kim Chalmers  
**Employment** Director, Chalmers Wines Australia Pty Ltd

## Qualifications

- Advanced Wine Assessment Course, Australian Wine Research Institute, 2009
- Graduate Diploma in Digital Arts, Adelaide University, 2000
- Bachelor of Music, Adelaide University, 1999

## Short Biography

Innovation in agriculture, horticulture and particularly viticulture is the cornerstone of the Chalmers family business. This intellectually and entrepreneurially fertile environment has inspired the Fellow to maintain a strong commitment to research, development and experimentation.

During the Fellow's tertiary education, she remained involved in the viticulture industry through a cutting-edge grapevine virus elimination project co-conducted by Chalmers Nurseries ([www.chalmersnurseries.com](http://www.chalmersnurseries.com)) and the Waite Institute, University of Adelaide. The project involved heat therapy of virus affected grapevine cultivars to produce virus free selections of a number of *Vitis vinifera* and rootstocks that were previously not available in 'clean' form in Australia.

Chalmers Nurseries' greatest contribution to the Australian wine industry was a large-scale private importation project undertaken in the late 1990s with Italian viticultural companies Vivai Cooperativi Raucedo ([www.vivairauscedo.com](http://www.vivairauscedo.com)) and Gruppo Matura ([www.matura.net](http://www.matura.net)). Together they selected around 70 clones and varieties (some entirely new to Australia and some improved clones of varieties already here), which Chalmers introduced to Australia in 2000. This vine material has been a major factor in the diversification and improvements in quality seen in the Australian wine industry in the last decade.

Since 2005, the Fellow has managed the wine production part of Chalmers Wines Australia Pty Ltd ([www.chalmerswine.com.au](http://www.chalmerswine.com.au)) including making and marketing wines from Italian varieties imported through the nursery. The key concerns in this undertaking have been minimising environmental impact, optimising quality and creating elegant, distinctive and characteristic wines. Chalmers produce wines from heat and drought tolerant varieties with a capacity to retain natural acidity and resist disease in hot dry climates. This means dramatic reductions in both water requirement and chemical use in the vineyard and the ability to create cleaner wines with less additions or intervention required in the winery.

In 2006, the Fellow was one of the first Australians to train with the Honourable Al Gore as a part of his initiative The Climate Project ([www.theclimateproject.org](http://www.theclimateproject.org)) which sees ordinary citizens from a wide variety of backgrounds, regions and sectors, deliver the slideshow made famous by the movie *An Inconvenient Truth*. Combining this work and her experience in the vineyard the Fellow wrote and directed the documentary *Sustainable Viticulture: growing for our future* in 2007/2008, funded by the GWRDC and corporate sponsors. It was given free to every grower in the Riverina, Murray Darling and Riverland so they could access information about techniques to insulate inland-irrigated winegrowing against climate change and reduced water availability.

## ***2. About the Fellow***

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The Fellow is currently treasurer of the Australian Varieties Wine Show ([www.aavws.com](http://www.aavws.com)), founded in 1999 and evolved over the last thirteen years to become the most important forum for non-mainstream grape varieties in Australia. Importantly this show is focused not only on medals but on the growing, making, marketing and drinking of alternative varieties and the role they will play in the future of the Australian wine scene.

The Fellow is passionate about creating a brighter future for the Australian wine industry, in particular in warm-climate irrigated winegrowing, and is determined to see alternative, especially Mediterranean varieties as major players in creating healthy vineyards, balanced ecosystems and a better bottom line.

# 3. Aims of the Fellowship Program

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To ensure a strong future, the Australian wine industry needs to achieve balance between a healthy, thriving natural environment and sustained productivity of the irrigated wine sector. This equilibrium will provide the framework for achieving improvements in wine quality and the ability to offer the marketplace greater diversity.

In warm inland regions, winegrowers are suffering at the hands of two main challenges. First the prolonged drought during the early 2000s reduced water allocations dramatically and drove water prices extremely high and out of reach for many growers. Although this drought has broken, the financial after-effects leave many growers unable to make their operations profitable. Secondly, the changing international market for Australian wine has seen traditionally strong markets turn away from big, fruity warm climate wines, leading to wineries paying growers record low fruit prices and cancelling grower contracts. The future of this sector is improvement in quality and therefore product value, in conjunction with a diversification of style by investment in new, more sustainable varieties.

Australia's inland warm-climate regions have typically produced large quantities of low-cost fruit for bargain priced wines destined for the UK and US markets among others. Whereas cool climates have been portrayed as 'fine wine' regions: climate change is set to make all of Australia's wine regions warmer within this generation. The CSIRO predicts "By 2070, the best estimate for annual warming over inland Australia ranges from around 1.8°C to around 3.4°C."<sup>2</sup> This means warm regions will become hot while warm, premium regions like the Barossa Valley and McLaren Vale will become warmer still with limited access to irrigation. To improve Australia's reputation in the global marketplace, the industry needs to move away from seeing warm-climate as lower quality and learn to produce fine wines with less water in hotter areas. One key to achieving this is working with varieties that originate in hot climate regions of the world.

The initial work Chalmers and other producers have done in exploring these varieties on Australian soil has seen success in improving efficiency in the vineyard and quality in the wine. The purpose of this fellowship is to extend that work significantly by visiting Sicily, Basilicata and Puglia where these southern and Mediterranean Italian varieties are produced. This study takes in not only the vines but the soils, the climate and micro-climate particularities of specific regions and sites, vineyard techniques, winemaking techniques and style - the full gamut of traditional local knowledge and evolution of techniques for hot climate production of fine wines in Italy over thousands of years.

Alternative varieties and smart variety/site matching, in conjunction with sustainable viticultural practices, are critical in the way forward for Australia's wine industry. The importance of gaining as much understanding of potential new varieties cannot be underestimated. The Chalmers family has contributed to the alternative variety movement by sharing knowledge and experience and provision of new grapevine material to almost every winegrowing region in Australia. The Fellow intends to build on this contribution by disseminating her discoveries through industry publications, social media, the AAVWS and direct contact with the industry when marketing wines and grapevine varieties. Hopefully this information will help the movement to remodel Australia's inland winegrowing areas around uniqueness and quality rather than generic quantity. Fine wine, no matter what region it is from, is the future of Australian wine.

<sup>2</sup> Climate Change in Australia – Technical Report; CSIRO, 2007  
[http://www.climatechangeinaustralia.com.au/documents/resources/TR\\_Web\\_Ch5i.pdf](http://www.climatechangeinaustralia.com.au/documents/resources/TR_Web_Ch5i.pdf)

# 4. The Australian Context

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While wine producers need to maintain profitability in domestic and global markets, they also need to become more sustainable in the vineyard and winery in order to reduce their environmental impact. By utilising sustainable practices and making informed varietal selections based on individual sites and conditions, water efficiency can be improved and inputs reduced, thus reducing costs. Australian vineyard sites have a wide range of regional variation in aspect, elevation, climate and soil conditions and there are potentially a multitude of grape varieties and clones which could be perfectly matched to those sites to create unique wines. This will aid production of high quality, environmentally friendly and distinctive wines, helping Australian producers maintain and expand their domestic and global market share.

Experimenting with new varieties is particularly important for warm climate irrigated growers as some analysts forecast these regions may become marginal, and even unviable as viticultural land, with only a few degrees warming.<sup>3</sup> Climate scientists are predicting a rise in mean temperatures (more exaggerated in Summer months), more frequent and severe droughts, reduced irrigation water availability and more extreme weather events like heat spikes and unseasonal rains.<sup>4</sup> Adopting varieties that require less water, are naturally disease resistant plus heat and drought tolerant, is one way to combat these conditions while continuing to improve wine quality.

## Background

Since the beginning of the wine industry in Australia in the mid 19th Century, there has been a lot of investment into importing vine material and conducting growing and winemaking trials. This work was mostly the domain of the government through bodies such as the CSIRO and vine improvement associations. However, in the last decade that investment has reduced to a point where importations are now via private nurseries or wine growers. Hence, there is no current national database on what varieties are growing or available in Australia. That situation leaves the industry responsible for its own research, knowledge sharing and innovation, a task that is hindered by the structure of the Australian industry as it has evolved.

In Europe wine regions have evolved around varieties that are indigenous or well suited to a particular site. This suite of varieties has become the signature for a particular denomination or wine style. Despite the plethora of varieties in Australia, when the wine industry boom of the 1990s started, the demand was for the French varieties such as shiraz, chardonnay and cabernet sauvignon so they were widely planted, often with little or no regard for climatic variability from one site to the next.

This essentially wasn't a problem when Australian wine was wildly popular in its biggest overseas markets (UK and US), but once its popularity waned things began to change. Australian wine lost followers when it appeared to become generic and boring. Wine was marketed as 'Australian' wine rather than being from a particular area and was largely devoid of regional characters due to multi-regional blending, implemented to keep the products consistent from year to year. In terms of price point, Australian wines began to be beaten on value by South American wines which were able to be produced cheaper and were rising in quality exponentially. Now Australia's large-scale production wines find themselves in the position of being too expensive for the low price point market and too big and bland for the premium market. One way out of this position is to raise the value of wine products by building integrity, pedigree and unique stories into brands and making wines of distinction by giving them regional identity.

<sup>3</sup> Future Climate Change Impacts on Australian Viticulture; L. Webb, P. Whetton, E. Barlow; 2007

<sup>4</sup> Intergovernmental Panel on Climate Change Fourth Assessment Report: Climate Change; 2007

## 4. The Australian Context

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The backbone of the Australian wine industry, in terms of the bulk of its revenue and volume, has been built around large corporate wine companies that contract their grape growing to multiple growers. These companies are driven by market research that governs their product portfolios, thus dictating what growers must produce. This takes the power to change out of the growers' hands and is a restraining factor in the path to sustainability. A grape grower needs to be granted a contract from a large corporate winery to make the change from an existing crop to a new variety. However, as these products are only a small part of the market to date, the corporate entities are reluctant to offer these contracts until the market share grows.

Small to medium sized wine producers, who tend to grow and make their own wines, have a more viable opportunity to pioneer a new variety. Rather than be dictated to by a buyer, they are able to directly educate and influence the consumer because of personal relationships with trade and the public. In many cases this group of businesses do the market trial work that leads to change in the industry.

Before this can happen though, there must be someone who takes responsibility for finding new varieties suited to Australian conditions then sourcing and importing vine material. The wealth of material in Australia is already rich but there are hundreds of varieties not yet in the country, and many might be more suitable to our growing conditions.

### The Way Forward

Over the last 10 years, Murray Darling and Riverland region growers have discovered a number of varieties that perform well, even excel, in hot dry conditions. Some of those varieties include vermentino, a white from Sardinia, fiano a white from Campania, sagrantino a red from Umbria, aglianico a red from Campania/Basilicata and nero d'Avola, Sicily's leading red. So far a number of producers have been successful in crafting great wines from these new varieties. However, the unique temperaments of these varieties have also brought challenges. Learning to deal with the individual growth habits and intricacies of each variety has been largely trial and error in many Australian vineyards as Italian viticulture texts aren't always applicable to our conditions. This study takes information gained from a decade of working with Mediterranean varieties in an Australian context and goes back to their original regions to see if traditional practices can help inform Australia's newly adapted techniques even further.

In addition to looking further into varieties currently being cultivated in Australia, the Fellow will be seeking to identify potential new varieties that may be suitable to warm climate viticulture in Australia. Research and investment into diversifying Australia's offerings is critical to the development and maturity of the industry's image into a sophisticated wine-producing nation made up of many distinct regions and wine styles. A progressive approach is essential due to the long lag times between selection of material and wines reaching the Australian Market; a process that can take up to a decade.

Marketing of new wine varieties is always a challenge. A small producer who is selling their products by hand may be able to influence the consumers one by one, but a large brand making millions of bottles needs the consumer to come into the shop already knowing what they want. Thus the revolution must happen via the successes of small passionate producers inspiring the larger corporate wine companies to follow their lead.

One key marketing advantage of many Italian varieties is that they can be made in a lower alcohol and savoury style of wine, more suited to consumption with food, rather than drinking on their own. This is a bonus for a society that needs to be heedful of problem drinking and is working to reposition wine as a cultural beverage to be consumed with a meal rather than simply an alcoholic beverage.

## 4. The Australian Context

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Overall there are many challenges and advantages to the uptake of new products in a market but the strength of the case for growing Mediterranean grape varieties in inland irrigated wine areas is three fold: Firstly, these varieties are simply going to grow better in such places thus requiring fewer inputs and placing less demand on natural resources. Secondly and because of this, they produce better quality fruit, raising the value of products by raising the quality of the wine. And finally, it's about creating a story; a reason why a particular grape grows well in a certain site that turns into a distinctive, unique wine giving every vineyard in any region a better chance of marketing their wine. The end result is consumers have a broader range of options both in bottles shops and on wine lists.

### SWOT Analysis

#### Strengths:

- Australia has a keen culture of innovation
- Australia's wine industry is not overly regulated allowing experimental work to flourish
- Australian wine producers are entrepreneurial
- Many parts of Australia are suitable for grape growing.

#### Weaknesses:

- A large percentage of Australian vineyards are planted to only a small number of varieties regardless of region and climate
- Disconnect between growers and the marketplace in large scale corporate wine production
- Financial challenges due to the economic climate.

#### Opportunities:

- To create uniquely regional wines that speak of their place
- To offer the market something different
- To produce wines with less health and social risks due to lower alcohol percentages
- To create a more diverse market allowing more brands to flourish.

#### Threats:

- Generic approach to grape growing due to lack of specialised skills pertaining to specific varieties could produce poor quality fruit
- More established wine producing countries in the old world are gaining ground against Australia due to their perceived superior maturity
- Old world producers are implementing more modern techniques and technologies in their production processes and therefore improving quality
- Other new world countries are able to produce wine of equal quality at a lower price point than Australia.

# 5. Identifying the necessary Skills and Knowledge Enhancement

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There are examples of areas in Australian industries where there are weaknesses in innovation, skills, knowledge, experience, policies and/or formal organisational structures to support the ongoing successful development and recognition of individuals and the particular sector.

The focus of all ISS Institute Fellowships is on applied research and investigation overseas by Australians. The main objective is to enable enhancement and improvement in skills, knowledge and practice not currently available or implemented in Australia and the subsequent dissemination and sharing of those skills and recommendations throughout the relevant Australian industry, education, government bodies and the community.

This Fellowship research targeted the learning necessary to adapt to the effects of climate change in Australia's wine growing regions by studying traditional Mediterranean varieties and viticultural techniques, which have evolved and adapted to hot dry climates. The research also investigates the ability of these grapevines to resist disease in unusually wet years (unseasonal and extreme rain/storm events are also an effect of climate change).

## **Knowledge of specific drought tolerant grape varieties**

The largest input required in warm climate grape growing is water. There are two main reasons to decrease the need for water:

1. To reduce environmental impact
2. To reduce costs.

Understanding a vine's ability to grow using minimal water, without resulting in collapse of the plant or fruit in hot conditions, is a key to making smart vineyard planting decisions as future water availability varies due to climate change.

There are many grape varieties that have evolved to grow in hot dry regions of the world with little or no irrigation. Adoption of these varieties in hot climate viticulture in Australia would be a sensible starting point to reducing irrigation requirements.

## **Knowledge of specific heat tolerant grape varieties**

Heat tolerance is as important as drought tolerance. They are often considered together as one attribute but it's important to understand the difference.

Drought tolerance is the vine's capacity to withstand water stress. Heat tolerance is the physical resilience of the grapevine to extreme temperatures, that is the ability of the vine to withstand a heat-spike or heat wave without the foliage or fruit collapsing.

Assessing heat tolerance in the vineyard is why it was important to conduct this fellowship travel in mid-summer to observe vines at full crop load and high temperature stress. Although there is anecdotal evidence for many of the varieties already in Australia about their performance in these conditions, there are many varieties yet to be observed in southern Italy. Collecting and disseminating this information on varieties which are potentially suitable but have not yet been trialled in Australia is the next step for the alternative varieties' movement.

## **Knowledge of the ability of these varieties to resist disease**

Disease resistance is generally due to the following physiological factors:

- Thick skins to protect the berry
- Loose bunches to allow intra-bunch airflow

## **5. Identifying the necessary Skills and Knowledge Enhancement**

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- Open canopy to allow air flow
- Bunch positioning to avoid crowding.

The first two points are genetic vine attributes; the second two can be manipulated by vineyard management practices. All these factors need to be assessed to determine the ability of a particular variety to resist disease. Generally the only way to know this is to see how a variety has performed in various climates and aspects. Many of the varieties that will be investigated during this study have no history of production in Australia so first-hand knowledge from growers of indigenous varieties is essential to understanding the advantages/disadvantages of a particular grape vine in a specific climate.

### **Knowledge of traditional grape growing techniques**

Most Australian inland vineyards have been established in a mechanised manner with ample irrigation. Perhaps looking back to traditional methods, which relied not on irrigation but on setting up the vineyard to best utilise natural water resources, could help the Australian industry to understand how to reduce water requirements.

### **Potential for these varieties and adaption of these techniques for Australian viticultural conditions**

Taking into account the performance of these varieties in their homeland and considering how they might fit into an Australian scenario is important to assess the viability of these varieties.

### **Understanding of derivative wine styles and flavour profiles for these varieties and their potential to re-invigorate the Australian domestic market**

Simply growing these more suitable grapes is not enough: the wines have to be marketable. It is important to understand what kind of wine styles can be achieved from these varieties and how they might relate to the Australian market domestically and globally. Many wines produced in Australia from new or alternative varieties are vastly different from their relatives in the old world because of lack of understanding of wine style. Australia should not aim to replicate the wines of Europe but it is important to be sympathetic to the inherent character of the varieties. In this respect holding a working knowledge of the wines is a key factor in understanding the potential of the grape variety.

### **Understanding the potential of these varieties to make higher quality, higher value, innovative new wines that Australia can export to established and emerging global markets**

All of the above factors discussed in the identification of skills deficiencies and knowledge gaps feed into this point. It needs to be ascertained that these varieties do in fact have the potential to make better quality wines, requiring less inputs, because of their adaption to growing in hot/dry conditions and the techniques that have evolved around them. If so, the engine room of the Australian industry – inland irrigated grape growing – can use this information to remodel itself demanding a better price point and making the industry sustainable both economically and environmentally.

# 6. The International Experience

The travel for this research began in Palermo, Sicily moving anti-clockwise around the coast to Marsala and Vittoria, then north to Etna and from Sicily to the mainland region of Vulture in Basilicata and to Puglia.



Southern Italy Map with travel route marked.<sup>5</sup>

The Fellow visited 21 wineries from July 12 to August 2, 2012 covering 2400 kilometres. The objective for every visit was identical - to glean specific local/regional/traditional/unique information pertaining to the company. Specifically to understand each district, varieties grown, techniques in grape growing and winemaking, wines styles produced, sustainability measures employed and finally where and how wines are marketed and consumed.

<sup>5</sup> Lonely Planet Travel Guide; Southern Italy (1st edition); Lonely Planet Publications Pty Ltd; Feb 2012

## **6. The International Experience**

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In the section below, these visits are summarised by region with an overview of the methods and varieties of each location. More detailed information is outlined in appendices at the end of the report (see appendix 1-21).

### **Western & Southern Sicily**

Eight producers were visited across western and southern Sicily. These companies ranged from large-scale wine producers making mass-marketable products to small artisans working in the premium category. In general their approach to wine growing and making depended on their end market.

Calatrasi near Palermo, Curatolo Arini and Pellegrino in Marsala all make vast quantities of wine at reasonable price points. Their products are designed to be appealing to a broad market and able to be produced en masse without expensive processes. Although all three producers had some international varieties they were still quite focused on Sicilian grapes and agree these varieties are better suited to the climate and conditions in Sicily.

Calatrasi has always been a table wine producer and has invested a lot over the past two decades in learning modern techniques to refine their wines. It has multiple vineyard sites and is able to match sites to varieties in order to achieve the best quality in hot conditions. Calatrasi also use techniques such as part pre-harvesting in their white wines to increase acidity. Its main red variety is the native nero d'Avola and the favoured style is that grown at low elevation on sand and limestone soils producing a more perfumed and elegant expression than those grown on more fertile ground. The setup of its vineyards is modern with wide rows and trellis systems allowing mechanised maintenance. Calatrasi apply irrigation reasonably liberally to support yields of up to 10 tonnes per hectare for reds and higher for whites.

Curatolo Arini and Pellegrino, both in Marsala, began as Marsala wine producers and have diversified into table wines to keep up with changing markets. Curatolo Arini still makes a considerable volume of Marsala but Pellegrino makes only 15 per cent of their total production into Marsala wine. Both producers have moved toward making modern style table wines with traditional Sicilian varieties.

Pellegrino has been making modern table wines from varieties like grillo, catarratto, inzolia, zibibbo and nero d'Avola as well as chardonnay and syrah, for some years and successfully exporting its extensive range of wines globally. Curatolo Arini is only beginning to make this type of wine and still relies heavily on its traditional production as their core business. Both producers aim to make international style wines from traditional grapes and market them on a broad scale. Both companies identified grillo and nero d'Avola as the best grapes to do this for their ability to produce quality in the regional climate of Marsala and make appealing wines.

In the middle-ground in terms of scale were internationally acclaimed producers Donnafugata in Marsala and Planeta in Menfi. Both well known for their contribution to raising the profile of Sicilian wine by investing in research and innovation to make and market quality branded wines. They both work with international varieties, which was a key part of their early successes in the wider wine market, but are focusing on Sicilian varieties in their future planning.

Donnafugata is constantly experimenting and has trial vineyards at many of its sites looking at clonal and varietal variation. In response to working in the heat the company developed a method of night-time hand harvesting to keep the temperature of the fruit lower when it reached the winery. Donnafugata is looking at replacing cabernet used in blended wines with tannat, another tannic grape that grows much better in hot climates. Donnafugata sees irrigation as essential in warm climate grape growing and renounces the idea that deliberate vine stress is a valid technique for producing quality fruit. Saline water is also an issue which means irrigation at Donnafugata's Contessa Entellina vineyards is applied

## 6. The International Experience

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in infrequent long shifts of 8 to 14 hours to ensure the salt is pushed down past the root zone so as not to be taken up by the vine.

Nero d'Avola is a key variety in the Donnafugata range and the company has various plantings in different terrains. It believes the wines from sandy soil are prettier and more fruit forward with fertile soil producing more structured wines. Donnafugata's nero d'Avola is trellised and spur pruned for lower yields and better quality.

Planeta is also focused on quality and has spent a lot of time and effort refining processes to combat the adversities of hot climate wine production, including irrigation in most vineyards. It harvests only in the morning and evening and not in the hottest part of the day. Planeta believes in being fully prepared to fix any mechanical issue which may arise during vintage swiftly and on-site to avoid delays, as fruit can be compromised in a matter of days during heat waves, so spare parts for all vineyard and winery machinery are kept in house.

Producing much smaller volumes of wine and applying more artisan methodologies, smaller producers Marco de Bartoli, COS and Occhipinti are growing and making flagship wines from native Sicilian grapes with flair and a strong sense of place.

Marco de Bartoli in the Marsala region makes Marsala wine, passito and white table wine from grillo and moscato d'Alessandria. Its Marsala production is considered to be one of the finest and that attention to detail extends to the table wines. Grillo is the traditional white variety used in the production of Marsala wine and has only in the last 10 to 20 years begun to be used for dry table wine production. De Bartoli extols the virtue of the grape as an excellent hot climate white due to its late ripening and excellent capacity to tolerate heat and drought while retaining natural acidity. It goes so far as to dry grow the variety in the Marsala region which has virtually no summer rainfall and peak summer daytime temperatures in the mid to high thirties. Another variety of interest for owner and winemaker Renato de Bartoli is catarratto bianco lucido, which also yields great results in hot climes.



*De Bartoli dry grown grillo*

## 6. The International Experience

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COS and Occhipinti are both located in Vittoria in south eastern Sicily; the DOCG area of the nero d'Avola wine Cerasuolo di Vittoria. Not surprisingly both companies focus much of their attention on this grape.

COS has experimented a lot with varieties and techniques but has come to a point where it favours native varieties and simple expressions without too much interference in the winemaking process. As well as a range of wines made in concrete tanks COS has around 150 amphorae in which it produces Cerasuolo di Vittoria and a white wine by traditional extended skin contact method.

Occhipinti is making only estate wines from just four varieties; indigenous reds nero d'Avola and frappato, a local white albanello and moscato d'Alessandria. Vineyards are managed biodynamically with no irrigation and an average rainfall of 470mm per annum<sup>6</sup>. Currently growing reds at high density in both alberello (10,000 vines per hectare) and a spur pruned trellis system (5500 vines per hectare), Occhipinti is planning to change the spur to guyot for higher productivity as the biodynamic principles and low water availability currently constrict yields to less than 1kg per vine. The whites are all managed on guyot.



*Alberello nero d'Avola at Occhipinti in Vittoria.*

Occhipinti's wine is made with no additions except minimal sulphur using reasonably modern equipment and the result is a range of wines which clearly present the personality of the grape and the approach of the winemaker.

<sup>6</sup> Average Rainfall Data from [www.meteosicilia.it](http://www.meteosicilia.it)

## 6. The International Experience

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As was witnessed across the west and south of Italy, there are a wealth of wine producers making wines with differing philosophies for diverse markets but the common thread are the varieties they see as most suitable for production in this area. Grillo, catarratto, moscato d'Alessandria and nero d'Avola were stand out varieties in terms of performance and proved to be versatile in terms of the wines they can produce.

### Etna

Mount Etna is an active volcano on the east coast of Sicily whose slopes have a long history of viticulture and some of the oldest surviving vines in Europe. Etna wines are distinctive due to richly mineral volcanic soils and the unusual combination of latitude and altitude creating unique climatic conditions. Diverse sub regions are characterised by their location and aspect with south eastern Etna having higher rainfall and coastal influence moderating temperatures while northern Etna lies further inland between the volcano and the Nebrodi mountains with lower rainfall and a broader diurnal range.

Southern Etna, particularly the Milo region, is better known for white wines. Carricante is the main indigenous white, along with minella. White varieties are more suited to the higher rainfall and warmer evenings here, although reds are also grown in the south. Inland, northern Etna is prized for its red wine production from nerello mascalese and nerello cappuccio; the hot, dry days and cool nights help develop great complexity and colour in the grapes.

Investment and research since the 1980s and a recent popularity boom have seen many brands emerge producing excellent local indigenous variety wines. Notable for their contribution to modern Etna are companies like Benanti and Tenuta delle Terre Nere. Benanti's engagement of regional expert Dr Salvo Foti to undertake detailed research in the 1980s led to extensive renewal of the regions vineyards and indigenous varieties in recent years.

Benanti produce wines from three sites across Etna utilising native varieties. Not only do they make the regional DOC blends they also produce straight varietal wines from nerello mascalese and nerello cappuccio. These two key Etna reds behave differently in the vineyard, with mascalese more vigorous and hardy while cappuccio is weaker and less productive; this is reflected in their vinous expressions. Etna Rosso DOC is traditionally a blend of at least 80% nerello mascalese with nerello cappuccio; the stand-alone wines make it clear mascalese is the stronger variety – a structured elegant wine with an acid/tannin profile for ageing. Cappuccio has pretty red floral aromatics but lacks structure and complexity.

Nerello mascalese is grown all over Etna, traditionally in alberello (up to 10,000 vines per hectare) because of steep, terraced sites, but more recently in trellised rows (from 4,500-10,000 vines per hectare depending on site). These rugged terrains allow little application of mechanisation so most vineyards are run using manual labour and often organically as dry summer conditions and hardy varieties minimise disease pressure. The exception was Gambino Vini in Linguaglossa whose vineyards are arranged in wide terraces and neatly trellised rows allowing for conventional viticulture using chemical applications, machine maintenance and harvesting, a rarity on the volcano. Irrigation is forbidden by DOC laws so vines survive on autumn-winter rainfall alone which averages 1000 millimetres in the south but as low as 550 millimetres in the northern inland, although in recent years rainfall has been below average<sup>7</sup>. Average yield for nerello mascalese is seven tonnes per hectare after crop thinning, naturally less for older vines. It is a late ripening variety usually harvested in mid October with typical analysis at maturity of 13-14 baume with 7 or more g/L TA.

<sup>7</sup> Reference from Dottore Stefano Dini, Viticulturist, Matura Group.

## 6. The International Experience

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Single vineyard expressions of nerello mascalese highlight its capacity to produce distinctive wines and a number of producers are focusing on this. Tenuta delle Terre Nere bought existing vineyards in nine sites of varying elevation and aspect across Randazzo to establish their range of Etna wines. They vinify up to 50 parcels of fruit separately before making decisions on final product destination in the winery. Although viticulture at Terre Nere is traditional, winemaking is more modern with use of selected yeasts and short cool macerations to produce juicier wines aimed at broader appeal in international markets.

Girolamo Russo in Passopisciaro is another producer intent on showcasing single vineyard nerello mascalese on a smaller scale than Terre Nere or Benanti, producing only 15,000 bottles per annum. Girolamo Russo makes only four wines, two of which are single vineyard Etna Rosso wines from old vines, the San Lorenzo Etna Rosso was awarded the coveted Tre Bicchieri (three glasses) in the 2012 Gambero Rosso.

Although the soil composition is vastly different from anything found in Australia the climatic conditions of north Etna are not dissimilar to the Murray Darling and other inland regions; hot dry summers with cooler evenings and frosty winters. Nerello mascalese thrives in these conditions and Terre Nere winemaker Calogero Statella suggested it could prove to be successful in Australia for hot climate wine production.



*Alberello and trellised nerello mascalese vineyards in the shadow of Mt Etna.*

### Vulture

Aglianico is the primary grape of the region surrounding Monte

Vulture, an extinct volcano in northern Basilicata. Like Etna, Vulture has rich volcanic soils but the vast DOC area extends past the limits of the ancient lava flows giving widely variable terroir across the region. Aglianico is an early budding and late ripening grape which gives a wine with great structure, tannin, acidity and ageing potential. All wine production in the region is centred on the indigenous variety.

Traditionally aglianico wines in Vulture were made with no intervention and long macerations in caves dug into the tufo. After visiting four different producers it was apparent that modern winemakers are using more controlled methods of production in an effort to reign in the variety's high tannin and acidity and make juicier wines.

Cantine del Notaio is a medium sized winery in Rionero del Vulture making 200,000 bottles per annum across a broad range of wines, including seven made with the aglianico grape. They have a number

## 6. The International Experience

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of vineyard sites but the home block at the Serra del Granato winery is in free draining, sandy soil. The vineyard is managed organically and some disease was evident in aglianico plantings with denser canopies. Aglianico is planted here at 5,000 vines per hectare on a single permanent cordon, pruned to 4 or 5 two bud spurs, yielding about 6 to 7 tonnes per hectare. Harvest occurs in late October to early November with average grape analysis at maturity of 13 to 14 baume, 3.3-3.4pH and 7-7.5 g/L TA.

The five-year-old Serra del Granato winery utilises modern mechanised winemaking like rotating fermenters to minimise labour requirement and speed up ferments, reducing maceration times. Shorter maceration means less tannin in the wine allowing for a juicier wine style, although further tannin is later added by the barrel refinement process. Cantine del Notaio also make a rosato and two traditional method sparkling wines from aglianico as well as a white vinification of the variety which they utilise in blended white wines to increase acidity.

Vignetti del Vulture is the Basilicata arm of the Farnese group that produces 13 million bottles of Southern Italian wine per annum exporting their products to 74 countries around the world. Their winery in Acerenza is made up of large stainless steel tanks and some large and small format oak ageing vessels. Fruit is sourced from multiple vineyards and wines are made on a large scale, presenting excellent value with entry level DOC aglianico priced at \$AUD15.00 retail. Wine style is modelled on bold, juicy new world wines, appealing to a broad international market, with aglianico reds showing juicy fruit, new oak and some sweetness. Of particular interest was the aglianico rosato, from a young high altitude vineyard in clay soil; the acidity and delicate floral character of the variety are clearly suited to the style.

Macarico and Elena Fucci in Barile represent the purist approach to aglianico del Vulture. Both producers make only one wine from estate vineyards and are intent on capturing the essence of the volcanic soil the vines grow in.

Elena Fucci's 10 to 60 year old aglianico vineyards are at varying altitudes on a sloping site located on the remnant lava. Most plantings are 8,000 vines per hectare trained in guyot, cane pruned to six buds for young vines and four for older ones, yielding 4 to 5 tonnes per hectare. Summer pruning is used to control the vigorous vine's canopy and only organic applications are used to combat disease risks, aglianico is resistant to powdery mildew but susceptible to downy mildew.



*Fucci aglianico vineyards at Vulture*

## **6. The International Experience**

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Individual vineyards are vinified separately to assess distinct characteristics before blending. Only 18,000 bottles are produced per annum so no risks are taken with unknown variables, Fucci prefers selected yeasts and stainless steels tank for both primary and malolactic fermentation. All wines are aged in new or one-year-old 225 litre French barrels before bottling.

Macarico has ten hectares of 11-year-old aglianico in two adjacent vineyards located on the ancient lava flows at 600 metres elevation and comprised of variable clay and limestone soils. Vineyards are planted at 10,000 vines per hectare in a cane pruned vertical shoot positioned trellis system with a low fruit zone. DOC laws forbid use of irrigation so vines are grafted on deep-rooted 110 Richter rootstocks to reach groundwater during heat and water stress. Rino Botte, owner of Macarico, says peak summer daytime temperatures here are around 36 degrees with a 15 degree drop at night and although the region receives about 800 millimetres annual rainfall it is normally completely dry in summer. Macarico do not green prune in summer despite the vigorous nature of aglianico as it stresses the vine too much. To make great aglianico an autumn spell of Mediterranean weather is required to ripen the grapes where optimum temperatures are around 28 degrees.



*Basilicata landscape with Aglianico del Vulture vineyards of Macarico in foreground*

Macarico produces 30,000 bottles of aglianico each year from four to five distinct parcels of hand picked, hand selected fruit. Made using wild yeasts, wines are fermented in stainless steel tanks with minimal agitation then gently racked off skins after 10 to 15 days to complete primary and malolactic fermentation in barrels, seeds are also removed half way through ferment to reduce the risk of green tannins. The only addition is a little sulphur at the end of malolactic ferment then the wine is aged in mostly old French barrels and large format botte before bottling.

## 6. The International Experience

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Aglianico is a fantastic variety and wines were generally good quality despite their stylistic differences. The elegance of the more boutique styles is alluring and the fact that warm autumn conditions are favourable for the variety bode well for its potential in inland Australia.

### Puglia

With high summer temperatures, cold winters, low elevation, red sand and limestone soils and irrigated vineyards, geographically Puglia is the most similar area to the river regions in Australia. The bulk wine production reputation of the region with higher yields and large scale wineries is also reminiscent of the Murray Darling.

Most representative of this kind of viticulture and wine production was Casaltrinita, a large co-operative in Foggia in the north of Puglia. It makes 60 million litres of wine annually buying fruit from 300 individual growers at an average price of AUD \$430 (300 Euro) per tonne. Grapes are grown mostly on pergola systems for shading fruit, with some spur pruned permanent cordon trellis, at lower density of 2850 vines per hectare or less. Crops are grown at up to 25 tonnes per hectare, sustained by up to seven megalitres per hectare irrigation on top of an average of 580 millimetres rainfall per annum<sup>8</sup> which was seen to create some disease pressure due to humidity under the pergola.

Most of the wine is sold in bulk or large format plastic containers in supermarkets. A small percentage is bottled and of these wines the nero di Troia and greco were of most interest. The red nero di Troia is the main indigenous variety of north Puglia, it's late ripening and makes soft, tannic wines which age well. Late ripening, high acid white greco is grown right across southern Italy and the wine produced at Casaltrinita had white stone fruit aromas, a pleasant savoury character and great texture; despite the lower quality of fruit and high yields at Casaltrinita, this AUD \$4.30 (3 Euro) retail wine was impressive, a good sign for the commercial viability of the grape.

Two companies proudly producing branded Puglian wines since the mid-20th century are Rivera in the north and Leone de Castris in the south. Puglia is 400 kilometres long with the northern and southern wine regions differing in climate. The north has a lot of limestone and gravel soils with hot summers and frosty winters. The south has more red sand and limestone and is mediated by the sea influence with hot summers but milder winters.

Rivera has 90 hectares of vineyards in the immediate Andria area and at Castel del Monte where there are a few hundred metres more elevation. Most of their plantings have been changed over or established to permanent cordon spur pruned systems since 1995, producing yields of 14 tonnes per hectare maximum. Rivera has invested a lot into nero di Troia conducting extensive research and making clonal selections with lower yields and smaller berries. It made the first varietal wine from the heat-loving grape in 2000 and now produces a number of versions in their range.

Leone de Castris is located in the southern region of Salento, about 25 metres from the coast at an elevation of 20 metres. It is the home of the negroamaro grape, and Leone de Castris is the inventor of the famous Salice Salentino wine that features the variety. Negroamaro is grown using conventional practices and irrigation, mostly on vertical shoot positioned trellis systems at 5,500 vines per hectare yielding 7 to 10 tonnes per hectare. It's tolerant of heat as Leone de Castris has observed no signs of stress in the foliage or fruit in extreme heat wave conditions of weeks above 40 degrees Celsius.

In the western inland plateau of Puglia near the Basilicata border lie Botromagno and A Mano, younger producers with an international style and strong quality focus.

<sup>8</sup> Average Rainfall Data from [www.ilmeteo.it](http://www.ilmeteo.it)

## 6. The International Experience

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*A Botromagno vineyard in Gravina in Puglia*

Gravina in Puglia is a DOC region at 350 to 500 metres altitude known for white wine production although Botromagno is the only producer located there. Established in 1991, it has conducted much research into the late ripening, high acid greco grape. Botromagno cultivates three types of greco, one from Campania and two native clones that are less structured and more aromatic. Greco mascolino was only identified by this research and is a lower yielding clone used in their straight varietal wine.

Mr d'Agostino, owner of Botromagno, says Gravina is a hot region that experiences a week or more of days above 40 degrees Celsius and a diurnal range of 20 degrees in summer and cold frosty winters. In summer time grapes need to be kept shaded and protected from hail by big canopies or pergola system training. Calcareous, clay soils are no more than a metre deep supported by a solid limestone shelf. Vines are irrigated when necessary to supplement the yearly rainfall, which d'Agostino estimates at 500 to 600 millimetres, that mostly falls in winter. Vineyards are managed organically as disease risk is low due to the hot dry climate and constant year round winds.

## 6. The International Experience

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*Primitivo vineyard in Gioia del Colle*

Just 55 kilometres east is Gioia del Colle and the A Mano winery, a modern operation established in 1998 making a large range of quality wines from Puglian grapes purchased from established local growers. Soils at the two vineyards visited were red with limestone and varying amounts of clay or sand. Some vineyards in the area are dry grown but 70 per cent are irrigated during establishment and later as required. The A Mano negroamaro is sourced from a 30-year-old dry grown vineyard trained with a permanent cordon and yielding 11 tonnes per hectare. The vigorous vine naturally produces a large canopy to shade the fruit from the harsh summer sun.

Nero di Troia, negroamaro and greco emerged as the Puglian varieties of interest for hot climates in Australia, especially given their application in large scale wine production.

## **6. The International Experience**

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### **Concluding Remarks**

These visits across Southern Italy were fascinating. The diversity of producers and wealth of knowledge shared was incredible. Much that was learned can immediately inform Australian warm climate viticulture and potential for introduction of these new varieties into Australia for future experimentation and diversification of the domestic wine scene is viable.

This trip allowed the Fellow to develop a much greater understanding of the unique challenges associated with hot climate wine production and the marketing of these products. As average temperatures continue to climb as a result of climate change, the information gathered in this research will help Australian grape growers adapt and continue to improve quality and sustainability.

# 7. Knowledge Transfer: Applying the Outcomes

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The material covered in the reporting of the international experience of this fellowship is broad and extensive but there are a number of outcomes that can be clearly distilled.

Visiting these regions has vastly improved the Fellow's knowledge of the Southern Italian terrain, viticulture and winemaking and it will directly inform her work in producing Italian varietal wines in Australia. Through her family business, the Fellow will utilise learned skills in relation to varieties currently produced but also work on the importation of new varieties studied during the fellowship for utilisation in the Australian wine industry. Using this knowledge to improve wine quality and sustainability in the vineyard simultaneously could potentially benefit the wider industry in terms of both production and marketing.

The implementation of gained knowledge and skills began immediately at Chalmers Wines Australia with 2013 vintage winemaking practices being adjusted according to findings from the fellowship. Some domestic research resulting from the fellowship will take a number of years to eventuate due to the extended time frames involved in importation of grape material and establishment of new plantings.

The Fellow intends to share her research and findings with the industry in a number of ways: firstly through her immediate personal relationships with other growers, winemakers and sommeliers; then through the publication of the executive summary and recommendations from this report in a national viticulture publication; and lastly through formal presentations of these findings at grower group meetings and seminars throughout 2013/2014 including the Australian Alternative Varieties Wine Show seminar in November.

It is envisaged that through the distribution of this report among industry bodies and key stakeholders the findings will educate and inspire growers and wine companies to think about how they perceive and approach hot climate grape and wine production into the future.

# 8. Recommendations

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## Knowledge of specific drought tolerant grape varieties

Drought tolerant qualities can be relative to both the scion (*Vitis vinifera*) and rootstock varieties of a grafted vine. In Europe all vineyards are established with grafted vines due to the widespread existence of phylloxera that attacks the roots of *Vitis vinifera* eventually killing the vine. In Australia many vineyards are grown without grafted vines but it would be useful to spend more time considering the rootstock's characteristics as well as the scion in order to achieve the desired drought tolerance of a particular vineyard. Australian nurseries and vine improvement associations already have a good collection of available rootstocks in circulation for which reasonably detailed information about growing characteristics is also readily accessible. In terms of improving sustainability, perhaps more emphasis should be placed on drought tolerance when selecting a rootstock for new plantings, especially in hot areas that rely on irrigation. In terms of actioning this, the responsibility lies with the nurseries and vine improvement associations themselves to communicate to clients the importance of this selection and advantages of grafted vines over rootlings.

During the fellowship study a number of dry grown vineyards were visited that survive on 500 millimetres of rainfall or less (500mm of rainfall is the equivalent of five megalitres per hectare of irrigation). They were mostly older vines with established deep root systems that can access ground water in times of little rainfall. In particular the varieties thriving in these conditions were grillo, catarratto bianco lucido and nero d'Avola in Sicily, aglianico in Basilicata, and greco, negroamaro and nero di Troia in Puglia. In the Murray Darling and Riverland where the average rainfall is about 250 millimetres per annum, the average irrigation applied per hectare is seven and a half megalitres per hectare<sup>9</sup> which equates to 1000 millimetres of water being received by the vines per annum. This is much higher than many areas that had similar conditions in Southern Italy. Given what the Fellow learnt, applying these drought tolerant varieties to Australian viticulture could dramatically reduce water requirements.

Some of these varieties are being cultivated in Australia and there are records for their water use, however others are yet to be imported. A useful way forward would be a national database of viticultural information that includes data on irrigation usage in certain soil types etc. The Fellow has helped establish such a database through the development of the Australian Alternative Varieties Wine Show entry system, which keeps detailed data on many aspects of the viticulture and winemaking for wines entered in the show. This is a beginning but deals only with wines that have been entered in the show. There is no published comprehensive Australian national grapevine register that has been collated or produced officially since 2006 and there have been a lot of importations by associations, nurseries and individuals since then that are not all recorded together anywhere. It would be valuable to have a free and open online catalogue of all grapevine material including viticultural information such as capacity for drought tolerance, this would make it much easier for growers to make informed choices about what they plant. The responsibility of grapevine collections data was once managed by the CSIRO or the Australian Vine Improvement Association but could now perhaps lie with the Australia Wine Research Institute, an industry and government funded body.

## Knowledge of specific heat tolerant grape varieties

Grillo, catarratto bianco lucido, nerello mascalese, nero di Troia and negroamaro were the five main varieties that were said to be extremely heat tolerant. All of these varieties were seen in dry growing conditions and were said to have shown no signs of stress or burn in either the foliage or the fruit during heat wave conditions. All of these varieties regularly experience summer daytime temperatures above 35 degrees Celsius; with the Puglian nero di Troia and negroamaro seeing weeks above 40 degrees Celsius in most years.

<sup>9</sup> Jeremy Giddings, Department of Primary Industries, Buronga NSW

## 8. Recommendations

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Canopy management and irrigation are key factors in assisting grapes to protect themselves from extreme heat and as such deserve a mention in regards to this point. Many of the vineyards we visited had irrigation that was used 'only in an emergency'. Interestingly, many viticulturists said that deliberate water stress in hot climate viticulture is not desirable and indeed that avoiding extreme stress greatly improves the quality of the grapes. Irrigation, even when applied only when required as opposed to a regular regime, is important in being able to help the vine withstand extreme heat spells. Perhaps it could be advantageous to begin to think about irrigation differently and rather than applying it liberally because it's available, it could be meted out carefully according to just what the plant requires. This may also mean investing in irrigation infrastructure in new vineyards that may not always require irrigation; quite an expense, but a great defence against future extreme conditions in terms of protecting vines from heat wave conditions. If the vine is sufficiently hydrated it can withstand much more heat stress.

Canopy management is also important in hot climate viticulture. Shady canopies protect the fruit in extreme sunny conditions and this helps protect the colour compounds as too much light can destroy the colour in some red grapes<sup>10</sup>. This is the opposite of cool climate viticulture where exposure of fruit is needed to achieve good colour. Also keeping a big canopy helps balance the vine and helps stop the sugar ripeness racing during extended heat spells as the vine is feeding all the foliage and the fruit rather than putting too much energy into sugar production in the berries.

### Knowledge of the ability of these varieties to resist disease

Some disease resistance attributes can be controlled by management, others are inherent qualities in the grapevine. Below is a list of varieties of interest and their disease resistant qualities.

- **Grillo** – Thick skinned and with open or only slightly compact bunches with reasonable resistance to mildew and disease.
- **Catarratto bianco lucido** – Thick skinned but bunches are compact which leaves the variety susceptible to mildew. Planting in less fertile soils in hilly sites is said to improve the bunch compaction issue.
- **Nero d'Avola** – Not overly thick skinned and with semi-compact bunches, but with reasonably good natural resistance to most diseases and climatic pressures.
- **Nerello mascalese** – Thick skinned with semi-open bunches; slight sensitivity to powdery mildew but good resistance to other diseases and climatic pressures.
- **Aglianico** – Medium thick-skinned and with semi-compact bunches but highly tolerant of fungal diseases, especially powdery mildew where it can survive well in rainy years and even when there is stagnant water laying around. Sensitive to downy mildew and rot.
- **Greco** – Thin and tender skinned with small compact bunches making it sensitive to botrytis, especially when there is rain in the later stages of ripening. Shows a good resistance to powdery and downy mildews.
- **Nero di Troia (Uva di Troia)** – Thick skinned and with medium compaction of the bunches; it shows average resistance to powdery mildew but is not overly resistant to downy mildew. It is generally resistant to adverse weather conditions because of its thick skins, except hot winds to which it is sensitive.
- **Negroamaro** – Thick skinned but with closed bunches. Highly frost resistant but a little sensitive to powdery and downy mildew and with a low resistance to botrytis.

<sup>10</sup> Michele Bean, Winemaker, Benanti Wines

## 8. Recommendations

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### Knowledge of traditional grape growing techniques

#### Clonal Selection and Planting Materials

Within the regions visited during this trip most new plantings had been established by the vineyard owners. In the South of Italy there is not a strong culture of nurseries or certified, regulated plant breeding. From the time of the phylloxera epidemic in the 19th Century when all the vineyards of Europe had to be re-established as grafted vines, Southern Italy had a communal approach. In public places such as along the roadsides there are *Vitis labrusca* and other American vitis vine plantations growing unmaintained. This meant that local farmers could come along in winter and have free access to the rootstock cuttings in order to establish any new plantings to protect against phylloxera. This system is pretty much the same today; rootstock vines grow along the roadsides and many growers simply take cuttings from older plantings to propagate, therefore many growers are unaware exactly which rootstock variety they have in their vineyards. Most growers establishing a new vineyard plant and grow the rootstock vines first then field graft the *Vitis vinifera* onto the vines later.

A similar process is utilised for selection of scion material which is generally accessed from cuttings taken from neighbouring blocks. Sometimes this is carried out as one selection for a whole new vineyard but other times growers will seek out a mixture of specific blocks of a certain variety that produce certain characteristics and mix plant these selections. The result of this is that there is not a lot of official DNA or breeding work that has been recorded on many of these southern varieties to date, yet the clonal diversities with each region and variety are well known and exploited colloquially.

#### Training Systems

The most traditional system of training in Southern Italy is the alberello or 'little tree' system, commonly known as bush vines. They are mostly planted at high densities, usually around 10,000 vines per hectare and can be arranged with even spacing or in small clusters with gaps between for access. In drier sites planting density can be as low as 2500 vines per hectare. These vines can either be trained up a single post or free-standing and pruned much like a stonefruit tree in a goblet shape. Depending on the rainfall and fertility of the soil the size of these bush vines will vary. This system is high labour as most of the time it is impossible to access these plantings with tractors etc. Despite this there are still new plantings being established to this system as there is a belief that it can produce great quality.

Another traditional bush vine system is the unique alberello Pantesco method utilised on the island of Pantelleria that sees the vines planted at a wider spacing because of low fertility of the volcanic rocky soils and in a depression to protect the vine from constant winds. A similar system is used in Santorini and the Canary Islands; these areas are generally considered the harshest vineyard conditions in the world. The low water availability and low fertility of the terroir mean that yields are low and fruit has intense character. The reality of this kind of viticulture is expensive and not really viable for commercial wine production.

A pergola system, also called tendone, is often utilised in Puglia and other parts of Southern Italy. It is a traditional growing system with two metre high permanent pergola constructions holding up the vines that grow two metres straight up to the canopy with four arms spreading out along horizontal wires. This system can overcrop and create unnecessary humidity and disease pressure under the canopy and is seen to be old fashioned and cumbersome. Despite the expense of constructing the pergola it is still sometimes employed in new plantings as a way of protecting against frost but is managed more wisely in terms of irrigation and clonal selection to keep the yields down. However in areas of low water availability it is not highly recommended as the large vine structure uses more water.

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When trellising vines with a more common modern cordon system it is important to consider when in dry climates that the lower the cordon the less water required to reach up to the canopy.

However a low cordon can also encourage humidity in the canopy and heighten frost risk depending on the climatic conditions of the site. The average cordon height in this type of system across Sicily and Basilicata was around 800 millimetres.

### **Canopy and Yield Management**

In the hot climates of Southern Italy it is important to keep fruit shaded in order to reach the best quality. Most trellised row systems include a single cordon and a foliage wire or wires running above that which the canopy hangs on to creating shade. Most vineyards were not using any green pruning to control the canopy; rather they were keeping all the foliage but bundling and wrapping the overgrowth down onto the foliage wire. The reason for keeping the foliage was to stop the vine from putting all its energy into ripening the fruit and which would see sugar level in the grapes race ahead of the physical ripeness. Leaving the canopy to create competition helps prolong the ripening which is an asset in hot climates as it encourages development of more complex flavour over time and allows the real ripening of the fruit to happen later in the season when the weather is not so hot.



*Long canes in the canopy that have been wrapped down along the top foliage wire instead of green pruning in summer time.*

Another way to prolong ripening and improve fruit quality in hot climates is to carry a higher crop yield on the vine. Many of the viticulturists and winemakers visited during the trip said that it was important to manage the vines in a balanced way. Due to warm conditions encouraging big canopies and generally larger vine structures, the crop load must not be too small or the vine pushes the

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ripeness too quickly. It is also not advisable to crop thin too much in hot climates for the same reason. Later ripening is essential to make wines of lower alcohol with more complexity and elegance in hot conditions. Therefore, varieties with a capacity to retain natural acidity are favoured. Varieties such as nero d'Avola, aglianico, nerello mascalese and greco are all naturally high in acidity and are late ripening.

These canopy and yield management ideas are contrary to some standard concepts of vine structure, yield and quality so asking people to think about hot climate viticulture in this way may be a challenge. In order for these ideas to be understood better it would be advantageous for viticulture teaching institutions and students to cover hot climate grape-growing during their studies, with visits to warm regions during summer in order to see the vines in full stress and how they cope with it. Trials have been conducted at Chalmers with yield and canopy management and the results of these are very much in line with what the producers in southern Italy have found. Wines from low yielding vines that have been shoot and crop thinned were more alcoholic and less complex. Further trials should be carried out by the industry with small batch winemaking to give liquid examples of how these procedures affect wines.

### Potential for these varieties and adaption of these techniques for Australian viticultural conditions

#### Varieties

- Grillo is already in Australia and showing good early signs. Imported by the CSIRO via University of California Davis in 1969 it has only recently been planted in the Riverland for wine grape production and is showing promising signs in winemaking trials by the CSIRO and others. Excellent potential for hot climate viticulture due to its excellent heat and drought tolerance, good disease resistance and capacity to retain natural acidity in the heat.
- Catarratto bianco lucido has a high tolerance for heat and drought, making this variety attractive for hot climate viticulture though compact bunches leave it somewhat susceptible to mildews and botrytis. However the potential for low alcohol, high acid wines in hot dry conditions make this variety worthy of a try in inland Australia. Catarratto bianco lucido is not yet in Australia and certified clonal selections in Italy are difficult to find so it may be some time before it is able to be imported into Australia.
- Nero d'Avola was imported into Australia by Chalmers Nurseries in 1998. Cultivated in inland hot regions since 2005 this variety is already showing promise. It has reasonable resistance to heat and drought although does not fare too well in extreme conditions. Downward growth habit of the canopy, in combination with the potential of big bunches and high yields to create a congested fruit zone, can create a disease risk in wet seasons. It prefers short hard pruning in a reasonably expanded training and if managed correctly can produce a wide spectrum of styles and can also retain acid well in most conditions.
- Nerello Mascalese is not yet available in Australia and with limited clonal research and identification being done in Italy it may be some time before this variety can reach the country. Its potential for hot climate viticulture is excellent with good heat and drought tolerance and late ripening with high natural acidity. Prefers compact training and short pruning. Makes a wine of great complexity with lower alcohol and good acidity. Rarely planted in terrain outside the specific black volcanic soils of Etna, it may have quite dramatically different characteristics in Australian soils.
- Aglianico is a great variety for growing in Australian warm climates, although the Italian text books say that it is better in hilly regions it has been successful in low elevation inland regions to date. It was introduced to Australia by Chalmers Nurseries in 1998 and has been made into commercial wines

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since 2004. The variety is resistant to powdery mildew, even in wet conditions, but susceptible to downy. It's late ripening and naturally high acidity make it a great hot climate grape although it can show some signs of suffering in prolonged extreme heat or drought.

- Greco originates from mountainous, volcanic areas but is being grown successfully in low-lying hot climates as well. It is a hardy variety in terms of heat and drought tolerance and with naturally high acidity it is great for hot dry climates. It has good resistance to powdery and downy mildew but is susceptible to botrytis in wet conditions, especially close to harvest, because of its extremely compact bunches. A great variety for hot/dry viticulture where there is little or no summer rain, especially as a blending option to improve acidity in white wines. There is vine material in Australia already with only a few wines on the market thus far.
- Nero di Troia is adaptable in terms of soil, training system and pruning but prefers warm climates. This variety is not in Australia as yet but could be interesting for hot climate and dry grown viticulture. It is quite hardy with thick skins and late ripening which make it appealing for warm climate grape growing.
- Negroamaro adapts well to different terrains with warm and dry climates, prefers clay and limestone soils. If irrigated can adapt to all kinds of training and pruning systems. Late-ripening and with good natural acidity this variety is suitable for dry inland hot climates which experience frosts in spring and hot dry summers. Negroamaro is already in cultivation in Australia but not many wines are in circulation as yet.

### Techniques

Irrigation technology and knowledge in Australia is already great; in fact Italy has learned a lot from the new world in this regard, but something interesting witnessed around southern Italy was the use of winery and farm building run-off which is collected in dams to irrigate vineyards. This sustainable approach followed through to power in almost every winery visited as well with most of them having a solar panel system that could cover a large percentage of their power usage. In Italy this kind of investment is seen as essential and an economic business decision rather than strictly an environmental one. This concept could be transferred to Australia successfully with its sunny climate but would require a shift in thinking from cheap dirty power to investing in cleaner more sustainable power.

Dry growing was a technique that was seen across Southern Italy that probably cannot be translated to the Australian inland areas. Most of these areas (Murray-Darling, Riverland) have too little annual rainfall at around 200 to 300 millimetres to adequately grow grapevines. However we would be wise to learn from these dry grown vineyards in Italy and utilise this information to reduce Australia's irrigation requirements by growing these varieties.

Training and pruning systems all over the world vary widely but most are established to a regional norm. Alberello is favoured in some parts of southern Italy for its quality and could potentially do well in Australia, however the expense of management of this system would seem to make it cost prohibitive. The low cordon concept could be well adapted to Australian viticulture and could reduce irrigation water requirement in hot climates, although when adapting to Australian conditions consideration will need to be given to the lower limits of mechanical harvesting.

### **Understanding of derivative wine styles and flavour profiles for these varieties and their potential to re-invigorate the Australian domestic market.**

Generally in Australia hot climate wines are considered to be jammy with plush ripe fruit characters and high in alcohol. In southern Italy these wines also exist, but have evolved to be this way in response to global demands for new world wines. The traditional high quality wines made from indigenous varieties in these regions are usually leaner and more acidic with an element of savouriness. This is

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not to say they have no fruit characters, but they are generally lower in alcohol and more food friendly. Structured lighter reds are usually associated with cooler climates and more premium wines (think Burgundy of central France and Barolo of north west Italy) but by utilising later ripening, higher acid varieties in a hot climate growers can make more elegant, structured wines in regions which were not previously associated with premium quality.

White wine maceration is utilised in some way at almost every winery in the south of Italy. This process of crushing the fruit and leaving it to soak for a number of hours before pressing is not often utilised in Australian white-winemaking and is a key factor in achieving the texture and dry/savoury character in many Italian white wines. In Australia we tend to use oak more for adding texture to white wines which is perhaps influenced by the French. The technique of white wine maceration in Italy gave their wines a strong identity and texture without masking the varietal characters as oak use sometimes can. This technique could be utilised very well in Australia as a more cost effective and less overt way to make warm climate white wines more structured and less simple.

Minerality is a descriptor associated with white wines that show chalky or slaty characters and is generally associated with more sophisticated wines. Minerality is derived from the soil in which the grapes grow and the grapes inherent characteristics, as well as winemaking. In southern Italy the tufo or limestone soils are highly regarded for producing great white wines, an attribute to be found in many low lying inland grape growing areas in Australia which were once under an inland sea in earlier geological times. There is a vast limestone shelf in these regions which when combined with the right varieties (greco and grillo etc) can produce wines of great mineral character in warm regions.

In Southern Italy most of the wines produced are red. However most of the wines consumed are white. The hot climate and al fresco lifestyle calls for refreshing drinks so white wines are favoured, as are more acidic and lighter reds. Much of Australia has a similar lifestyle and as such could begin to focus more on lower alcohol, more acidic and refreshing styles of wine. Varieties like nero d'Avola and negroamaro make fantastic red wines at 13 per cent alcohol or less and wines like greco and the dry moscato d'Alessandria of Pantelleria are perfumed, mineral and low alcohol all at once. A great choice for premium wine produced and consumed in a warm climate.

### **Understanding the potential of these varieties to make higher quality, higher value, innovative new wines that Australia can export to established and emerging global markets**

The bulk of Australian wine exported overseas is grown in hot, inland irrigated regions. This has resulted in many of our exported wines made from traditional French varieties like chardonnay and shiraz being ripe, full bodied and high in alcohol. To combat this image those regions could easily produce wines from Southern Italian varieties that bear similar yields, using less inputs and create wines of lower alcohol, higher natural acidity and greater finesse. Marketing these wines is where the challenge lies as traditional export markets such as the UK and USA are accustomed to seeing French varieties dominating this landscape yet when presented with an Australian nero d'Avola, the comment would be: "Why wouldn't I buy an Italian one?"

Australian warm climates can definitely improve wine quality by changing the varieties they grow, but the education process required to help the world understand why these varieties are being grown would be critical in the success of any of these wines on a global scale. Wine Australia is already working on this kind of education at the moment but effects are slow to flow on as the recent high value of the Australian dollar sees only the lower price-point wines from Australia being widely sold overseas. More premium wines are not finding shelf space as easily and this includes the boutique pioneers of these varieties.

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# 10. Appendices

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### Calatrasi, San Ciparello, North Western Sicily

**Thursday 12th July, 2012**

*Contact - Maurizio Micciche, Owner and Viticulturist*

Established in 1830, Calatrasi is today a large-scale winery producing 4.2 million bottles a year. Calatrasi owns 600 hectares of vineyards across twelve sites in the north-west of Sicily covering a range of elevations up to 1000 metres and planted to indigenous Sicilian and international varieties such as shiraz and sauvignon blanc. Owner/viticulturist, Mr Micciche says the grillo and the Sardinian carignano (carignan in France) perform the best because they tolerate the heat while still retaining their acidity.

As for nero d'Avola, Mr Micciche says it is important to restrict its naturally high yields to ensure intensity of flavour while careful management of applications and treatments is necessary to produce quality fruit. He says nero d'Avola grown in sandy soils tends to produce finer wines. Calatrasi's Mazara vineyard, near Marsala, is an organically grown nero d'Avola site on shallow red sand over limestone at 20 metres above sea level. It's a single cordon vertical shoot positioned system at 4,000 vines per hectare; 2.4 metres row spacing by one metre vine spacing. It is trained in both spur and cane pruning systems with the former lower yielding by one kilogram per vine, which produces better quality fruit for higher value products. Vines pruned to seven or eight one bud spurs yield four to five and a half tonnes per hectare while cane pruning to ten to twelve buds produces 24 to 25 bunches per vine yielding eight to 10 tonnes per hectare. Mazara is drip irrigated with 1.6 litre per hour drippers at 500 millimetre emitter spacing but water is applied only two to three hours, three times a week in summer increasing to eight to 12 hours per week in extreme heat. That works out to approximately 2.5 to 4 megalitres per hectare in a growing season, the equivalent of 250-350 millimetres of rain.



*Mazara nero D'avola*

Calatrasi also uses winemaking techniques to off-set problems associated with hot climate wine production. For example, it picks 10 per cent of its catarratto early (at 9 Baume, 2.99pH and 10 g/L TA) then later blends it back into the wine made from harvested ripe fruit (at 12 or more Baume). The less-ripe catarratto adds acidity and minerality creating a better-balanced wine.

## 10. Appendix 2

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### Donnafugata, Marsala, Western Sicily

**Friday 13th July, 2012**

*Contacts - Antonio Rallo, Owner and Winemaker*

Donnafugata, a commercial producer of two million bottles per annum with a strong commitment to experimentation and innovation, is known for achieving high quality regardless of its large scale. It began as a traditional Marsala wine producer but as Marsala's popularity diminished in the 1980s it focused on table wines and passito from the island of Pantelleria. Donnafugata has worked commercially with international varieties for many years and has a one-hectare vineyard with small lots of multiple varieties for trial winemaking. On the island of Pantelleria it is conducting clonal trials with selections of moscato d'Alessandria from Italy, Greece, Spain, Portugal and France. It is also doing wine trials replacing cabernet in blends with tannat, a more suitable hot climate grape. Donnafugata sees research as a key to successful business and is committed to continuing the work into the future regardless of the current strength of the brand.

Donnafugata's 260 hectare Contessa Entellina vineyards, established in 1983, are located across nine sites ranging from 200 to 500 metre elevation with various aspects and soil types and a relatively high average soil pH of eight. The vineyards are planted to a density of 4500 to 6000 vines per hectare and irrigated by drippers mounted on a wire 20 millimetres above ground level along the vine row. The irrigation application rate is four litres per vine per hour but the application frequency is low due to low water quality. As the water is saline, the vineyards are irrigated only three or four times per season for no less than eight hours per irrigation, normally 12 to 14 hours. This long irrigation method ensures the salt is pushed down past the root zone to avoid adverse effects on vine health.

Donnafugata makes a number of nero d'Avola wines, those grown on sandy soils are fruit forward, pretty wines, while fertile soils produce more structural wines. Mr Rallo commented that nero d'Avola lacks colour when stressed saying "healthy vines should never be starved". He said deliberate vine stress as a viticultural technique was designed by 'French Burgundy' growers where water is plentiful, he believes that these practices simply do not transfer to hot climates. The nero d'Avola vineyards at Donnafugata are trained on a single permanent cordon and spur pruned to six to 10 buds as spur pruning reduces yields giving better quality fruit.

Donnafugata pioneered night-time hand harvesting with a large, tractor mounted over-row lighting rig allowing it to hand pick in cooler night time temperatures.

### Curatolo Arini, Marsala, Western Sicily

**Friday 13th July, 2012**

*Contact - Riccardo Curatolo, Production Co-ordinator*

The Curatolo family began this Marsala winery in 1875. It still specialises in Marsala wine, which accounts for 2/5 of the 2.5 million bottle production today. Before World War I there were 150 wineries making Marsala wine in the region; now there are only about seven or eight. This means the wineries in the region have either changed what they produce or gone out of business as the world's taste for wine evolved.

Curatolo has recently engaged the assistance of international consultant winemaker and viticulturist Dr Alberto Antonini and Australian wine marketer Michelle Jordan to come up with a new range of table wines to help them evolve their brand into the future and support Marsala sales. It has designed a range of modern new world style table wines made from indigenous Sicilian varieties. The labelling is clean, modern and attractive, exuding an air of quality. This aesthetic is in stark contrast to Curatolo's ornate and old world style Marsala labels.



*Curatolo Labels*

This project is an interesting blend of old and new world sensibilities from a producer whose main business is a traditional style of wine. The wines are made in a bold, ripe, fruit forward style that seems to be modelled more on the wines of South America and Australia than the savoury styles traditionally found in Italy. The idea is that this will help Curatolo market the lesser know Sicilian varieties like grillo, zibibbo, insolia and nero d'Avola to a market more accustomed to the flavours of traditional international varieties. It remains to be seen if this approach will work.

## **10. Appendix 4**

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### **Cantine Carlo Pellegrino, Marsala, Western Sicily**

**Friday 13th July, 2012**

*Contact - Massimo Bellina, Export Director*

Pellegrino is a family run large-scale winery producing eight million bottles per year. Although it began as a Marsala producer the traditional wine now accounts for only 15 per cent of production, 20 per cent is passito di Pantelleria dessert wine and the rest is table wine. Mr Bellina said the two favoured hot climate varieties for Pellegrino table wines are grillo and nero d'Avola, with additional mention of the following varieties from other parts of Italy as also suitable for hot climates: pignatello, nocera, alicante bouschet and pachino.

Mr Bellina stated that nine out of ten Sicilians drink white wine, understandable given the climate, however traditionally most of the region's table wine production was red. This is changing, as Mr Bellina said that grillo, used for Marsala production, has only begun to be used for dry table wine in the last ten years and is already producing smart wines. He believes the best grillo is grown away from the coast and on clay and limestone soils.

Mr Bellina gave some insights into the weather in the Marsala region saying that Sicily receives all of its rainfall in winter, in the months from November to April, and summer is completely dry from May to October. The Pellegrino vineyards are irrigated by drip irrigation from dams that collect rainfall in winter. Irrigation occurs two or three times per season for more than 12 hours.

### Marco de Bartoli, Marsala, Western Sicily

**Saturday 14th July, 2012**

*Contact - Renato de Bartoli, Owner and Winemaker*

32 year old Marco de Bartoli winery produces 20,000 bottles of Marsala, 15,000 bottles of passito di Pantelleria and 50,000 bottles of white table wine annually. Many de Bartoli wines are estate grown on the 12 hectare vineyard at the winery. Old grillo vines are completely dry grown here, surviving on an average 484 millimetres per annum rainfall<sup>11</sup>, which mostly falls in winter. Impressive given Mr de Bartoli said that peak summer daytime temperatures average 35 degrees Celsius and winter days are a mild 15-17 degrees Celsius. The soil consists of one metre of yellow/grey coarse sand atop a deep bed of solid limestone rock (tufo). A second planting of grillo established four years ago to a lower



*Young grillo plantings at de Bartoli near Marsala*

vigour, smaller bunched clone is grafted onto medium vigour rootstock 420A. This block receives one 24-hour drip irrigation per year to help it establish and assist with vigour.

Mr de Bartoli said grillo is late ripening with enormous resistance to heat and drought showing no signs of heat stress in the canopy or fruit during extreme heat, even when dry grown. De Bartoli makes the versatile grillo grape into Marsala, dry sparkling, blended and straight varietal table wines. Simply treated it can be crisp and fresh, given oak and lees batonnage is gives a broader more complex style,

<sup>11</sup> Average Rainfall Data from [www.meteosicilia.it](http://www.meteosicilia.it)

## 10. Appendix 5

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always retaining refreshing acidity and structure to suit ageing.

De Bartoli also makes a dry zibibbo (moscato d'Alessandria) table wine from the island of Pantelleria. These vines grow in extreme conditions of heat, dry and wind in a traditional system called alberello pantesco; a low bush vine grown in a depression in the volcanic rock to protect the vine. De Bartoli's was the best of a number of interesting dry zibibbo wines in the Marsala region. A lovely juxtaposition of the floral aromatics of the Muscat grape with the minerality and structure derived from the volcanic soils produce an appealing wine with finesse.

Under a second label, Terzavia, Mr de Bartoli makes a nero d'Avola wine and spoke of the viticultural conditions he preferred for the variety. His nero d'Avola is dry grown in sand and limestone on a cane pruned 'guyot' system to improve yield given the lack of vigour due to low water availability. At 3300 vines per hectare it yields about two kilograms per vine.

Italy's third most common variety catarratto is also produced under Terzavia. There are three known clones: catarratto bianco lucido, catarratto bianco extra lucido and the most common catarratto bianco comune. Mr de Bartoli uses the lucido clone that is more 'lucid' characterised by less bloom on the berries and smaller bunches. It makes wine of intense mineral/grapefruit characters that are fresh and structured despite the harsh growing environment.

### **Planeta, Ulmo Winery, Sambuca di Sicilia, Menfi, South Western Sicily**

**Saturday 14th July, 2012**

*Contact - Chiara Planeta, Hospitality Manager*

The Planeta family were grape growers in a large co-operative until 1985 when they began producing wines under their own brand from their plantings. They began making international varieties chardonnay, merlot and cabernet as well as nero d'Avola and grecanico (which it blended with chardonnay to add acidity). Planeta now produces two and a half million bottles per annum and is probably the most well known Sicilian wine brand outside Italy. Its most popular wines blend international varieties with indigenous Sicilian grapes but its most exciting wines are the indigenous variety wines made with a thoroughly modern approach, while respecting tradition.

Planeta is focused on quality and have invested a lot in the technology implemented in its wineries to make the best possible wines. It has worked together with Carlo Carino, an Australian winemaker, on learning from 'new world' winemaking techniques for quality wine production in hot climates. "Hot regions have different issues to face," says Chiara Planeta, stressing that timing is crucial. Disciplined, well-trained staff, a perfectly clean and organised winery and perfect preparation are paramount at Planeta with ample time set aside before vintage each year for testing and preparing all winery equipment. Spare parts for all machinery are kept on site in order to minimise any down time from breakdowns. When temperatures are extreme fruit can be spoiled within a day or two, therefore hasty and accurate decision-making is critical.



*Planeta Menfi Vineyards*

Planeta's Menfi vineyards are drip irrigated from a large nearby lake. Harvest occurs during the day both by hand and with machine, beginning in the early morning and stopping during the hottest time of day. In summer Chiara Planeta said there is usually one heat wave of 40 to 43 degrees Celsius in June/July and a month of hot weather from mid-June to mid-July. She said normally the rainfall stops in June and summer is completely dry until September.

## 10. Appendix 7

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### Azienda Agricola Occipinti, Vittoria, Ragusa, South Eastern Sicily

**Monday 16th July, 2012**

*Contact - Arianna Occhipinti, Owner, Viticulturist, and Winemaker*

Vittoria native Arianna Occhipinti returned from winemaking studies in Northern Italy to begin her own cantina in 2004. She grows only classic regional varieties at her estate – frappato, nero d'Avola, albanello and moscato d'Alessandria. There are a mixture of traditional alberello; individual vines grown up a two metre vertical post, and single cordon trellis systems. The vines are planted as rootstocks then field grafted with a selection of clones sourced from local vineyards. This method is common in southern Italy with few official registered clones, locals source materials from neighbours rather than nurseries. This is perhaps why these varieties are less available from catalogued collections and therefore less distributed around the wine growing world.

Vittoria has a unique climate lying between the Iblei mountains and the sea, it's a dry climate with average rainfall of about 470<sup>12</sup> millimetres per annum falling mostly in winter. This makes it a low disease risk area because lack of humidity in the vine canopy inhibits growth of mildews. The Occhipinti vineyard is run under biodynamic principles without use of artificial chemicals and with work schedules based upon lunar cycles. Only copper and sulphur are applied as fungicides (twice per year in solution and once as powder) and fava beans are grown in the alternating mid-rows each winter for fertilisation.

One of the challenges of hot climate viticulture is keeping the sugar in the grapes from getting to high too fast to avoid over alcoholic wines. Occhipinti believe when there is more canopy there is less sugar in the grapes because of the energy the vine puts into growing the canopy so no summer pruning is applied; rather overgrowth is maintained and wrapped down (either vertically for alberello or horizontally onto a foliage wire for trellised vineyards).

Nero d'Avola in the Occhipinti estate is grafted onto 140 Ruggeri rootstock and planted as both alberello (10,000 vines/Ha, one metre by one metre spacing) and trellised in a spur pruned system (5500 vines/Ha, 2.1 metre rows by 800 millimetres vine spacing). Occhipinti is planning to change the spur to guyot for higher yields as with little rainfall, no irrigation and little fertilisation the crops are very low in her vineyard.

Frappato, the traditional blend-mate of nero d'Avola in the DOCG regional wine Cerasuolo di Vittoria, is a lower yielding variety that is not fertile in the basal buds so



*Occhipinti Alberello Nero d'Avola*

<sup>12</sup> Average Rainfall Data from [www.meteosicilia.it](http://www.meteosicilia.it)

its grown in a guyot system. Guyot generally yields about one kilogram per vine more fruit than spur pruning, but frappato in this vineyard yields less than one kilogram per vine. White varieties albanello and moscato d'Alessandria are also grown on guyot.

Harvest usually begins at the end of September or first week of October but never before the 15th September. Occhipinti makes 110,000 bottles per annum. The wine is made with spontaneous ferments using wild yeasts. Minimal sulphur as a preservative is the only addition, occasionally at crushing but always at bottling. Occhipinti mentioned nero d'Avola as a naturally reductive variety saying it can be completely random as to which wines show more reduction, not necessarily based on the amount of oxygen they've received. Two pump-overs and two plunges per day are carried out at the beginning of ferment to help counter reduction then less as the ferment goes on, just plunging once the wine is dry. Occhipinti uses a lot of skin contact in all wines, from ten days for white wine up to 40 days for some reds. This gives the texture and structure to the wines, although they retain fruit characters that some other Italian wines lose through oxidative handling.

## 10. Appendix 8

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### COS, Vittoria, Ragusa, South-Eastern Sicily

**Monday 16th July, 2012**

*Contacts - Giambattista (Titta) Cilia, Owner and Giusto Occhipinti, Owner and Winemaker*

COS is probably most famous for making wines in terracotta amphorae, although the winery also produces wines by more commonplace methods. When they began in the 1980s they experimented primarily with international varieties like chardonnay but over the years have moved their main focus back toward indigenous varieties.

The COS wines are all from the region of Vittoria and are grown using biodynamic principles in an effort to highlight the terroir. The vineyard adjacent to the winery is relatively young and has been established with an infrastructure of irrigation fed from a dam which collects run-off water from the villa and winery buildings and is topped up from ground water when required. The irrigation is apparently used 'only in an emergency' but this could be a reasonably regular occurrence with at least some irrigation applied every year. The irrigation is a dripper system with the dripper tube mounted on a wire running 300 millimetres above ground level along the vine row. The soil is comprised of one metre of clay topsoil over a bed of limestone. The climate is warm and dry with COS speaking of mild winters with 12-18 degrees Celsius days and nocturnal minimum of eight degrees Celsius at the lowest. It never reaches zero so there is no frost risk and it is also usually windy keeping potential disease risk low.

The vineyard is planted at two metre row spacing by one metre vine spacing (5000 vines/Ha) on a vertical shoot positioned system with two pairs of foliage wires. In January each year when the soil is still moist every second mid-row is cultivated and ripped, alternate rows are ripped the following year to aerate the soil.



*COS alternate ripped vine rows*

## 10. Appendix 8

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The winery descends deep underground so that large concrete vats, stainless steel tanks and barrels are kept in naturally cool environments for refinement of wines. Amphorae are buried in sand up to their necks to stabilise the temperature of the wine during the winemaking and refinement processes. The winery is also working on installing a large solar panel arrangement on its roof to help power the facility and reduce environmental impact from electricity use.



*COS amphorae*

## 10. Appendix 9

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### Benanti, Monte Serra vineyard and winery, Viagrande, Southern Etna, Eastern Sicily

**Tuesday 17th July, 2012**

Contact - Michele Bean, Consultant Winemaker

Etna is the oldest wine region in Sicily, awarded DOC status in 1968, the district runs from 400 to 1000 metres elevation around the active volcano in a clockwise arc from north west to south east. South-eastern sites have coastal influence and are better suited to whites like carricante, Northern sites have more favourable inland conditions for reds with a greater diurnal range.

From 1988 Benanti researched Etna varieties, soil and microclimates, subsequently releasing wines from three different Etna sites: The home vineyard and winery Monte Serra at Viagrande in the south, Caselle in Milo to the east and a third at Rovitello in the North.

The Monte Serra vineyard is 400 to 500 metres elevation with sandy and volcanic soil high in mineral content, concentrated at the top of the profile by falling volcanic ash. Average rainfall at Etna is generally high (between 700-1100mm per annum)<sup>13</sup>, DOC laws forbid irrigation. Benanti suggests that average summer daytime temperatures at Monte Serra vineyard are up to 38 degrees Celsius, five to ten degrees Celsius less at night. Monte Serra vineyard is planted mostly to nerello mascalese and nerello cappuccio including the oldest surviving vines on Etna, and a small amount of ancient local white minella. All work is done by hand as close plantings and terraced slopes prohibit tractors, including harvest which usually begins in late September.



*Younger trellised nerello mascalese plantings at Benanti's terraced Monte Serra vineyard*

<sup>13</sup> Average Rainfall Data from [www.meteosicilia.it](http://www.meteosicilia.it)

Benanti's Rovitello site is located on the northern part of Etna where it says average summer daytime temperatures are 35-38 degrees Celsius and nights are 15-28 degrees Celsius. Vintage at Rovitello begins much later in late October.

Benanti's Etna products, a range of structured, savoury and aged wines, are made exclusively from the native carricante, minella, nerello mascalese and nerello cappuccio. Carricante is only grown at Milo (the DOCG Superiore region of Etna Bianco), all other varieties are grown across all sites.

Late ripening carricante grows best in the south east of Etna where Benanti's wine comes from 80 year old vines grown at 920 metres elevation. Benanti said summer temperatures here reach 35-38 degrees Celsius with cool evenings around 20 degrees Celsius. Carricante makes an intensely mineral and acidic wine requiring long bottle ageing to mellow before release at five years of age. The reds are also tank, barrel and bottle refined for five or more years before release. The result is less fruit forward wines that show great structure and finesse.

Nerello mascalese is a robust, vigorous variety with a woolly appearance due to excessive lateral growth. At Monte Serra it is mostly planted in one by one metre spacing on a single permanent bi-lateral cordon and pruned to 4 or 5 by 2 bud spurs. There are also some bush vines up to 110 years old. Nerello Cappuccio is planted in alberello fashion at lower density because it is lower yielding and requires more canopy to be productive.

Etna's DOC red Etna Rosso is a blend of at least 80 per cent nerello mascalese and up to 20 per cent another red, normally nerello cappuccio; Benanti also produce a straight varietal wine from both varieties. Nerello mascalese makes a fantastic, structured stand-alone varietal yet nerello cappuccio is weak when vinified alone. Its key attribute, a delicate pretty perfume, is what it contributes to the Etna rosso wine.

Benanti's consultant winemaker, Mr Michele Bean of Friuli, was generous in sharing his knowledge of grape and wine production in hot climates. From his experience working all over Italy and the east Adriatic, Bean had well-informed insights into regional diversity in viticulture saying that the much-revered French/Burgundian system doesn't always work in other parts of the world.

"High density is not always the best quality" said Mr Bean. In true dry climates like Pantelleria, Santorini and the Canary Islands, bush vines are grown widely spaced and low to the ground in order to produce quality fruit and Priorat in Spain is normally 2500 vines per hectare. Mr Bean suggested 2000 vines per hectare is an ideal planting density in areas of low water availability.

In some situations a low cordon can encourage unnecessary canopy humidity, yet in warm, dry climates a short plant is preferable requiring less water to reach the foliage. In hot, sunny areas a shady canopy is good as over-exposure can damage the grapes ability to produce colour compounds.

Mr Bean suggested late ripening varieties are best in hot climates, as the real maturity occurs during the cooler Autumn period. In general crop thinning in hot climates does not improve the quality of fruit. Vines in warm climates with readily available water are bigger structures with larger canopies and will produce better quality fruit at a higher crop when the vine is in balance. Production level also holds back ripeness, allowing for development of complex flavours and tannin maturity before the sugar reaches optimum levels, thus avoiding over-alcoholic wines.

## 10. Appendix 10

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### **Girolamo Russo, Passopisciaro, Northern Etna, Catania, Eastern Sicily**

**Tuesday 17th July, 2012**

*Contact - Giuseppe Russo, Owner & Viticulturist*

2012 Gambero Rosso Viticulturist of the Year Giuseppe Russo runs his family's certified organic vineyard and winery producing Girolamo Russo branded wines since 2005. He makes three Etna Rosso wines which are predominantly nerello mascalese with a small percentage of nerello cappuccio and one Etna Bianco from four sites in the district. The entry level Etna Rosso is a blend of all four vineyards and the other rosso wines are single vineyard wines from the San Lorenzo and Feudo sites.



*Giuseppe Russo's San Lorenzo vineyard, young plantings of nerello mascalese showing the unique soil and Mt Etna in the distance.*

## 10. Appendix 10

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In the Feudo vineyard, at 650 metres elevation, 60 year old nerello mascalese is planted at row spacing of two and a half metres by vine spacing of 800 millimetres at 4500 vines per hectare. It is espaliered on a single cordon and pruned to four by two bud spurs. It yields between six and eight tonnes per hectare after some crop thinning is applied. Vintage here usually happens around the 15th to 25th October.

At 750 metres elevation at San Lorenzo vineyard most vines are 70 to 80 years old. Old vines have been converted to a trellis from old bush vines while new plantings are at 4500 vines/Ha on a single cordon system. Typical analysis at maturity for nerello mascalese from this vineyard is 13 to 14 Baume with 6-7g/L total acidity.



*Old bush vine nerello mascalese which has been converted to a trellis at Russo's San Lorenzo Vineyard.*

Girolamo Russo has gone away from co-operative grape growing into boutique branded wines producing only 15,000 bottles per year. Labelling is smart and modern, and its wines are sold globally at a premium, to much acclaim (2009 San Lorenzo Etna Rosso won the top honour, Tre Bicchieri, in Gambero Rosso 2012). Girolamo Russo is a great example of evolving from co-operative growing into branded product and turning a region from a poor image, to premium.

## 10. Appendix 11

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### Tenuta delle Terre Nere, Randazzo, North Western Etna, Eastern Sicily

**Wednesday 18th July, 2012**

*Contacts - Alessandro d'Errico, Public Relations Manager and Calogero Statella, Winemaker.*

Tuscan-American Marc de Grazia sought out the most prized sites in Randazzo to establish Tenuta delle Terre Nere, purchasing nine established vineyards across four sub-regions from 650 to 1,000 metres elevation. It makes 155,000 bottles per annum of nine different Etna wines, predominantly reds.

The Terre Nere approach is modern and Mr de Grazia intends his Etna wines to rival those of Burgundy. New plantings are established using nursery-bought grafted vines and are trained to a single cordon planted at 5,500 vines per hectare in two metre row by 900 millimetre vine spacings. Older vineyards are a mixture of training systems depending on widely varying site specifics despite their relative vicinity.

The Calderara Sottana vineyard, where the winery is located, is at 650 metre elevation with one to one and a half metres of topsoil over solid rock. It's 90 per cent nerello mascalese, mostly new plantings since 2004.

The Santo Spirito vineyard is at 700 to 750 metre elevation made up of contoured, old vine plantings at various angles according to slope and aspect. The lower terraces have a trellised system with a 900 millimetre high cordon and two sets of foliage wires holding a two metre tall canopy. The steeper parts are alberello style at around 7000 vines per hectare (1.2 by 1.2 metres). The soil is deeper, sandier and softer here; more fertile than other sites with a powder like consistency after cultivation.



*Cultivating the black soils at Terre Nere's Santo Spirito vineyard*

Guardiola vineyard is the highest at 750 to 1,000 metre elevation, running to the upper limit of the DOC laws and the physical limits of grape growing. It has old steep terraces making it extremely labour intensive to work, but it is the source of some of Terre Nere's top wines. This vineyard is mostly nerello mascalese, a mixture of single cordon and alberello, pruned to four by one bud spurs.



*'Alberello' bush vines of nerello mascalese at Terre Nere's steeply terraced, high altitude Guardiola vineyard.*

The maximum yield allowed in Etna Rosso by DOC laws is nine tonnes per hectare, the average yield at Terre Nere is 5 to 7 tonnes per hectare, with old vines yielding about 700 grams to one kilogram per vine. The younger plantings are used for making basic reds while the older vines produce the top tier, single vineyard wines. Terre Nere keeps all its parcels of fruit separate during fermentation and classify them individually before making blending decisions, vinifying up to 50 different parcels each vintage. The single vineyard wines are labelled Etna Rosso but are 98 per cent nerello mascalese, as is the top Etna Bianco which is 100 per cent carricante (the DOC law only calls for a minimum 60 per cent). Vintage usually happens in the first three weeks of October, if it's late and runs into November sometimes it can snow.

A conversation with winemaker Calogero Statella revealed that north-west Etna DOC is climatically different from the south. He said annual rainfall is more like 550 millimetres with steady wind from the northwest, as opposed to 1000 millimetres in the south with easterly sea breezes. He explained that the traditional pruning system for old vines was four branches with one spur of one bud each, now they use three branches.

Mr Statella said nerello mascalese is strong and resilient and could be good for cultivation in Australia. He had visited Mildura when working with Treasury Wine Estates some years ago and thought that the Murray Darling climate could suit the variety. He said nerello mascalese must grow in neutral or slightly acidic soils (seven pH or a little less) because they have less potassium. Weather in the three weeks before vintage is critical for the variety because it's late ripening. Normally harvested at 13 to 14 baume, the wine usually has over seven grams per litre total acidity before malolactic fermentation.

## **10. Appendix 11**

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Carricante was not recommended for Australia, being more delicate; sensitive to drought, heat and with thin skins leaving it susceptible to disease, it can be overly high cropping and produce grapes of low sugar and acidity.

Mr Statella takes a new world approach to technology implementation and winemaking using particular selected yeasts (including Australian selections) for emphasis of fruit characters as well as short macerations for juicier, less tannic wines. The Terre Nere wines are modern in style using traditional varieties, carefully designed to be appealing to a global marketplace.

### Gambino Vini, Linguaglossa, North Eastern Etna, Eastern Sicily

**Wednesday 18th July, 2012**

*Contact - Francesco Raciti, Owner*

Established in 1980, family owned Gambino Vini has been producing wines under their own label since 2002. 95 per cent of bottled wine production is sold to private customers via mailing list and cellar door (in 2011 they did 11,000 wine tastings at their facility), along with bulk wine and bag-in box for supermarkets.

The vineyard is managed conventionally, using chemical applications (sulphur applications are kept low) and tended by tractor, a rarity in Etna. Despite the use of herbicides this site had the most varied and widespread incidence of weeds of any we saw at Etna when most other farms are organic. Soil is sandy volcanic, planting density is 5,000 vines/Ha and the canopy is kept like a green wall using summer pruning to maintain two square metres of foliage per vine creating a shaded canopy. The sun side is leaf plucked in August and the crop is thinned in summer to an eventual yield of around one and a half kilograms per vine (7.5t/Ha).



*Gambino Vini's high altitude terraced vineyards.*

Although Etna is warm, Mr Raciti said that at this elevation summer days are only around 30 degrees Celsius and nights are 15 degrees Celsius less. Gambino Vini regularly have trouble ripening grapes at the cool end of the season, in winter the vineyard is covered by snow for two weeks. In the winery whites are whole bunch pressed and reds are taken off skins after only five to 12 days to keep wine styles fresh. The winemaking is mostly stainless steel tank with some oak ageing in large and small format but also the use of oak chips and micro-oxygenation to speed up the process and get wines on the market sooner.

## 10. Appendix 13

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### Cantine del Notaio, Rionero in Vulture, Basilicata, Southern Italy

**Friday 20th July, 2012**

*Contact – Saverio Vernucci, International Marketing Manager*

Cantine del Notaio produces 200,000 bottles of high quality, high value wine per year. Its vineyards are managed with organic and biodynamic principles and are unirrigated as per Vulture DOC laws. The main variety of Vulture is the red grape aglianico although Cantine del Notaio also grows international varieties like chardonnay and sauvignon blanc and Italian whites fiano, malvasia and moscato.

The vineyard located on the winery block has sandy, free draining soil and is planted at 5,000 vines per hectare, trained on a single permanent cordon and pruned to 4 to 5 two bud spurs. The inter-row has a permanent sward of wild grasses and weeds that is slashed and disced in spring. The vineyard owner said there was little disease pressure in the region but signs of disease were evident in some of the rows. These vineyards yield around six to seven tonnes per hectare on average. Some other vineyards owned by Cantine del Notaio are planted at higher density and yield up to the DOC maximum of ten tonnes per hectare. The average aglianico analysis at maturity here is 13 to 14 baume, 3.3-3.4 pH and 7-7.5 grams per litre total acidity.

The five year old Serra del Granato winery uses only stainless steel tanks and mostly modern mechanised winemaking equipment such as Vinomatic and Ganymede fermenters for less labour intensive winemaking. Some of the barrel-aged wines undergo refinement in a series of seven caves dug into the tufo (limestone) under the buildings of the cantina's cellar door and administration hub in the township of Rionero in Vulture. The caves, dating back to the 1600s, have fantastic insulating qualities and perfect natural humidity with year round temperatures of 12 to 13 degrees Celsius and steady 90 per cent humidity.



*Tufo caves for barrel ageing wines at Cantine del Notaio*

## **10. Appendix 13**

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Traditionally in Vulture vintage began after the 2nd November and aglianico wines would end up sweet as cold weather would stop fermentation before reaching dryness; modern Vulture wines are now conventionally dry. Cantine del Notaio is seriously focused on aglianico and have invested a lot in experimenting, making seven different wines from the variety: four red table wines, one rosato and two traditional method sparkling wines. The versatility of the grape extends further still with a white vinification of aglianico used in their white wine blend to add acidity.

## 10. Appendix 14

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### Macarico, Barile, Basilicata, Southern Italy

**Friday 20th July, 2012**

*Contact - Rino Botte – Owner, Viticulturist and Winemaker*

Macarico has two adjacent 11 year old aglianico vineyards totalling ten hectares on the ancient lava flows of Vulture. Soil is clay and limestone, rich in minerals but diverse in composition across the sites. Average elevation is 600 metres and Mr Botte said average summer daytime temperatures are 35 to 36 degrees Celsius with night time temperatures around 22 to 23 degrees Celsius. These sites are always windy so disease pressure is low, vineyards are only sprayed with copper and sulphur about seven times per year. The vines are grafted on 110 Richter rootstock for its deep root systems ability to find water in an unirrigated vineyard. It's established at 10,000 vines per hectare in a cane-pruned system with vertical shoot positioning and a low wire leaving the fruit zone close to the ground. Aglianico in Vulture is vigorous, Botte says that it would grow "up to the sky" if it could, yet no green pruning is applied; instead long canes are wrapped onto foliage wires.



*Aglianico del Vulture vineyards at Macarico*

Mr Botte said most of the annual rainfall happens in the period from March to May when mornings are sunny with afternoon rains. From May to July it usually doesn't rain at all so late July is the biggest stress period for the vines. He said the rains usually return around the 10th August with August and September being cooler than July. Veraison occurs around the 20th to 25th August. Mr Botte said it is important to have hot-dry 'Mediterranean weather' from mid-September to mid-October to make

good aglianico. Ideal conditions are 22 to 28 degrees Celsius during the day and no less than 10 to 15 degrees Celsius at night. There is a local folklore which believes that in Vulture they always receive an unusual 'late summer' from 25th October to 5th November for harvest, then from the 10th to 15th November snows can arrive.

The Macarico winery is a typical small winery of the region excavated from the tufo by hand in the 1400s. Botte single-handedly produces 30,000 bottles of aglianico per annum from hand picked high quality estate fruit. Wine is fermented wild, in stainless steel tank on skins for 10 to 15 days then pressed into barrels on heavy lees to finish ferment. Interestingly he removes the seeds when the wine reaches eight per cent alcohol to reduce the risk of green tannin characters in the wine. The only addition is minimal sulphur (as potassium metabisulphite) leaving 60 to 70 grams of total sulphur in the finished wine. Only two wines are produced; an Aglianico del Vulture and an Aglianico del Vulture Riserva.

The purist approach to viticulture and winemaking exercised by Macarico produces good results, the riserva wine was the best example experienced in the region. The wine showed power and great structure in a restrained, medium-bodied and elegant expression which Botte said is a true character of aglianico wines produced from the Vulture lava terroir.

## 10. Appendix 15

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### Farnese, Vignetti del Vulture, Acerenza, Basilicata, Southern Italy

**Saturday 21st July, 2012**

Contact - Dennis Verdecchia, Group Winemaker

Dennis Verdecchia is a winemaker for the enormous Farnese group that owns Vignetti del Vulture in Basilicata. Mr Verdecchia said the large Vulture DOC holds 1,000 hectares of aglianico, although there is a sentiment that the only 'real' Vulture aglianico is grown on the actual remains of the ancient lava flows. The local traditional method of making wine saw crushed grapes placed in the tufo caves, in a vessel with a board and rocks on top keep the skins submerged, and left there for months.

Basilicata is mountainous with hot summers and cold winters but it also touches both the Ionian and Adriatic seas. Vineyards in Vulture range from 200 to 900 metres elevation with the average being 400 to 500 metres. Vulture normally has 650-750 millimetres of rainfall annually<sup>14</sup> but Mr Verdecchia said the 2012 season had only received 200 millimetres to date (21 July).



*Aglianico vineyards near Acerenza used to source rosato fruit for Vignetti del Vulture*

Vignetti del Vulture makes large volumes of consistent quality wine for the global market at a reasonable price point. The wines are made in a modern style and most reds have some residual sugar with entry level wines seeing larger format oak and riserva wines seeing new barriques. The simpler wines with less oak influence were more attractive. The aglianico rosato was outstanding, from a high altitude site grown at 4,000 vines per hectare at one and a half kilograms per vine it showed pretty aromas and great balance. The process of adding back sweet aglianico passito to increase the residual sugar before bottling is a technique used in many Vignetti del Vulture reds aimed toward the USA market. An aglianico del Vulture DOP wine tasted in tank prior to the addition of passito and was more elegant than the fuller bodied, sweeter, oaked wines. Farnese's bold house style is a deliberate decision aimed at international markets.

<sup>14</sup> Average Rainfall Data from [www.ilmeteo.it](http://www.ilmeteo.it)

### Elena Fucci, Barile, Basilicata, Southern Italy

**Monday 23rd July, 2012**

*Contact - Elena Fucci, Winemaker*

Elena Fucci makes wines from her family vineyards which are mostly 60 years old with some new plantings in 1998 and 2002. Once co-operative growers, a young Fucci studied winemaking in Pisa and began the winery business in 2000 making just 16,000 to 18,000 bottles per year. Fucci only makes one aglianico wine under one label in low volume and high quality taking a proud and pure approach to making Aglianico del Vulture expressive of the volcanic soils.

The six hectare vineyard is managed organically and planted to a single clone of aglianico at 8,000 vines per hectare (1.2 metres by 800 millimetres) trained in a guyot system and pruned to six buds for young vines and four buds for old vines. There is also some alberello at 10,000 vines per hectare. Summer pruning is implemented to keep the vigorous canopy under control. Ms Fucci says aglianico is susceptible to downy mildew, and less so powdery, so copper and sulphur are applied to combat this.



The roots of the vines go eight to ten metres deep and the volcanic rock at that level holds water to feed the vine in dry times.

The fruit is grown at yields of four to five tonnes per hectare (less than half the DOC maximum) and wine is made by hand, vinified in separate parcels according to the distinct individual vineyards on the sloping site. Only free run is made into bottled wine, fermented in stainless steel tanks using selected yeast and only moving to barrel after malolactic fermentation. The wine is refined for 12 months in barrel and a further 12 months in bottle before release.

*Profile of the volcanic soil, characteristic of Vulture, at Elena Fucci's vineyard*

## 10. Appendix 17

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### A Mano, Gioia del Colle, central inland Puglia, Southern Italy

**Wednesday 25th July, 2012**

*Contacts - Mark Shannon, Owner and Winemaker and Elvezia Sbalchiero, Owner and Marketing Manager*

American Mark Shannon and wife Elvezia Sbalchiero from Friuli are both passionate about Puglia. They make appealing well-priced wines that sell globally, building their brand from nothing to international renown in just 12 years. A Mano utilises native Pugliese grapes to make a range of wines from crisp whites to full bodied reds. It buys grapes from vigneroni in the district, maintaining close relationships with the farmers.

One vineyard visited was comprised of dark ochre red soils similar to the Cambrian soil of Heathcote in central Victoria; these red soils sit over a limestone shelf. This site had old traditional alberello negroamaro vines, grown in a shape like a short stonefruit tree or a wine glass. New plantings are more commercial on a single unilateral cordon with vertical shoot positioning at between 4,000 and 7,000 vines per hectare.

Mr Shannon said that average summer temperatures are 30 degrees Celsius with heat spikes of up to 38 degrees Celsius, in winter it can go below zero at night. Regional average annual rainfall is around 600 millimetres<sup>15</sup> and 70 per cent of vineyards are irrigated although some dry grown vineyards survive on this minimal rainfall, including newly established ones. Organic practices are cheaper so they are often used, but Mr Shannon's general concept is to respond to needs rather than use a schedule. He says "the first profit is saving" so don't use any inputs that are not necessary.

A Mano makes a primitivo wine, which is usually grown closer to the coast where the water table is higher, at yields of up to six kilograms per vine. Mr Shannon noted that because there is a four to five per cent variation in ripeness of the berries within the bunch, it is important to be careful about measuring maturity by sugar level. He suggested that the harvest date should be selected at the point when five per cent of the berries are in the bunch are raisined.



*An old alberello negroamaro vine in one of A Mano's source blocks comprised of rich red earth with limestone.*

<sup>15</sup> Average Rainfall Data from [www.ilmeteo.it](http://www.ilmeteo.it)

He suggested a planting density of 6,000 vines per hectare would be ideal for primitivo.

In Mr Shannon's experience, the vigorous variety negroamaro sunburns easily so it prefers a shady canopy. The A Mano negroamaro comes from an unirrigated vineyard grown at 11 tonnes per hectare on 30 year old vines. The finished wine is 13.5 per cent alcohol with a floral note on the nose due to cool fermentation. The palate has a pleasant hint of bitter Mediterranean herbs (macchia Mediterranea) which is said to be why it's called negroamaro – translating literally as 'black-bitter'.

## 10. Appendix 18

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### Casaltrinita, Trintapoli, Northern Puglia, Southern Italy

**Friday 27th July, 2012**

*Contacts - Antonio Gargano, President and Pasquale Pastore, Winemaker*

Casaltrinita is a large cooperative winery in Foggia, northern Puglia producing 60 million litres of wine per annum of which 80 per cent is red and 20 per cent is white. It also sells juice and concentrate. Fruit is purchased from 300 individual local growers who have an average of eight hectares per farm with multiple varieties planted.

The region is only 70 metres above sea level with calcareous soil, even appearing stark white in some places, which is good terroir for producing white wine aromatics. According to Mr Pastore, the summer daytime temperatures regularly reach 40 degrees Celsius while nights are around 30 degrees Celsius, yet winter days are only eight to 12 degrees Celsius.

Many vineyards here are planted in the pergola system to shade the fruit from hot summer sun. The canopy is up to two metres high so a lot of water is required to reach the canopy. Average rainfall is 586 millimetres per annum<sup>16</sup> and about 700 millimetres additional irrigation is applied by dripper in the canopy at a rate of eight litres per minute in three irrigations per week. In one of the vineyards visited, the floor under the pergola was covered in grass or weeds that, when combined with ample water, create a humid environment conducive to mildew. White varieties grown on pergola yield 20 tonnes per hectare on average.



*Irrigated pergola system vineyard at one of Casaltrinita's source vineyards.*

<sup>16</sup> Average Rainfall Data from [www.ilmeteo.it](http://www.ilmeteo.it)

Other vineyards are grown in rows at a spacing of two metres with 2.2 metre vine spacing or around 2,250 vines per hectare, trained on a permanent cordon and spur pruned. Native Pugliese white greco grown in this way yields about 20 tonnes per hectare as it has relatively small bunches while sangiovese yields 25 tonnes per hectare. The crop yields being grown for this type of wine production are clearly high with a greater level of inputs and irrigation requirement to produce them, yet the average price paid to growers is 300 Euro per tonne for hand picked grapes as machines are not able to work in the pergola system.

Casaltrinita produces wines from nero di Troia, sangiovese, montepulciano, lambrusco maestri, cabernet, trebbiano, malvasia, moscato, garganega and greco varieties. Ninety per cent is sold as bulk wine all over Europe, the rest is mostly packaged in five litre plastic flagons and five, 10 and 20 litre bag-in-box; a small amount is bottled.

Nero di Troia is an ancient native variety from northern Puglia that is soft, tannic and long-lived. It can have higher pH when cropped high but at lower yields retains more acidity. The grapes look similar to nebbiolo; round berries, open bunches and naturally low colour. Casaltrinita growers train it on a permanent cordon, spur pruned at 2.4 metre row spacing by 1.1 metre vine spacing, a density of 2,850 vines per hectare. It is usually harvested in late October early November, which is very late for a hot region.

Greco, commonly grown in Puglia and most of central and southern Italy, is a late variety, ripening in early October, with small bunches and generally small berries. A bottled Casaltrinita wine from greco was tasted which had a natural pH of 3.19, despite the high crop levels and less than optimum growing conditions. The wine had white stonefruit aromas, a lovely round body, pleasant salty/savoury character and slippery texture. For a mass produced wine at a retail value of three Euro per bottle it was an impressive drink and a sign of the commercial viability of greco.

## 10. Appendix 19

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### Rivera, Andria, Barletta, Northern Puglia, Southern Italy

**Friday 27th July, 2012**

*Contact – Sebastiano de Corato, Owner*

Established in the 1950s, Rivera is a pioneering family owned wine company focused on building the reputation of Puglian wines. Owner Mr Sebastiano de Corato explained there are three main native varieties of Puglia: primitivo which originates in Gioia del Colle, now more widely planted in Manduria; negroamaro from the southern Salento region; and nero di Troia from the north. Mr de Corato highlighted the diversity of terrain in the 400 kilometre region stretching one third the length of Italy.

Both north and south Puglia have hot summers, however the north is cold in winter with icy Balkan winds from across the Adriatic bringing snowy conditions and reaching minus five degrees Celsius at night (neighbouring Abuzzo and Marche have the more snow than the Italian alps in winter). As such, southern Puglia has more summer ripening grapes with maturity brought forward by the heat, while northern Puglia has later ripening varieties because of slower maturing in the cooler autumn. Northern Puglia also has more elevated area with Castel del Monte vineyards ranging from 170 to 500 metres, while Salento in the south is just 50 to 70 metres above sea level.

Rivera has two types of terroir in its 90 hectares of vineyard: loose limestone and gravel. Traditional plantings in the region were all pergola; the tendone system with four branches was invented in Puglia. This system yields between nine and 14 tonnes per hectare depending on the variety, while older vines naturally produce less at about eight to 10 tonnes per hectare. 1995 saw the first permanent cordon, spur pruned trellis system in Puglia introduced by Rivera, most vineyards have now been changed over. The maximum crop levels grown at Rivera are 14 tonnes per hectare for whites and 13 tonnes per hectare for reds.

The main premium wine production focus for Rivera is nero di Troia, which has only been made as a straight varietal since 2000; it was usually blended with montepulciano, a variety from neighbouring Abruzzo. Older vineyards were planted alternating two rows of nero di Troia with one row of montepulciano to create field blends. Rivera researched clonal variation, eventually choosing three virus-free clones of a smaller berried, lower yielding (around 11 tonnes per hectare) nero di Troia for establishing new vineyards. The variety is late ripening; harvest happens when ambient temperatures are 10 to 20 degrees Celsius. It is thick skinned and makes a dry wine second only to Umbrian grape variety sagrantino in its level of polyphenols. The nero di Troia wines of Rivera are robust yet noble with immense tannins and some cranberry/raspberry fruit notes in the higher altitude wines. A smart variety for ageing wines when handled with care in the vineyard and winery.

Two other regional varieties tasted on the day were bombino bianco, a late ripening variety which prefers light limestone soils producing a low alcohol white with high acidity. And bombino nero, a light red grape which is only grown above 300 metres elevation, is quite finicky to grow and handle, but is prized in the region with DOCG status for its rosato wines.

Rivera's packaging and promotional/marketing material is elegant, giving a premium look and feel to the range. The professionalism of the operation is evident at the vineyards and winery and it's longevity as a family owned company, in a region which has been primarily producing cheaper, bulk wines, is admirable. It has the feel of a boutique brand yet is quite a large producer at 1.3 million bottles per annum (45 per cent sold in Puglia, 15 per cent in Italy and 40 per cent exported globally).

### Botromagno, Gravina in Puglia, Central Inland Puglia, Southern Italy

**Monday 30th July, 2012**

*Contacts – Beniamino d'Agostino, Owner and Stefano Dini, Consultant Viticulturist*

Gravina in Puglia, located on the ancient Appian Way, has a long tradition of viticulture with Roman records mentioning white wines from the region. It is close to the border with Basilicata on an inland plateau ranging in elevation from 350 to 500 metres. The winery was established in 1991 and now has 45 hectares of vineyards, 30 of which are located across Gravina to spread hail risk and achieve different characteristics from diverse soil types and aspects.

Summer in Gravina is hot, Dr Dini said temperature averages 32 to 36 degrees Celsius in the day and 20 to 22 degrees Celsius at night, with usually one week over 40 degrees Celsius per year (although Mr d'Agostino said that in 2012 there had been more than a month of days above 40 degrees Celsius by mid summer). In February/March there is usually some snow with average winter days eight to 10 degrees Celsius and one to two degrees Celsius at night. Average annual rainfall is 550 to 650 millimetres per annum<sup>17</sup> falling mostly in winter and a little in mid-July to August. Most vineyards also have irrigation 'in case of an emergency' used as required in a regime where one irrigation application delivers around 10 litres per vine.

Traditional plantings in the region were established to 90 per cent pergola system and 10 per cent alberello. More recent plantings are a mixture of permanent cordon and guyot on trellis and spurred-cordon pergola. The pergola system is used here to protect the fruit during high hail risk times in late October, as the canopy is above the fruit zone. The average yield on new plantings under pergola is eight tonnes per hectare. When using trellised rows, whites are normally on a permanent cordon and spur pruned to four spurs of two buds each, or one bud for top quality, reds are cane pruned.

The Zingariello vineyard sits at 500 metres elevation and consists of shallow topsoil over a limestone shelf. The calcareous and clay soil is of poor quality requiring a lot of nutrition but produces good quality white fruit. This site is windy all year round leaving little disease pressure and allowing organic management. Three clones of greco grown at this site are: greco di Tufo from Campania; greco femminile from Puglia, a lower yielding clone than Tufo and most common around Puglia; and greco mascolino, a rare low yielding clone which is prone to hen and chicken but makes great wine. Puglian greco in general is less structured and more aromatic than other grecos.

Other Botromagno vineyards visited were planted to red varieties with some international but mostly nero di Troia and montepulciano. Viticulturist, Dr Stefano Dini, said that nero di Troia is a disease resistant variety which produces a lot of foliage in an upright growth habit. It has long internodes along the cane and is not fertile on the basal buds so is trained guyot to ensure productivity. It is a late ripening variety (similar to aglianico in timing of maturity) with loose, medium sized bunches and usually has a few green berries in the bunches at time of harvest. It produces a smooth wine with strong tannins, relatively low acidity and good ageing potential.

The wines of Botromagno are made in quite a modern style in terms of fruit weight and oak use in the reds, however in a very Southern Italian approach whites all receive some maceration and owing to the calcareous terroir show a grainy, chalky texture. Of particular interest was a 100 per cent greco mascolino wine which showed distinct grapefruit, mandarin and fresh honey aromas and a nutty/grapefruit palate with a pleasantly tannic mouth-feel. The main Gravina DOC wine of the region is a white blend of greco and malvasia (plus sometimes a little fiano or bianco d'Alessano) which has

<sup>17</sup> Average Rainfall Data from [www.ilmeteo.it](http://www.ilmeteo.it)

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attractive light pear and slaty notes on the nose and a fresh citrusy palate with a backbone of grainy seashell chalkiness.



*Greco grown in tendone system at Botromagno's Zingariello vineyard.*

Mr d'Agostino said that there are now around 150 wineries in Puglia of which 80 per cent are leaning towards a higher quality focus, with five or six large co-ops still making huge volumes of bulk wine. Of the 250,000 bottles produced by Botromagno per year, 60 per cent are sold in Puglia, the other 40 per cent are sold in 10 different countries around the world.

### Leone de Castris, Salento, Southern Puglia, Southern Italy

**Thursday 2nd August, 2012**

Contact - Adriano Sicuro, Export Manager

Leone de Castris is a large winery in the southern Puglian region of Salento which began as a grapevine, olive and tobacco farm founded in 1675 by Conti Leone de Castris. In 1925 Leone de Castris produced the first bottled wines from Puglia leading the move toward more premium wines in the region. Its most famous wine Five Roses is a rosato developed in 1943 for the American soldiers posted in the region during World War II. In 1954 Leone de Castris were the first to make Salice Salentino Riserva, a negroamaro wine with up to 20 per cent malvasia nera, which went on to be awarded DOC in 1978.

Leone de Castris makes two and a half million bottles over 40 different products each year from 300 hectares of vineyard, half owned and half leased. It uses conventional farming practices and has only 30 Ha of traditional alberello (1.5 metres by 0.9 metre spacing) with 70 per cent of the vineyards in vertical shoot positioned trellis systems at 5,500 vines per hectare (2.2 metres by one metre spacing). White and rosato fruit is grown at around 11 tonnes per hectare and reds are grown at seven to 10 tonnes per hectare depending on quality requirements.



Leone de Castris Salice Salentino Riserva

The region sits at about 20 to 25 metres above sea level and about 25 kilometres from the coast. The soils are red sand and limestone, similar to the Murray Darling in Australia and most vineyards are irrigated when required although some are still dry grown. Average rainfall is about 630 millimetres per annum; average summer daytime temperatures are around 32 degrees Celsius with evenings about 18 to 19 degrees Celsius.<sup>18</sup> Mr Sicuro said that in summer there are usually about two weeks with temperatures above 40 degrees Celsius. He also said that bigger berried varieties, such as negroamaro and verdeca, fare better in hot climates, even in the extremely hot 2011 vintage when every variety showed heat stress, negroamaro held up soundly and produced fantastic colour.

<sup>18</sup> Average Rainfall and temperature data from [www.ilmeteo.it](http://www.ilmeteo.it)