

# 2012 POST-VINTAGE BULK WINE REVIEW

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*There is a renewed sense of optimism in the Australian wine industry. Has such optimism arisen from a fundamental, longer term shift in the economic fortunes of our industry? Or are we just witnessing a false rally following the 2012 vintage? This article examines such questions in light of Australian bulk wine market during 2012. The key issues addressed are an analysis of supply, tracking changes in wine inventories in recent years, the 2012 vintage, and the supply outlook for 2013. The bulk wine market for each of the main varieties is also examined.*

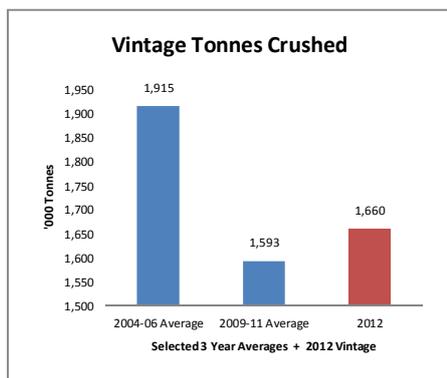
## 2012 Vintage: Short, long or balanced?

Many bulk wine players thought the 2012 vintage of 1.660m tonnes<sup>i</sup> was short. It certainly felt short, players behaved as though it was short, and for several weeks after Griffith was hit with widespread flooding late during vintage, it seemed a certainty that supply was going to be extremely short. So short, that wineries stopped trading bulk wine altogether for fear of giving up valuable inventories. But was the vintage actually as short as we thought?

Sometimes, we wine business folk can overreact to short term supply interruptions, when we should take a longer term view. Over reacting to fast moving events is certainly understandable, particularly when dramatic pictures emerge such as this one, of a major Griffith winery, taken during early March 2012.



To remove some short term volatility, it is useful to analyse supply across multiple, rather than individual, years: Set out in the graph below are average tonnes crushed for two key, three year periods ('trienniums') to help put the size of vintage 2012 in context.<sup>ii</sup>



The vintages of the 1<sup>st</sup> triennium, ending with the 2006 vintage, were really big, averaging just over 1.9m tonnes. Much smaller were the vintages of the 2<sup>nd</sup> triennium, ending with the 2011 vintage which were about 300,000 tonnes less, averaging just under 1.6m tonnes. The extreme drought year of 2007 and its aftermath, 2008, are excluded on the basis that such extremes generate unreliable, outlier, data.

In comparison, 2012 weighed in at 1.660m tonnes. Was the size of the 2012 vintage too little, too much or just right? It felt short, and this market sentiment has persisted since vintage, but why is this so? An analysis of beverage wine inventories over time provides some clues:

**Historical Insight No 1:**  
*The eruption of Mt Vesuvius in AD 79 had a devastating effect on the Roman wine industry, leading wine prices to quadruple.*

## Beverage Wine Inventories

During the 1<sup>st</sup> triennium, where the vintages were very big at just over 1.9m tonnes, there were just too many grapes crushed, leading to falling grape and bulk wine prices each year. This led to ballooning beverage wine inventories, which increased by a massive 175m litres on average, each year, for three years as wineries struggled to deal with all the grapes. 175m litres is about 250,000 tonnes worth of extra grapes that wineries absorbed each year during this time.

During the 2<sup>nd</sup> triennium, where the smaller vintages averaged just under 1.6m tonnes, it is unclear whether this was too much or too little. Many would argue that 1.6m tonnes was (and remains) too big mainly due to the unsustainably low wine and grape prices recorded during those years. This is a very valid point.

But this actually flies in the face of the ABS data<sup>iii</sup> which shows that inventories actually fell by 70m litres on average, each year, for three years during the 2<sup>nd</sup> triennium. This indicates that a vintage of just under 1.6m tonnes is insufficient to meet demand. (However, whether such a reduction in inventory would have been achieved at higher, and sustainable, prices is another matter altogether.)

**Historical Insight No 2:**  
*Just 13 years later, the subsequent planting boom led to an Emperor's edict to uproot ½ the Roman Empire's vineyards, along with a ban on new vineyard plantings.*

Consider the crude calculations overleaf, which demonstrate that the balanced Supply/Demand range is 1.650-1.700mT, on a very simplified analysis of each Triennium as follows:

**Balanced Supply/Demand Range = Average Tonnes Crushed – Average Annual Change in Beverage Wine Inventories**

Australian Wine Industry Selected 3 Year Averages + 2012 Vintage		1st Triennium 2004-2006	2nd Triennium 2009-2011	Variance	2012	Comments
Average Tonnes Crushed	'000 Tonnes	1,915	1,593	-321	1,660	
Average Beverage Wine Inventories (30 June)	mL	2,008	1,755		Unknown	Yet to be published
Total 3-Year Change in Beverage Wine Inventories	mL	525	-210		-	
Average Annual Change in Beverage Wine Inventories	mL	175	-70		Unknown	Yet to be published
Average Annual Change in Beverage Wine Inventories	~'000 Tonnes	250	-100	-350	Minimal	2012 is Author's est. only
Balanced Supply/Demand Range *	~'000 Tonnes	1,665	1,693			
Balanced Supply/Demand Range *, rounded	~'000 Tonnes	1,650	1,700			To nearest 50,000t
Oversupply or Undersupply		Oversupply	Undersupply		Balanced	Author's est. only

Source: ABS & WFA

\* Average Tonnes Crushed - Average Annual Change in Beverage Wine Inventories

If the above calculations are valid, at 1.660m tonnes, the 2012 vintage is almost precisely within the range of balanced Supply/Demand of 1.650 to 1.700mT. So why did it feel so short when recent past vintages of similar size failed to produce such a reaction in the market?

The answer most likely lies in the falling inventories during the 2<sup>nd</sup> triennium, 2009-2011: During this time, wineries reduced their inventory levels to the point where they felt confident enough to pay more for grapes in successive years.

Clearly illustrative of the trend of falling inventories during the 2<sup>nd</sup> Triennium is Austwine bulk inventory listings. Currently there is just over 70m litres for sale on the Austwine bulk list. This is a very low level, not seen since the extremely short, drought affected 2007 vintage. This is just *one third* of recent highs of 180m litres, recorded in 2009.

Low inventory levels stimulated increased winery appetite for grapes during the 2012 vintage, leading to slightly higher grapes prices for the third successive year. In other words, the three shorter vintages of 2009-2011 led to increased winery demand for grapes during 2012 when it became apparent that the 2012 crop size was going to be average at best.

In conclusion, therefore, yes, the vintage felt short, players behaved as though it was short, and the subsequent bulk market is short. But the actual crush number of 1.660m tonnes is only short in the context of the three most recent vintages which were shorter still and drove down inventory levels to well below winery preferred levels.

**Historical Insight No 3:**  
The arrival of powdery mildew in 1850's France led to wine shortages and wine prices doubled. The arrival of Phylloxera during 1870's led to further wine shortages and price rises.

### 2013 Vintage Supply Outlook Part 1 - Bearing Area

There has been robust discussion in the wine trade media during the last couple of years about the level of vineyard removals as reported by the Australian Bureau of Statistics.<sup>iv</sup> Bearing area peaked at 166,000Ha in 2008 and fell to 152,000Ha by 2010, a fall of 14,000Ha. But just a year later, in June 2011, bearing area had actually increased slightly to 154,000Ha. Based on anecdotal evidence from vine nurseries, and the author's own observations, it is likely that bearing area may well have crept up another couple thousand hectares another year later by June 2012.

**Historical Insight No 4:**  
The strong wine prices resulting from Phylloxera in 1870's stimulated massive plantings and oversupply resulted. From 1900-06 wine prices crashed to one third of production costs.

When average bearing area is also analysed across the two selected Trienniums, it can be seen from the table below that it has not really changed all that much:

Australian Wine Industry Selected 3 Year Averages + 2012 Vintage		1st Triennium 2004-2006	2nd Triennium 2009-2011	Variance
Average Tonnes Crushed	'000 Tonnes	1,915	1,593	-321
Average Bearing Area	'000 Hectares	154	154	0
Average Annual Change in Bearing Area	'000 Hectares	5	-4	-
Total 3-Year Change in Bearing Area	'000 Hectares	15	-12	-

Source: ABS & WFA

In fact the average bearing area for both the 1<sup>st</sup> and 2<sup>nd</sup> trienniums is identical at 154,000Ha.

During the 1<sup>st</sup> triennium to 2006, there was an average annual increase of 5,000Ha, and during the second triennium there was an annual average decrease of 5,000Ha. In other words, 3 years of 3.3% annual increases in bearing area then 3 years of 2.5% annual decreases. Not big annual changes and recall that the peak vineyard area of 166,000Ha actually occurred in 2008.

In summary, vineyard bearing area has not changed much since the 3 big vintages of 2004-6. So the potential must clearly exist for future vintages, including 2013, to equal those in size if conditions are favourable.

### 2013 Vintage Supply Outlook Part 2 - Wine Grape Cropping Yields

During the 2<sup>nd</sup> triennium, cropping yields were suppressed significantly at a national average of 10.3 tonnes per Ha, compared to 12.4 tonnes per Ha in the 1<sup>st</sup> Triennium. See the table below:

Australian Wine Industry Selected 3 Year Averages + 2012 Vintage		1st Triennium 2004-2006	2nd Triennium 2009-2011	Variance	2012	Comments
Average Tonnes Crushed	'000 Tonnes	1,915	1,593	-321	1,660	2012 is Author's est. only
Average Bearing Area	'000 Hectares	154	154	0	156	
Average Yield	'Tonnes / Ha	12.4	10.3	-2.1	10.6	

Source: ABS & WFA

Again, an analysis over three years tends to average out individual vintage variation, so why the difference in yield between the two trienniums? Here are some possible contributing factors:

- Lower vineyard crops due to reduced grower inputs over an extended period. This is most likely a significant contributor to reduced yields in the second triennium as many growers continually reduced inputs as grape prices continued to fall during most of the 2000s.
- In extreme cases growers all but abandoned their vineyards. But instead of uprooting their vineyards altogether, they mothballed them so as to be able to get them back into possible production at some later date. This practice was more prevalent in the 2<sup>nd</sup> Triennium, and if such vineyard were counted by the ABS as productive, their inclusion would contribute to the lower reported yields.
- In 2009 and 2010 water was scarce and rationed by growers as a result of much lower grape prices. An increasing number of growers had sold their permanent water by then in order to continue operating and had to purchase temporary water. (The drought broke in South Eastern Australia in spectacular fashion prior to the 2011 vintage.)
- Impact of 2011. Another part of the variance could lie in the extraordinary crop losses from the very difficult and very wet 2011 vintage bringing average yields down during the 2<sup>nd</sup> triennium. But although *beverage wine production* was down significantly, mainly due to significant concentrate production, *grapes crushed* were still at average levels.
- Premium v Commercial vineyard mix. Part of the answer may lie in the differing yields between premium and commercial vineyards. More higher yielding, commercial vineyards have been removed from production in recent years, so there may have been fewer of them in the 2<sup>nd</sup> Triennium. But removals have only been a couple of percentage points per annum, so this does not explain much of the difference in yields.
- Winery cropping covenants limiting the number of tonnes that growers deliver. But such covenants were well in place during both trienniums and so does not explain the difference in yields.

So what does this mean for the outlook for 2013 vintage?

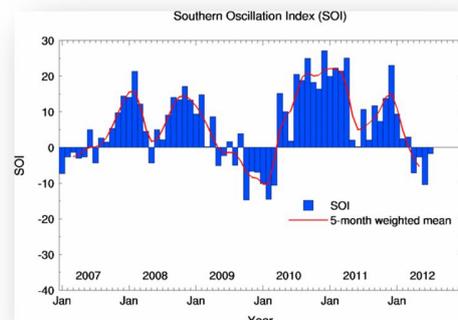
To begin with, there seems to be a changing mindset that we have passed through the worst of the downturn, where despondency and inactivity were typical grower responses. Growers are now more willing to invest in the next winegrape crop due to the better grape prices since their recent lows of 2009 vintage. As I drive around the country side this winter I also am struck by the increased inputs that grape growers are now investing in their vineyards in readiness for 2013 vintage: For example, lots more organic manures and inorganic fertilisers stockpiled on roadsides and in headlands for broadcast on vineyards.

Furthermore, I observed much more rigorous spray programs prior to 2012 vintage as a result of the very wet 2011 vintage. I expect those programs to continue, at least until 2011 fades from memory or financial reserves again become exhausted if lower grape prices return.

It also appears, and this observation is anecdotal and in no way scientific, that more fruiting wood and buds have been left in some of the commercial, inland irrigated regions now that pruning is nearly complete. But it may be that these observations are quite possibly just my imagination.

But what is not anecdotal, is that dams are full or near full, rivers are flowing again, water allocations are very high and temporary water is cheap. There is also the possibility of an El Niño event unfolding during the 2013 growing season as the graph opposite of the Southern Oscillation Index shows.<sup>vii</sup> In the absence of widespread water restrictions and extreme, long term drought (both which appear unlikely) an increased probability of a drier growing season means a relatively kind growing season. This means an increased likelihood of both good quality and quantity of grapes to be grown this coming harvest.

The next key pivot points in the likely 2013 crop level are budburst, flowering and set. In the meantime, it may be that increased vineyard inputs, good spray programs, more fruiting wood and buds (perhaps), abundant water and good dry weather means a higher 2013 yield potential.



### 2013 Vintage Supply Outlook - Conclusion

Considering budburst is yet to occur, there is still a very long way to go until 2013 grapes are delivered to the crushers. But in the absence of any number of major climatic or economic calamities, there is certainly the potential for a larger than average crop in 2013. If recent historical averages in cropping level are again achieved, assuming no growth in the author's estimated current vineyard area of 156,000Ha, then 2013 could deliver a large crop. How large? Three scenarios are presented in the table below:

Australian Wine Industry Selected 3 Year Averages + 2013 Vintage Size Scenarios		Up Case	Down Case	Base Case	Comments
		1st Triennium 2004-2006	2nd Triennium 2009-2011	Mid-Point	
Average Yield	'Tonnes / Ha	12.4	10.3	11.4	No growth assumed
2013 Estimated Bearing Area	'000 Hectares	156	156	156	
2013 Estimated Tonnes Crushed Scenarios	'Tonnes / Ha	1,941	1,610	1,775	

Source: ABS & WFA & Author's Estimates for 2013

The up case uses the average yield of the 3 big crops of the 1<sup>st</sup> Triennium over the estimated vineyard area for 2013, and predicts a 2013 crush of 1.9m tonnes. This is a big crop.

The down case is 1.6m tonnes, which uses the average yield of the 3 smaller crops of the 2<sup>nd</sup> Triennium. A crop this size, smaller than 2012, would see increased demand for grapes by wineries and a relative scarcity of bulk wine, with widespread upward price pressure.

The base case is calculated as the average yield across *both* Trienniums and predicts a 2013 crush of 1.8m tonnes. This is also a big crop.

A large 1.8m or 1.9m tonne crop may actually suit some producers, as they look to continue to rebuild depleted stock levels, so it may not necessarily cause a relapse into oversupply. Prices for grapes and bulk wine would most likely remain stable or fall slightly during 2013 in each of the larger two crop scenarios. But more than one or two years of such large crops in succession, *at current demand levels*, is likely to lead to widespread downward pricing pressure emerging in the marketplace once again.

**The Demand Side**  
*What are the major demand stimuli for the Australian grape and wine producers prior to 2013 vintage?*

- *A major negative stimulus is the slow strangle of a very high exchange rate against our major trading partners crimping our competitiveness at every juncture. This affects all producers since it ring fences Australian wine production within Australia.*
- *Those producers with large exposures to export markets cite regular press reports of short vintages in many regions throughout the world, as a major positive stimulus to profitable demand.*
- *Other producers with large exposures to the domestic retail duopoly cite the growth in retailers private label business, as a major negative stimulus to profitable demand.*

### Bulk Wine Round Up

There is very little bulk wine available on the spot market, especially from the inland irrigated or *ōwarmō* regions<sup>viii</sup>. The Austwine inventory list is currently just 72m litres and this is a level not seen since the severely drought effected 2007 vintage.

Due to the general scarcity of bulk wine available in the market place, many of the parcels that we do have listed are priced at well above what buyers are currently able or prepared to pay, or are of generally lower quality. So it is very hard to find value in the Australian bulk wine spot market at present.

Warm region wineries have generally been edging their asking prices upward a few cents at a time, sensitive to the price point barriers that their customers generally face and allocating scare inventory to preferred customers based on track record, such as:

- Do they take their wine?
- Do they pay for their wine?
- Are they good and honorable to deal with?
- Were they there for me in tough times?
- Will they be back as a customer next year?

As a broad generalization, cool area wineries have *generally* been more inclined to increase prices more rapidly with lesser regard to the track record of their buyers. I would always caution against too rapid price rises of cool area based on the amount of inventory that did not sell for years following massive price increases following the very short 2007 vintage.

**Wine Pricing and Market Integration – Today:**  
*Increased retailer consolidation together with greater international substitutability of commercial, everyday, wines in key export markets has reduced the ability of producers in any one producing country to increase prices. The last time prices of Australian bulk wine prices increased substantially was in 2007. This led to a massive stock overhang and subsequent bulk wine write downs in the years following. This was a fundamental change in the market for Australian bulk wine during the last 15 years as a result of increased retailer consolidation and globalisation of wine.*

**Wine Pricing and Market Integration – Yesterday:**  
*The widespread expansion of railways in Europe during the mid 19<sup>th</sup> century reduced wine transport costs by 75-85% greatly increasing the substitutability of various European wine producing regions in major urban markets. This reduced the ability of producers in any one region to increase prices in their local market. Higher cost wine producing regions becoming increasingly uncompetitive, forcing such regions to specialise in the wine styles where they enjoyed some competitive advantage. This was a fundamental change in the major urban markets for wines in Europe at the time.*

### Chardonnay

Of the top four major Australian grape varieties, Chardonnay bulk wine is the most abundant. There are still some reasonable, but not absurdly abundant, good quality selections available of 2012 Chardonnay. 374,000 tonnes of Chardonnay were crushed in 2012, down from 398,000 tonnes crushed in 2011 (although a very significant percentage was sent to concentrate production in 2011). Still, for all those tonnes crushed in 2012, there is just 10.6m litres (or ~15,000 tonnes) listed for sale on Austwine's bulk list across all vintages and regions. Entry level prices for warm area 2012 Chardonnay are \$0.90-\$1.00 per litre with good export demand at these levels. There is limited domestic demand for Chardonnay. Premium Cool area Chardonnay is not overly abundant, matched by limited demand.

Chardonnay – Austwine Bulk Wine Inventory Summary - August 2012							
Total	Warm	Cool		2012	2011	2010+	Total
13.0	7.8	5.2	Volume (M Ltrs)	10.6	2.2	0.2	13.0
123	24	99	No of Lots	70	38	15	123
106	326	53	Ave Size (K Ltrs)	151	59	15	106

### Cabernet Sauvignon

221,000 tonnes of Cabernet Sauvignon were crushed in 2012, down slightly from 231,000 tonnes in 2011. Total warm area Cabernet Sauvignon listed amounting to a measly 2.7m litres, indicating that this segment is in clear undersupply. Transaction prices for warm area, basic quality, entry level, 2012 Cabernet Sauvignon are \$1.15-\$1.30 per litre, but supply options for spot market transactions are very limited at this level and there is upward pricing pressure. Much more abundant is premium, cool area Cabernet Sauvignon with 15x the number of lots of warm area Cabernet Sauvignon listed. Interestingly, over half of these lots are from the poor quality 2011 vintage, so prices of cool area Cabernet Sauvignon have firmed to the extent that lots under \$2.50 per litre are rare for beverage quality wine. Coonawarra lots are rare below \$3.00 per litre.

Cabernet Sauvignon – Austwine Bulk Wine Inventory Summary - August 2012							
Total	Warm	Cool		2012	2011	2010+	Total
12.1	2.7	9.4	Volume (M Ltrs)	4.6	6.3	1.2	12.1
201	12	189	No of Lots	54	104	43	201
60	225	50	Ave Size (K Ltrs)	85	60	28	60

### Shiraz

380,000 tonnes of Shiraz were crushed in 2012, up significantly from 326,000 tonnes in 2011. But the 2012 crush did not reach 400,000 tonnes, which has been achieved every year since 2004, excluding drought affected 2007. This helps explain why Shiraz bulk wine is in even shorter supply than Cabernet Sauvignon. Particularly short is supply of warm area Shiraz with just 1.8m listed for sale on the Austwine list. Warm area prices for basic quality, entry level 2012 Shiraz range from \$1.10-\$1.30 per litre, but supply for spot market transactions is almost impossible at this level. Most asking prices for spot business exceed this level and buyers have yet to accept such higher asking prices. Premium, cool area Shiraz that is below \$2.50 per litre are rare. Barossa and McLaren Vale lots are scarce below \$3.00 and Western Australian reds are very scarce.

Shiraz – Austwine Bulk Wine Inventory Summary - August 2012							
Total	Warm	Cool		2012	2011	2010+	Total
11.9	1.8	10.1	Volume (M Ltrs)	5.7	4.7	1.6	11.9
214	16	198	No of Lots	73	85	56	214
56	113	51	Ave Size (K Ltrs)	78	55	28	56

### Merlot

Merlot is the smallest of the 4 main varieties at 127,000 tonnes crushed, up from 110,000 tonnes last year. Merlot is in much more relative abundance than either Shiraz or Cabernet Sauvignon, with similar volumes available for bulk sale, despite the annual crop being just a fraction of the size.

Merlot – Austwine Bulk Wine Inventory Summary - August 2012							
Total	Warm	Cool		2012	2011	2010+	Total
6.5	2.0	4.5	Volume (M Ltrs)	3.8	1.9	0.7	6.5
103	12	91	No of Lots	42	37	24	103
62	164	49	Ave Size (K Ltrs)	91	50	31	62

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### Sauvignon Blanc

Sauvignon Blanc is rapidly coming into oversupply as imports from Marlborough, NZ, continue to dominate this segment in the Australian retail marketplace. The pace of growth in imports of Marlborough Sauvignon Blanc has slowed in recent years and the growth trend may even be temporarily reversed following the short 2012 New Zealand crop of 269,000 tonnes, down 18%, or 59,000 tonnes, on 2011.<sup>ix</sup> But imports from Marlborough continue to release large volumes of Australian Sauvignon Blanc onto the bulk market. Regions such as Adelaide Hills, Yarra Valley and Western Australia were first to come into oversupply, but now warm area Sauvignon Blanc is being released onto the bulk market and is readily available. The commercialisation of Australian Sauvignon Blanc at around A\$1.00 per litre in key export markets presents a wonderful opportunity to ease the current supply pressure on this variety.

### Gordo

Gordo has been in extremely tight supply in recent years as the growth in Moscato wine styles continues. But there are clear signs that supply is catching up on the demand as current vintage lots come onto the market late in the year indicating sales forecasts have not been met. Most bulk transactions for this variety tend to be done as juice, and transactions as finished wine are not as common. This may change as more lots come onto the market as finished wine and buyers' anxiety about supply eases, reducing the need to buy juice.

### Bulk Wine Pricing and the rise of China

Prior to 18 months ago, sales of dry red varietal table wine above A\$5 per litre were fairly unusual. Sales above A\$6 per litre were very rare indeed. Today this market is relatively brisk and, invariably, the destination market is ultimately China. Such wines are some of the best that we have seen in the bulk market and although the volumes are quite modest, some prices have approached A\$10 per litre. This has led to asking prices of other cool area wines of lesser quality rising in sympathy. However, such stratospheric prices for bulk wine are only available for the very, very best wines: Take such opportunities as they present themselves, but do not to base your business model on them because common sense tells us they cannot last.

### Overall Conclusions

After about a dozen very difficult years, it *could* be that the worst of the cyclical downturn that has plagued the Australian wine industry for most of the 2000s is behind us. So I share *some* of the optimism that is currently evident in the market.

But there are many moving parts in the market place, so any recovery is not likely to be linear and neat: markets just don't seem to work that way.

If 2013 and subsequent vintages are large and demand stays are around current levels, then we are still in for some more difficult times yet.

Here are some specific conclusions arising out of the above analysis and discussion:

- At 1.660m tonnes, the market sentiment was that 2012 vintage was short and this sentiment has persisted since vintage, mainly due to low levels of beverage wine inventories held by wineries.
- Compared to recent 3 year averages, 2012 wasn't short, but almost precisely within the range of balanced Supply / Demand, estimated by the author at 1.650 to 1.700m tonnes, calculated by tracking changes in beverage wine inventories over time.
- Current bearing area is estimated by the author at 156,000 Ha and, if conditions are favourable, bearing area is still big enough to deliver very large vintages in 2013 and beyond. It all depends on vineyard cropping levels. A small vintage, less than the author's estimated Supply / Demand balance range of 1.650 to 1.700m tonnes is also a possibility, but looks less likely.
- There is very little bulk wine on the market at present: Austwine bulk wine listings are around 70m litres, and are the lowest since the very small, drought affected 2007 vintage and are just one third of recent highs, recorded in 2009.
- Warm area producers have been edging their bulk wine prices up, and have generally been allocating bulk wine to customers based on previous behaviour and the likelihood of future business. Cool area producers have been more aggressive in their increase in asking prices.
- Chardonnay and Merlot are in reasonable supply, but supply of Cabernet Sauvignon and Shiraz is very tight, especially at entry level price points.
- Sauvignon Blanc is in good supply and the tight supply of Gordo experienced in recent years appears to be easing.
- Some very high priced premium red wines have been transacted in recent times, driven by demand from China.

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### About the author:

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**References:**

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- <sup>i</sup> Winemakers Federation of Australia.
- <sup>ii</sup> Winemakers Federation of Australia and ABS Catalogue No 1329.0
- <sup>iii</sup> ABS Catalogue No 1329.0, published each February.
- <sup>iv</sup> *ibid.*
- <sup>v</sup> Courtesy, Australian Government, Bureau of Meteorology [www.bom.gov.au](http://www.bom.gov.au)
- <sup>vi</sup> The Southern Oscillation Index (SOI) is calculated from the monthly or seasonal fluctuations in the air pressure difference between Tahiti and Darwin.
- <sup>vii</sup> Sustained negative values, which often indicate El Niño episodes mean increased probability of drier conditions and positive values are associated with La Niña episodes. In Australia (particularly eastern Australia), El Niño events are associated with an increased probability of drier conditions and La Niña increased probability of wetter conditions.
- <sup>viii</sup> Warm Regions = Inland Irrigated Regions of SA Riverland, NSW & Vic Murray Darling, Swan Hill and MLA. Cool Regions = All other regions.
- <sup>ix</sup> New Zealand Winegrowers, New Zealand Vintage Report 2012, 15 June 2012.