

WINES & VINES

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Managing Vines Organically

Growers focus on integrated canopy management techniques

by Glenn T. McGourty



Dave Koball, vineyard director at Bonterra, looks for leafhoppers in Mendocino County, Calif. Overly vigorous growth encourages leafhopper populations, as well as mildew and Botrytis bunch rot. Large shady canopies also can result in reduced fruitfulness the following year.

Most organic winegrowers are focused closely on producing high-quality fruit that will make wines balanced, deeply flavored and expressive of the winegrape variety and place in which the fruit is grown. Organic winegrowers in California use many of the same viticultural practices as conventional growers. Canopy management practices are critical to vine balance, disease and pest control. Organic winegrowers need to carefully evaluate how pruning, irrigation, fertility, cultivar and rootstock, trellis system and canopy manipulations affect production, vine vigor, wine quality and profitability.

Part IV in a series on organic winegrowing

In this series of articles, we will present information for growers and wineries interested in farming their vineyards organically, based on the author's knowledge and experience during the past 20 years of working with organic winegrowers in Lake and Mendocino counties. Glenn T. McGourty is a winegrowing and plant science adviser with the University of California Cooperative Extension in Mendocino County, Calif. The four

Understanding your site

Vineyard design and variety selection are site specific. If you are going to achieve good economic returns, grow quality fruit and ultimately make good wine, it is important that you carefully match the site's capacity with

your choice of rootstock, trellis and variety. Organic winegrowers always start by focusing on the soil, since it controls so many functions of crop growth and quality. If you are planning a new vineyard or seeking to better understand the growth of an existing vineyard, soil physical data can give you great insight as to how the vines are likely to grow:

Vineyard sites with deep soils, high water-holding capacities and moderate fertility are best for white winegrape varieties. These locations are capable of producing moderate to large crops of high-quality fruit. Red cultivars tend to be less successful when planted in these sites, but with devigorating rootstocks, competitive cover crops and careful irrigation, it is possible to grow high-quality fruit.

Controlling excessive vigor is very important to prevent the organic vineyard from having these problems:

- Lush, succulent growth encourages large leafhopper populations that are not easily controlled with organic pesticides.
- Dense canopies with large leaves, secondary shoots and shading create a poorly ventilated environment and are conditions that favor powdery mildew and Botrytis bunch rot.
- Vigorous shoot expansion during bloom and accumulation of nitrates can cause poor fruit set when flowers shatter during pollination.
- Heavy shade of next year's fruit wood reduces fruitfulness the following year.

Sites such as hillside vineyards with less water-holding capacity, shallower soils and less fertility are better choices for red cultivars. It is important to note that with irrigated conditions and fertigation (soluble fertilizers), low potential vigor sites can be greatly invigorated when farmed conventionally. Organic growers do not have the same options for inexpensive water-soluble fertilizers.

Additionally, most organic growers want their vineyards to reflect the natural *terroir* of their site, and have found that wine quality is improved by building the soil organic matter. Consequently, they try to match the vigor potential of their site and don't invigorate their vines simply with fertigation. While some organic fertilizers can be injected into drip systems, they are expensive. Most organic winegrowers try to lower their expectations for high yields (more than 5 tons per acre) and provide nitrogen with leguminous cover crops and modest applications of compost (1 or 2 tons per acre per year, applied in the fall).

parts of the series are:

- [Going through transition and building your soil](#)
- [Pest management](#)
- [Disease management](#)
- [Viticultural practices](#)

HIGHLIGHTS

- Large, heavy canopies that aren't maintained can serve as a breeding ground for vineyard pests and diseases.
- The choice of trellis system can directly impact vine vigor and the possibility of sunburn.
- Timing of canopy management is directly related to the quality of fruit. Most techniques will take place during the two-month period between bud break and just after fruit set.

"Our approach to trellising depends on what we expect to yield," says Dave Koball of [Fetzer](#) and Bonterra Vineyards in Hopland, Calif. "For whites, we really like big vines. Divided canopy systems have tremendous yield potentials. Labor is a big factor, though, and as the cost of farming these systems continues to rise, we are looking for simpler ways of doing things that don't require so much handwork. So now, when we replant or install a new vineyard, we are choosing trellis systems thinking about cost of farming as well as what is the best system for the variety. Ease of mechanization is very important for harvesting, leaf pulling and pre-pruning. We even like the old California three-wire sprawl for Chardonnay on fertile sites. Since we developed a strong powdery mildew control strategy, we find that we can grow very high-quality fruit and still get good yields with this system (up to 7 tons per acre)."

On lower vigor sites, Koball plants red varieties with a VSP trellis system. "Since the reds are cropped at a more modest level, VSP systems work well for them. We usually manage the vines with a floppy look on the afternoon side of the vine to minimize sunburn. We like the fact that we can easily mechanize harvest, leaf pulling and pre-pruning. It really reduces our farming costs but doesn't reduce fruit quality."

Effect of Soil on Vigor

Saturation	Soil Texture	CEC (meq/100g of soil)	Available Water (in./ft.)	Potential grapevine vigor*
Below 20%	Sandy or sandy loam	2-7	<0.6	Very low
20-35%	Sandy loam	7-15	0.6-1.0	Low-moderate
35-50%	Loam or silt loam	15-30	1.1-1.4	Moderate to high
50-65%	Clay loam	30-40	1.5-2.0	High to very high
>65%	Clay or peat	>40	>2.0	Very high to extremely high

Relationship of saturation percentage to soil texture, cation exchange capacity (CEC) and available water (field capacity-permanent wilting point). *Based on four feet of rooting depth with no chemical or physical rooting limitations.

Daniel Roberts and Bill Peacock provided data used in this chart.

Assessing vigor

Growers can assess vigor in their vineyards in several ways. Visual inspection during the growing season can reveal much information. Look for these features of a well-balanced vine:

- Ideal shoot length is normally about 36 inches long, with 16 to 18 leaves per shoot.
- By veraison, shoots are beginning to lignify (become woody).
- Few late ral shoots (secondary shoots).
- Leaves are a healthy green color.
- The canopy should appear open and well ventilated.
- The vine utilizes all of its allotted space in the trellis system.
- Shade beneath the canopy should be dappled with sunlight, and not solid shade.
- Two clusters of fruit are present on all shoots (may be less if clusters are large, such as

Marsanne and some clones of Sangiovese).

- Basal leaves (the lowest leaves on the canes) should be green and functional, not yellow or dry.
- Ripening fruit has uniform color from cluster to cluster and vine to vine.
- Vine balance can also be evaluated by fruit:shoot ratios. This process is quite easy:
- Select and flag 10 representative vines in each block at harvest.
- Count the clusters, harvest them and weigh the fruit.
- Return and prune when the vines are dormant. Count the shoots and weigh the prunings.
- Calculate the ratio of fruit to shoot weight. (*See fruit:shoot relationship table on page 105.*)

Since shoot weights are taken at pruning time, you should make adjustments to bud counts at that time. Vigorous vines probably need more buds; if possible, on spur cordon-pruned vines, add an extra bud per spur, short kicker canes or other strategies to create more fruit bearing. For cane-pruned vineyards, add additional canes if possible. (This may require modifications to the trellis system, such as adding extra wires to support more canes.) Finally, evaluate the amount of water, fertilizer or compost and the types of cover crops that are used to be sure that vegetative growth is not being overly stimulated. Sod-forming grasses that are competitive may help reduce vegetative growth and bring the vines into balance.

Vines that are not vigorous enough may need fewer buds, more water and a soil-management program that increases nutrients for plant growth. During the growing season, a clean tilled vineyard floor may be appropriate to reduce competition from cover crops and weeds.

Canopy management practices

Organic growers are very dependent on canopy management practices for light penetration, aeration to prevent mildew, reduce the number of leafhopper nymphs, improve spray penetration and vine balance. Understand that many of these procedures are labor intensive and expensive. If the crop value in your vineyard is not very high, you may have limited options for these procedures. The following manipulations are usually done:

- Suckering of the trunk and removal of sterile shoots on the cordons, or in the interior of head pruned vines.
- Leaf removal right after fruit set, removing the two basal leaves from around the flower clusters on the cooler or most shady part of the vine. (There are mechanical leaf removers available, and some custom operators can be hired to provide this service.)
- Positioning shoots with movable foliage wires, if present in the trellis system.
- Light hedging of the vines to improve air movement and allow equipment to move through the vineyard without becoming entangled in shoots.

Shoots should be at least 3 feet long after hedging, or fruit ripening may be delayed. Hedging should be put off as long as possible to prevent excessive lateral shoot growth. If multiple hedging passes are needed, excessive vigor is a problem and a plan should be implemented to address this that might include less watering, competitive cover crops, more fruit load (but not overcropping), or a change in the trellis system to reduce vigor.

Fruit:Shoot Relationships

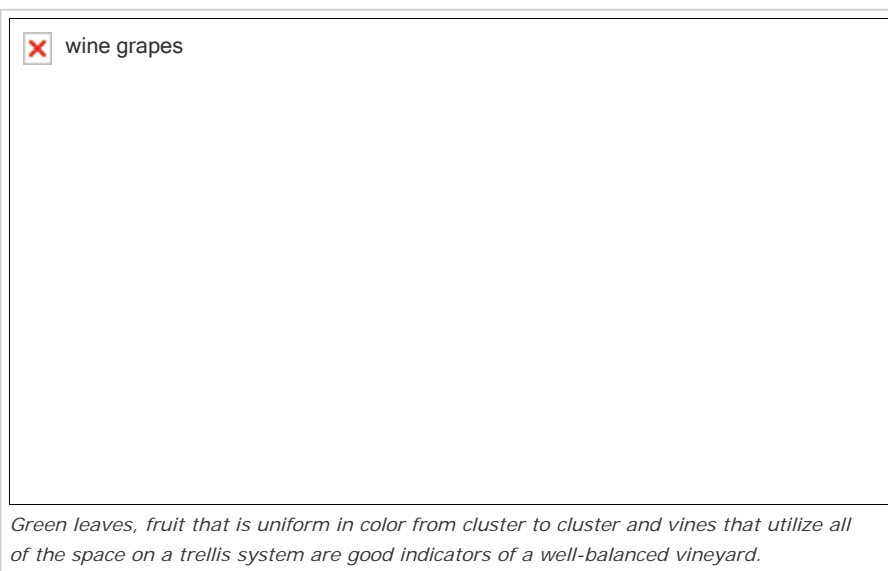
Mean	Ratio of
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cane weight	fruit: pruning	Vigor
>60 grams	<3:1	Vines overly vigorous. Too much wood, not enough fruit. Wine often has "veggie" flavors. Shading of fruit zone may cause poor flower initiation and fruit set.
20-40 grams	4:1-6:1	Vines are balanced, especially at 5:1. Wines have good balance of alcohol, acidity, tannins and color.
<10 grams	>7:1	Vines are cropped, not vigorous. More canopy is needed to properly ripen fruit. Wines tend to be light in color, low tannins, high pH, low in acidity.

From R.Smart, Sunlight Into Wine, 1991

Fruit thinning might be needed if vines are not growing adequately. A general rule of thumb is that shoots should be at least 2 feet long for a single cluster and at least 3 feet long for two clusters. Shoots less than 2 feet long should have the fruit removed (especially young vines.)

A key point in all of these operations is *timing*. Vine vegetative expansion is very rapid in the spring, and most of these activities need to be done in about a two-month period from bud break to just after fruit set.



Leaf pulling needs to be done shortly after fruit set for best results. When leaves are pulled too late, fruit is likely to sunburn. If trunks are not suckered early, the shoots become woody and cannot be removed by hand. It is easy to remove sterile shoots when they are small early in the season, but later on it becomes difficult and slow. Finally, if you wait too long to position flopping shoots vertically, lateral shoots will form and require extra labor to remove them.

"Timing is everything on many of these canopy management practices, especially for vines with divided canopies," Dave Koball explains. "If you get behind on canopy management, you can affect the vine growth for one or two years. You can also set up conditions for disastrous fungal infections. You really need to pay attention to what is happening in the vineyard and keep up with the workload. This can be a real challenge some years if there is lots of rain and vine

vigor."

Irrigation

Some organically farmed vineyards are farmed without irrigation, especially those planted on deep soils with high water-holding capacities. Usually the vineyards are tilled to remove all competing vegetation. It is important to take steps to ensure that no erosion is going to happen in these sites when fall rains begin. Cover crops and straw mulching in areas prone to erosion are essential to protect the soil.

Drip irrigation systems can place the water precisely beneath the vines and avoid wetting the fruit during the growing season. Irrigation water can be applied right up until harvest. Regulated Deficit Irrigation (RDI) is a strategy used by many organic growers in which irrigation is minimized compared to fully watered vines. RDI is not used until a young vineyard has fully expanded and filled the trellis system, which usually takes four or five growing seasons.

To begin the RDI program, the vineyard soil profile should be fully charged with water at bud break. In the North Coast during most years, rainfall (and frost protection from overhead sprinklers) is adequate to do this in many vineyards. In drier climates, preseason irrigation may be necessary. Normally, water then is withheld while the vine canopy is actively elongating and setting fruit to reduce vegetative growth and crop load.

Often when RDI is used, grape clusters are lighter and looser, which can improve wine quality and reduce the potential for bunch rot. Canopies tend to be more open, and red fruit often colors well under these conditions. Leafhoppers are also less of a problem in vineyards without vigorous canopies. It is important not to stress the vines excessively, as mites tend to favor vines that are water stressed.

Fruit quality also will suffer if vines start to lose leaves. Photosynthesis may stop on stressed vines, and ripening occurs by dehydration, resulting in fruit with high sugars, high acidity, green tannins and dry fruit tastes.

In an RDI approach, a *deficit threshold* (a predetermined level of midday water deficit) is measured by using a pressure chamber (pressure bomb) to measure vine leaf water status. Usually a fully expanded leaf growing in the sunshine is detached from the vine, the end of the petiole is cut, the leaf placed in a plastic bag and then into the pressure bomb. The chamber is pressurized until sap is exuded from the end of the petiole. The amount of pressure needed to move sap from the leaf corresponds to how tightly moisture is being held by the leaf. This is measured in bars or atmospheres. Most grapevines begin to show stress at -12 bars; others may not show stress until -15 bars.

Generally, growers with white cultivars and those from northern climates (such as Pinot Noir, Merlot) use -12 bars as the threshold to begin irrigation. Red cultivars from warmer climates (such as Zinfandel, Syrah, Mourvèdre and Sangiovese) can use an irrigation threshold of -15 bars. Visual inspection should confirm that shoot tip growth is slowing, with shoots showing small internodes and small tendrils.

Once irrigation begins, many growers apply water based on the percentage of the ground that is shaded by the vineyard canopy multiplied by the evapo-transpiration rates for a given period of

time. For instance, if evapotranspiration for the week is 15 gallons of water per vine, but the vineyard canopy only covers 60% of the vineyard floor, 15 gallons X .6 = 9 gallons per vine are applied.

This topic is well covered in Winegrape Irrigation Scheduling Using Deficit Irrigation Techniques by UC irrigation specialist Terry Prichard and should be consulted for more details (ucce.ucdavis.edu/files/filelibrary/2019/13563.pdf.) Many organic winegrowers use this process to conserve water, improve fruit quality and minimize conditions for fungal growth. This also helps with vine balance, especially if irrigation practices in the past have lead to overly vigorous vines.

Finally, continue to irrigate right up until harvest. It is important to keep the canopy in good condition so that leaves photosynthesize and sugar accumulates in the fruit. If sugar maturity is occurring too rapidly, extra irrigations can slow down ripening and allow more time for tannins to mature and fruit flavors to develop.

"We irrigate every block based on what we see happening in the vineyard," Koball says. "Spring rains determine when we begin to irrigate. If the vineyard is dry, we will water early to get the shoots up to the top of the trellis. On the other hand, if the soil is fairly wet from rain or frost protection, we may not start until a couple of weeks before veraison. We use neutron probe data to help our scheduling. Everything is so site dependent. At the Bonterra McNab Ranch, we have Merlot on 5C rootstock in three different blocks within 100 yards of each other that have completely different watering requirements due to the soil. The vines in one block get 25 gallons of water per vine per year; in the next block, it is 50 gallons, and in the final it is 75 gallons per vine. You really have to pay attention to shoot growth, fruit set and berry size to get the irrigation program right."

Farming costs and income

Cost studies done during the past 10 years by University of California Extension agricultural economist Karen Klonskey and her staff have shown that the costs to farm vineyards organically in California's North Coast region are similar to conventional farming. Organic growers spend more money on specialized equipment and manual labor for weed control, but less money on crop protectants compared to conventional growers. Many practices such as canopy management, irrigation management and vineyard floor management are quite similar for both conventional and organic winegrowing operations. (For more information, visit the UC Davis Department of Agricultural and Resource Economics website: coststudies.ucdavis.edu/current.php, where you can download production cost studies.

Income tends to be quite similar between organic and conventional growers, and it really isn't a market where an organic premium can be expected for certified organic production. Rather, growers are paid based on bottle price and tonnage.

Conclusions

Organic winegrowers use many of the same viticultural practices as conventional growers, with a focus on integrated canopy management techniques to produce high-quality fruit. These include understanding the potential vigor of the vineyard based on soil fertility and water-holding capacity, proper irrigation and fertilization, pruning for balanced growth and timely canopy management manipulations.

Many of these practices also reduce pest and disease pressure and are very important in minimizing problems that require corrective measures, such as spraying. Every vineyard site is different and requires constant evaluation by the winegrower to ensure that high quality fruit is being produced.

Innovators in organic winegrowing

The content of this series is the result of documenting the experiences and practices of more than 60 Mendocino and Lake County growers who farm nearly half of California's 9,000 acres of organically certified vineyards. Two families played a large role in the development of organic winegrowing, the Fetzers and the Freys, who grew up as neighbors and friends in Redwood Valley in Mendocino County.



Bob Blue.

Today, [Frey Vineyards](#) is the largest producer of organic wines (made without added sulfites) in the United States. The Fetzer family sold Fetzer Winery to Brown Forman Corp. (better known for its Jack Daniel's brand of whiskey) in 1992. Under the creative leadership of Paul Dolan and winemaker Bob Blue, the winery continued its development of organic winegrowing and winemaking under the Bonterra label, now the largest U.S. brand of wine made from organically grown grapes (sulfites are used in these wines).

Paul Dolan has moved on as a partner with Tim and Tom Thornhill in [Mendocino Wine Co.](#) (owners of the Parducci brand), which is gradually transitioning all of its production to organic certification.

Two key innovators in the organic winegrowing business are Jim Fetzer and Ron Bartolucci. Both worked closely together during the 1990s to create the farming system used today by Fetzer Vineyards, the largest organic winegrowing operation in California, with more than 1,700 acres of vineyards.

Since the sale of the family's winery, Jim Fetzer has developed the beautiful [Ceago Winegarden](#) on the shore of Clear Lake in Lake County (the only winery in the U.S. where you may arrive at the winery's private dock by boat or seaplane), an attractive winery estate with Mediterranean buildings, 100 acres of vineyard, olive trees and lavender fields. Ron Bartolucci has more than 250 acres of vines planted both on the fertile black soils of Big Valley and the upland areas of Red Hills, famed for their volcanic red soils.



Paul Dolan.

Other organic pioneers include Charlie Barra, who grew up farming organically with his family in the 1930s and was well versed in the traditional ways of farming. Charlie and his wife Martha make wine under the [Barra of Mendocino](#) label and are very active in promotion of Mendocino County as a leader in organic winegrowing.

Guinness McFadden started farming organically in the



Andy Beckstoffer
PHOTO: Lightworks
Photography.

1970s in Potter Valley. His interests in organic farming are varied, as he produces herbs, wild rice, wine, beef and garlic wreaths, which he sells at his tasting room in Hopland as well as on the Internet.

Andy Beckstoffer of Beckstoffer Vineyards, based in Napa, also has a strong presence in both counties and has produced organic winegrapes in Mendocino County for more than 10 years. He is transitioning his Lake County vineyards to organic in the Red Hills area. U.S. Congressman Mike Thompson and his wife Jan grow Sauvignon Blanc in Big Valley in Lake County, which is blended into the Bonterra

Sauvignon Blanc wines.

This is a region of family farming, and numerous young people have joined their family farming businesses, representing as many as five generations farming the same properties. The interest in organic fruit from this region continues to grow, with organic wine programs being started by larger companies such as Constellation and the Hess Collection. Both counties are a delight to visit, offering numerous small family wineries at which to taste, friendly people to interact with, stunning scenery, good restaurants and comfortable accommodations. (For more information, visit gomendo.com and lakecountyag.com.)

G.T.M.

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