Field Experiences – Southern Victoria

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Introduction
Southern Victoria is generally regarded as a cool climate grapegrowing region. While this may be generally the case by definition, the area is far from homogeneous. Some areas in Southern Victoria can be defined as ‘warm’, others as ‘cold’. The rainfall can range from 650 to 1,500mm, the sunshine hours can be 5 hours per day in January to 9 hours, there are ‘continental’ and ‘maritime’ climates, and the elevation of vineyard sites ranges from 3m to 550m.

As well as widely differing climates within Southern Victoria the soils range from deep red volcanic soils to the shallow, duplex clay loams, to deep sand. Such variability as this means that the sites will vary greatly in their fertility, and thus, the likely vigour of the vines.

As a consultant in this climatically diverse area I have observed the performance of most of the major canopy management systems, and have come to the conclusion that no one vineyard system (including plant and row spacing, trellis system, pruning method and canopy management systems) is appropriate under all conditions. This is particularly so when the diverse objectives of the grapegrowers are taken into consideration as well as the terroir of the site.

This paper contains observations of the performance and characteristics of the main canopy management systems in use in Southern Victoria.

Vertical Shoot Positioning
Vertical shoot positioning (VSP) is the most common of the management systems in use in Southern Victoria. This is also the case in many other grapegrowing areas of the world. In recent years the deficiencies of VSP vineyards have been highlighted, resulting in some very bad press about this system.

VSP was developed as a system in the premium grapegrowing areas of France, where the vines are planted at high density, on low trellises, generally on low fertility soils. The yield expectations were low, and hand canopy management operations were expected.

When vines are established on VSP on high fertility sites, with the vineyard planted to wide rows, the problems of the system become apparent, particularly in the wetter, less sunny areas. The problems include: excessively high vigour; shading of fruit, leaves and buds; low and decreasing fruitfulness (particularly on spur pruned vines); low crops; high titratable acidity; high disease incidence, and so on.

Specific observations regarding the use and performance of VSP follow.

Prone to low fruitfulness on spurs
The major problem with VSP vineyards with relatively wide rows is that, in order to achieve good yields, the number of spurs or buds per metre has to be high. This often results in low shoot fruitfulness from spurs and declining yields, as well as the other detrimental effects of shoot crowding. In some of the cloudier, cooler areas of Southern Victoria, bud fruitfulness has declined to very low levels following a succession of cooler-than-average seasons.

Needs narrow rows for high crop levels
In order that the detrimental effects of shoot crowding do not occur, VSP rows have to be narrow to achieve high yields at low shoot densities. This may not be feasible in high vigour situations where the close rows do not decrease vigour.

High capital cost of establishment
As row widths decrease, the cost of the trellis system increases. VSP on narrow rows has a high capital cost of establishment for a given number of shoots per linear metre of cordon.

Can be highly mechanised
VSP systems may be (almost) totally mechanised using readily available machinery, for pre-pruning, wire lifting, trimming and harvesting.

Best suited to low fertility conditions
Where the soil is shallow and poor, and the rainfall not excessive, VSP may still be the best choice of system. The fertility of the soil will determine how close the rows may be planted. Relatively high crop levels of very high quality grapes are being efficiently produced on narrow row VSP systems on many low fertility/vigour sites in Southern Victoria.

Allows the growth of long shoots
Vines established on VSP systems usually provide vertical support for shoots of 1 to 1.5 metre in length. This is not often practical on other systems such as the Scott Henry system. It is suspected that superior fruit is produced on longer rather than shorter shoots. This seems to be of particular importance with Pinot Noir vines where a high leaf area to fruit ratio per shoot is required for the highest quality fruit production.

Scott Henry
The Scott Henry system has been adopted reasonably widely in Southern Victoria, particularly as a conversion from wide spaced unmanaged or VSP systems. The conversions have often been highly successful in achieving higher crops, greater fruit exposure and generally less dense canopies where the rows are wide.

Suitable to moderate fertility conditions
Due to the greater leaf area per row and lower shoot density relative to VSP, the rate of moisture loss from the canopy of Scott Henry vines should be higher than those on VSP. Thus, vines established on a Scott Henry system may be successfully used on higher vigour sites than VSP. However, on very high vigour sites the downward-pointing shoots quickly hit the ground and start growing back upwards through the canopy. The ventilation of the vineyard is adversely affected by the solid canopy wall, with resultant increases in disease.

Crops increased from 0–25% over VSP
Depending on the vineyard, crop levels may be increased by the use of the Scott Henry system instead of VSP. The greatest yield response to Scott Henry over VSP is likely in situations where rows are wide, in cooler, wetter areas, and where vines are spur pruned. Little or no yield response is likely in narrow row vineyards in warmer, sunnier areas where vines are either cane pruned or highly fruitful varieties are grown.
Can be partially mechanised
This system can be mechanised to a point. It is not possible to mechanise the folding down of the lower tier, and customised equipment is required for pre-pruning of the lower tier.

Requires high level of management skills
To achieve the best results from the system a high level of management is required, particularly concerning the timing and execution of pruning down the lower tier, management of downward pointing shoots and in weed control.

Relatively low capital cost
Relative to VSP the capital cost of the Scott Henry trellis is often lower, since wider rows are usually used in Scott Henry vineyards. The wider rows are necessary to avoid shading the lower tier of vines by adjacent rows.

Fruit and shoots may be less ripe on the bottom tier
It has been an observation that the fruit on the lower tier is often less ripe than the top. This also applies to the ripening of shoots, where shoots from the lower tier frequently do not ripen properly and die back. This situation is common where rows are too narrow, or the vines are overcrowded. The yield expectations following conversion from VSP have often exceeded the capacity of the canopy to ripen. As a rule it has become usual practice to leave less buds on the lower cordon than the top to avoid under-ripe fruit from the lower canopy.

Lyre or U-trellis
This system is not widely used, but is most suited to situations where the highest possible fruit quality is required from a very fertile site. The high transpiration leaf area per hectare relative to the soil volume occupied by the root system allows for maximum retardation of growth. A high proportion of the lyre trellis in use in Southern Victoria are conversions from untrained or VSP canopies established on wide rows.

High capital and operating costs
A major drawback of the system as it is usually established is the high capital and operating cost. Suitably strong trellis structures are expensive and many wires per row are required to support the canopy. In operation, poor access to the centre of the canopy slows hand operations such as wire lifting and leaf plucking, the many wires per row are time consuming to lift, and the possibilities of mechanisation are limited.

High yields possible, 25-50% > VSP
Conversions from untrained or VSP canopies have produced significant yield increases, due to the higher number of buds that may be retained and/or increased bud fruitfulness, due to better light incidence on buds.

High quality grapes
Exceptionally high quality grapes have been a feature of this system.

Need abundant water on low fertility sites
Care needs to be taken in the use of the lyre system on low fertility sites, where both the moisture holding capacity and nutrient supply is low. The high transpiration rates of the canopy will deplete soil moisture reserves rapidly, so it is important that adequate irrigation water is available to maintain canopy function. Attention to the nutritional requirements of the vines is also essential.

Cannot be machine harvested
A flexible lyre trellis can be machine harvested by vertical impactor machines (either one- or two-sided) or those with the wide ‘combo’ head. Unfortunately neither of these types of machines is available in Southern Victoria nor are they ever likely to be, due to their specialist nature and high cost, so the prospect of the mechanisation of harvesting is low.

Geneva Double Curtain (GDC)
The GDC system was a very early development of an alternative to traditional systems of canopy management. It was developed specifically for cool, cloudy, fertile grapegrowing areas in New York State where the vines required maximum sun exposure to achieve adequate fruitfulness of buds and ripeness in fruit. These site characteristics are not dissimilar to those in some areas in Southern Victoria in some years. The system is used to a very limited extent at present, but interest is increasing as the possibility of machine harvesting the system becomes more apparent. It is very suitable as a conversion from VSP or unmanaged canopies on wide rows.

Suitable for high fertility sites
Similar to the lyre trellis, the high canopy surface area per hectare results in rapid, early loss of soil moisture and consequent early reductions in shoot vigour. The downward pointing of shoots also has some degrading effect. The GDC system is therefore highly suited to getting the best performance from high fertility sites. On low fertility sites abundant irrigation water and applied nutrients will be required to sustain high photosynthetic rates and crop production.

Relatively high capital costs of installation or conversion
To build a trellis sufficiently strong for large crops suspended on a wide ‘T’ and suitable for machine harvesting results in a relatively costly structure, involving very strong end assemblies and large cross pieces and intermediate posts.

High yields possible, 25-50% > VSP
High yields have been achieved from this system, due to the large photosynthetic area per hectare and the high bud fruitfulness on spurs resulting from maximum sun exposure.

Low operating costs
The GDC system has been developed to a point where it can be almost totally mechanised. However, in southern Victoria the very low operating costs possible have not yet been able to be realised as the shoots require considerable time for hand rotation, and the grapes must be hand harvested in the absence of specialist machine harvesters.

Very high quality grapes
High quality grapes have been achieved at high crop levels due to the large canopy surface area and high degree of fruit exposure to the sun.

Often difficulty rotating the canopy
Although the system involves pruning to downward-pointing spurs, there is often difficulty in rotating shoots down without considerable breakage. Some varieties and clones are very upright in their growth habit and strongly resist the efforts to make them go down.

Sunburn of fruit, shoots and leaves can occur
At the time of rotating the canopy down in southern Victoria, the fruit, shoots and leaves are highly susceptible to
sunburn. This is particularly so on varieties or clones that have largely not turned downwards themselves by this time. Where possible, the operation is delayed until a period of cooler weather occurs.

**Bird damage can be severe**

The presence of the fruit on the top of the canopy rather than hidden underneath is beneficial for fruit ripening purposes. However, it does present birds with a very tempting display and a convenient perch on which to feed. Where the crop is to be netted, the net needs to be supported above the fruiting wire to prevent sag onto the fruit.

**Cannot be easily machine harvested**

As discussed for the lyre trellis, machine harvesters capable of picking wide trellises are not available in southern Victoria at present. CDC systems involving flexible T’s have been developed for use with commonly available tractor-tow harvesters, although the long-term success of such structures is open to question.

**Hanging Cane/Sylvvoz**

The hanging cane system is a relatively recent canopy management system, also known as a ‘modified’ Sylvvoz system. Unlike the traditional Sylvvoz system where canes arising from a cordon are attached to a wire below, the canes on a hanging cane system are allowed to fall under the influence of gravity. This system is used in a number of vineyards, but has proved to be somewhat controversial since it goes against the general trend in the cooler viticultural areas towards systems requiring greater management.

**Suitable for moderate fertility sites**

Vines trained to hanging canes require sites of moderate fertility. High fertility sites produce excessively dense and shaded canopies. The system does not allow for simple exposure of fruit by leaf plucking. Hanging canes on low fertility sites can result in low leaf area to fruit ratios if abundant water and nutrients are not provided.

**Moderate to high yields, about 25% > VSP**

Hanging cane vineyards have usually cropped considerably higher than VSP and some other systems, particularly following cool seasons, when compared with spur pruned vines. It is possible to achieve high crops by retaining large numbers of buds per vine, bud numbers that it may not be physically possible to retain on other systems. Thus, it is easy to retain excessive buds and overcrowd the vines, particularly in their early years. This has somewhat tarnished the reputation of this system in some circles.

**Low costs of installation**

The costs of installation of the hanging cane system are relatively low. Vine rows are wide (a minimum of 2.75 m) and there are usually only 2 to 3 wires per row. Partially offsetting these cost savings is the necessity to ensure that the end assemblies are strong, to withstand the considerable tension on the single high fruiting wire. Intermediate posts also have to be strong, with 75–100 mm cambio or 100–125 mm peeled pine posts being a minimum specification.

**Relatively low cost of management**

The costs of production are low, since there are generally no catchwires to manipulate the canopy. Despite being a cane pruning system the pruning costs are roughly equivalent to spur pruning. It has proved beneficial to trim the sides of vines once or twice to expose fruit and to ensure easy row access. Shoots trailing on the ground are also usually trimmed, either by hand or machine.

**Can be slow to bring into bearing**

Due to the height of the fruiting wire (1.4–1.5 m) and the wide rows, the early crops are lower than for higher density systems established on low (0.8–1.2 m) fruit wires.

**Cane selection critical, otherwise poor budburst**

Similar to all cane pruning systems, good cane selection is important for best results. It is more important on the hanging cane system since the canes are not uniformly arranged and twisted onto wires as in conventional systems. It has been observed that poorer budburst occurs on canes that point downwards, and the best budburst occurs on the most upward pointing canes.

**Cane and shoot breakage in windy sites**

Since canes and shoots are essentially unsupported, extensive breakage may occur in windy sites or as a result of windy conditions, particularly in spring. A stabilisation wire about 0.25 m above the fruit wire is recommended, mainly to prevent breakage of the cordon in the early years. Some varieties and clones are more susceptible to breakage than others, such as the upright-growing Pinot Noir clone DSV12. In very windy sites the hanging cane system may not be suitable, or, the varieties susceptible to breakage may need to have canes and shoots supported by wires.

**Easy conversion to MPCT**

The hanging cane system could be regarded as a transition stage to the minimal pruning (MPCT) system. The row spacings and height of the hanging cane vines are suitable for minimal pruning.

**Minimal Pruning (MPCT)**

Minimal pruning is used extensively in some Australian viticultural regions, but is not widely used in Southern Victoria. Trials at Dromana Estate showed that the system does work in the cooler, higher rainfall areas of Australia, as have subsequent commercial evaluations.

**Low costs of installation**

A similar low cost system is used for minimal pruned vines as for hanging canes.

**Suitable for high fertility sites**

Minimal pruning has been found to be suitable for sites of high fertility. As a result of the attainment of the full canopy early in the season, the large number of growing tips and the high water use of the canopy, shoot growth is usually stops in even the highest fertility sites very early in the summer. The sites where the system has not proved capable of containing vigour are those in very humid areas.

**Very low cost of production**

Very low costs of production are possible with this system. Since all operations can be easily mechanised using standard equipment, large areas of vineyard can be managed per unit of labour.

**Requires abundant water**

Due to the early development of a full canopy and a large surface area of exposed leaves the canopy water use per season is very high. It has been found that the crop factors of well
watered minimally pruned vines may be about 0.45–0.55 in mid-summer.

**Needs a very high degree of management skill**

Minimal pruning is often regarded as minimal management. In fact, minimal pruning requires a very high degree of management skill and viticultural knowledge to get the best performance from the vineyard. The greatest causes of failure of minimal pruning are allowing the vines to overcrop, particularly in the early years or following conversion from another system, and poor irrigation and nutritional management.

High yields, about 25–50% > VSP

For a given row width minimally pruned vines will usually crop considerably higher than vines on VSP. The highly efficient, early developed canopy, the absence of competitive vegetative growth and the large amount of permanent wood in the vine structure allows high crops to be achieved without any necessary compromise of ripeness or quality.

**Potentially high quality grapes**

Minimal pruned vines can produce high quality grapes, particularly from red grapes which benefit from the reduced berry size that is a usual characteristic of grapes from minimal pruning. High quality is achieved form the lack of vegetative competition during the ripening period, the usual high degree of fruit exposure, the large amount of permanent wood of the vine structure, and small berry size.

**Must be machine harvested**

Due to the production of the crop as numerous, small bunches distributed evenly over a large canopy surface area, hand picking is not a practical consideration on any scale. As a consequence, minimal pruning has not been able to be considered where machine harvesters are not available or where fruit is required to be hand picked, such as for sparkling wine base material.

**Conclusion**

As a consultant with no vested interest in any particular canopy management system, I have evaluated most systems under a wide range of site conditions. I have concluded that for the conditions particular to the vineyard site, any of the systems may be superior in achieving the objectives of the grapegrower. These objectives may range from growing the highest crops at the lowest cost, to producing trophy-winning wines to be sold at $30 per bottle. The selection of the most appropriate system will depend on accurately defining the objectives of the grapegrowing enterprise and having a good understanding of the vineyard environment.

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**RYAN – continued from page 44**

1st growing season

Fertilisation was applied in November, December and January with 10 grams of urea and 3 grams of potassium nitrate per vine per fortnight. Weed control under-vine is very important. Surlan was applied after planting followed up by four hand spot sprays using Sprayseed with shielded jets. It is important to get the vines up to the wire and fill it.

I commonly hear that it takes up to 7 years for vines to come into full bearing. I argue that a good commercial crop can be harvested from the third growing season, that is, 2.5 years after planting. Some people say that you should not push along young vines. My experience does not support this. (By the way, I asked Dr Max Lake, prior to my first vintage, what his thoughts were about wine made from young vines. He looked at me, summing up my age, and declared: ‘Your first vintage will be the best you will make in your lifetime’.)

2nd growing season

Fertilisation of 10 grams per vine per fortnight October to December (6 applications). Leaf petiole tests showed potassium deficiency. Applied 5 bags per hectare banded potash. Cover crop of faba beans and triticale planted in autumn. 3% Dormex applied 30 days before normal budburst.

3rd growing season

Leaf petiole tests showed adequate nutrition. No nitrogen applied. Cover crop of barley planted in autumn.

4th growing season

Fertilisation 30 kg N/ha as calcium nitrate from September to November. Cover crop of triticale planted in autumn.

5th growing season

Fertilisation 30 kg N/ha as calcium nitrate from September to November. Too dry for autumn cover crop. 10 bags per hectare of superphosphate banded along vine rows in autumn.

6th growing season

Autumn cover crop of mustard planted. (Excellent result, appears to be drought resistant).

Observations

1994 pruning level and spur numbers similar on high and low vines. Pruning weights 25% higher on low vine (low vine not summer trimmed). After five years of Scott Henry no evidence of over devigoration of low vines.