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Yield vs. Quality

a new perspective

By Carole Taines

There is a prevailing notion in the wine industry — one held worldwide — that grape yield and wine quality are inversely related, *i.e.,* when grape yield is increased above a certain 'optimum', quality begins to decline.

In France, legislation stipulates the exact tonnage of grapes and litres of wine allowed per hectare, based on variety and region.

The rationale behind this restriction on yield, which has existed for centuries, is based for the most part on commonly held opinion, rather than on documented evidence. It is thought that as a vine bears more fruit, the intensity of that fruit is diluted, varietal character is diminished, and wine character suffers.

The most common ways of increasing yield are:

1) leaving more buds on the vine at pruning;
2) fertilizing to correct nutrient deficiencies;
3) providing more water to the vine through irrigation;
4) changing pruning and trellis techniques.

These operations can affect a vine's performance dramatically. One effect of each is to increase the vegetative capacity of the vine. This in turn can increase shade within the vine canopy and competition between fruit and vegetative growth, which may inhibit ripening.

Increased malic acid, potassium, and pH in grapes are also associated with shade, as are diminished color and Brix. Irrigation often increases berry size, which can have a negative effect on phenols and aromatic compounds. Many of these problems in grapes will be present in the resulting wines.[2]

A new attitude

Despite this evidence of an inverse yield/quality relation, there is a growing tendency within the wine industry to challenge the view that such viticultural practices of necessity decrease grape and wine quality.

Dr. Richard Smart of New Zealand suggests it is inadequate canopy management in high vigor vineyards that has led to increased shading.[3] Smart recommends that where vigor-stimulating cultural practices are used, increased vigor should be matched to more appropriate trellis systems.

This approach suggests that what is most important to grape quality is the balance between vegetative growth and yield, not yield per se, and that such choices as rootstock and vine spacing are critical factors in this equation.

Andrew Beckstoffer, of Beckstoffer Vineyards, St. Helena, CA, believes that if vineyardists take advantage of current technology and 'state of the art' vine management techniques, small North Coast wineries, "need not look beyond the North Coast for growth potential. The grapes will be available to support growth, and the quality will be there as well."

Beckstoffer, a Virginia native who came to Napa Valley in 1969 after earning degrees in engineering and business administration, is the north coast's largest independent grape grower. He owns over 1,500 acres and manages a total of 2,000 acres of prime vineyard acreage in Napa and Mendocino counties. In these vineyards, a variety of innovative viticultural practices have been implemented. For example, he was one of the first growers in California to install drip irrigation, close spacing, trellis experimentation, night hand harvesting, and the matching of variety to site through soil and climate analysis. These techniques, Beckstoffer firmly believes, can enable the grape grower to significantly increase yields while maintaining or enhancing quality standards.

Beckstoffer's grapes are sold to a large group of California wineries, including Acacia, Beaulieu, Beringer, Cakebread, Clos du Val, Domaine, Carneros, Fetzer, Guenoc, Parducci,

Raymond, Stonegate, Schug Cellars, Simi, Stag's Leap Wine Cellars and Viansa.

Big numbers, high quality

In 1989, there were 31,781 acres planted to vines in Napa County — 29,243 bearing and 2,538 non-bearing.[4] This acreage yielded a total of about 100,000 tons of grapes.

In recent years, much has been written about the scarcity of vineyard land in Napa Valley. The Napa Valley floor is probably planted to maximum capacity, and though there may be some additional plantable acres in the hills, these areas will be expensive to farm and generally low-yielding.

Does this mean grapes will have to be 'imported' from other winegrowing regions to support the current and future demands of Napa wineries? No, says Beckstoffer.

"Everything we're learning about vineyard and canopy management should enable us to mature more fruit per land acre," Beckstoffer contends. 'With better management practices, we should be able to increase yields 50% with only a 10% increase in land use.

"Almost 32,000 acres now produce about 100,000 tons. We can probably increase to 35,000 acres (most remaining plantable land is in the Carneros district) while boosting our yield to 150,000 tons.

Beckstoffer predicts a similar growth potential for Sonoma, Mendocino and Lake counties, which if realized, would increase grape production in those areas by approximately 210,000 tons.

Beckstoffer's projections are based on his grapegrowing experience between 1984 and 1987, when yields in his vineyards were 50% higher than Napa County averages. The largest increases were for Sauvignon blanc, Riesling, and Zinfandel. There were smaller increases with Cabernet Sauvignon, Pinot noir, and Chardonnay.

What are the keys to increasing yield while maintaining or improving grape and wine quality?

The ABCs of 'more and better'

"For me, farming is really quite simple" Beckstoffer says. "It's about light, heat, and air. Then there is the plant, soil and water. But it's very important to do the right things from the very beginning.

"First, we match the variety with the soil and the climate. This is one of the most important decisions; it directly affects yield and the ability to properly mature the fruit.

"Also, you must use absolutely clean stock — that is a given. Virus-infected stock can cause delayed grape maturity, poor color, and poor yields.[5]

"*The co*rrect scion/rootstock match is important. The rootstock itself affects vine performance. Most of our vineyards are on AXR-1. We used to think it was phylloxera-resistant. Now it appears that it isn't — or at least not to a new type of phylloxera. We are experimenting with other rootstocks that show better resistance.

"We devote a lot of time to soil preparation. Ripping is important for good root development. Tile will be laid in areas where drainage is a problem. Soil amendments such as lime are added to improve soil structure. Deep soil preparation encourages a large root system and provides a better soil reservoir for storage of winter rains."

In Beckstoffer vineyards, vine spacing, trellis system, and irrigation management are a function of site. "In 1970, we wanted to put in a vineyard spaced 6'xlO'," Beckstoffer recalls. "I talked to A.J. Winkler [co-author of *General Viticulture* and former UC Davis professor] who recommended 12-foot spacing for North Coast vineyards.

"He didn't think we could get enough plant material for closer spacing — there wasn't much available back then — and said we'd never be able to get our equipment through. Finally he said to go ahead — he wanted to see what would happen."

Many European viticulturists have long held the opinion that it is detrimental to grape quality to decrease planting density — as has been common practice in California since Winkler's work — because this requires increasing the vigor of the less numerous vines to generate yield sufficient

to realize a profit.[9]

"We'd rather be too close," Beckstoffer agrees. "We can always deal with it by pruning or trellising modifications. The right spacing is very important to increasing yields. We have vines planted 6x10, 8x10, and 7x11. Some Sauvignon blanc on a Geneva Double Curtain trellis with 48-inch crossarms is planted 8x11.

"We have both sprinkler and drip irrigation systems. Everyone used to say irrigation was bad, that it hurt quality. Now we know we need it, that many vineyards can't be farmed without it.

"There is one Cabernet Sauvignon vineyard that is practically on a rock bed. [Beckstoffer Vineyard #4, 20 acres of 20-year-old vines in the hills west of St. Helena.] We irrigate sparingly right up until two weeks before harvest. If we didn't, those vines would fold up.

"I believe we put in one of the first drip systems in Napa County — in the Carneros in 1971 — when I was associated with Heublein and Beaulieu Vineyards. Drip is better for the vines, and proper balance is easier to achieve. Sprinklers, of course, are necessary in frost sensitive areas."

The choice of a trellis system depends on soil, climate, grape variety, and spacing decisions.

"The old view was that more leaves and less fruit was better," recalls Beckstoffer. "Leaves were thought to be little photosynthetic factories, and you needed lots of them. Also sunlight was thought to be bad for the fruit.

"Now we feel that **balance** is the key. We weren't leaving enough vine above the ground — not enough wood — and we were leaving too many leaves. Now we want less leaves and more fruit. We want sunlight on the fruiting buds and on the clusters. This will lead to bigger yields and better quality."

Nelson Shaulis was one of the first researchers to show the importance of adequate light to bud burst and bud fruitfulness. His work led to the development of divided canopy trellis systems, beginning with the Geneva Double Curtain.[8] This work, although now over 20 years old, has only recently begun to be put to practical advantage in California vineyards.

Most of Beckstoffer's vineyards are cordon-pruned. This controls the fruit better and also minimizes labor costs. Vertical shoot positioning and leaf removal are also employed. Several of Beckstoffer's vineyards are in various stages of conversion to more upright trellising systems.

Beckstoffer acknowledges that vertical training is not the 'be all and end all' of canopy management. "There is no perfect system," he insists. "We are still experimenting. We know the basics — the need to get light, heat and air into the vine. Now we need to find the best way to do it, given the soil conditions and the varieties."

Beckstoffer doesn't believe that there is an absolute 'optimum' yield for a given variety. What is considered a desirable yield for a variety in a particular site will always be relative to the soil and the trellis system employed.

For example, in the Napa vineyards where Beckstoffer grows Sauvignon blanc, average yields between 1984 and 1987 were eight tons/acre, compared to a county average of 4.5 tons/acre.

"Seven years ago, with Sauvignon blanc, we went into the vineyard twice — to prune and to pick. Today, we prune, we shoot-thin, we cluster-thin, we pick basal leaves to reduce herbaceousness, and then we harvest. We're doing it to improve wine quality, but at the same time these practices enable us to hang more fruit of higher quality on the vine."

Theory in action

Beckstoffer's vineyard holdings are distributed among 16 parcels in Napa and Mendocino counties and include eight *vinifera* varieties: Cabernet Sauvignon, Chardonnay, Chenin blanc, Camay Beaujolais, Gewurztraminer, Pinot noir, Sauvignon blanc and Zinfandel.

John Crossland manages the Napa vineyards, which comprise 1,010 acres. Included in this acreage are two vineyards from which Schug Cellars and Stag's Leap Wine Cellars make Beckstoffer Vineyard-designated wines.

Crossland says, "Before planting, extensive soil analysis is done: soil structure, depth, fertility, drainage, and available water sources are all evaluated."

Normally, the land is ripped before planting or redevelopment. Either straight shank or slip plow is used the latter mixes the existing soil strata and allows for better root and water penetration. Ripping is to five feet in the most restrictive situations, otherwise to at least 3.5 feet. Measurements of soil moisture indicate to Crossland the depth of root activity.

Bench grafts are preferred over field grafting. Beckstoffer Vineyards has had a cooperative rootstock trial with the U.S. Dept. of Agriculture and UC Davis for ten years. AXR-1 is no longer used because of the current concern over phylloxera and fan leaf virus.

Experiments are being conducted with UCD 03916 and 04343. These look promising for both phylloxera and nematode resistance. Crossland disdains the so-called devigorating rootstocks, such as S04, that other Napa grapegrowers believe may enhance grape quality by restricting yields in the fertile valley floor soils. "They all grow like hell here," Crossland maintains.

In most of the Beckstoffer Carneros vineyards, there are inadequate water resources to support both vines and a cover crop. "We've seen extreme drops in grape production due to competition," says Crossland. "On hillside sites in Napa Valley, we either mow the natural vegetation or plant mixes with the advice of the Soil Conservation Service."

Irrigation is provided to the vines early in the growing season to encourage initial growth and fruit set. In most sites, water is limited during the middle and latter stages of the season to insure fruit ripening.

Soil moisture is monitored by neutron probe or gypsum blocks, but Crossland has found that the best indication of soil moisture status often is achieved with a shovel or soil auger. "None of these technological innovations precludes the necessity to be out there in the vineyard," Crossland observes.

Morgan Ruddick is manager of Beckstoffer Vineyards' 1,100 acres in Mendocino County. The primary customers for these grapes are Fetzer, Simi, Parducci, and Beringer along with several small wineries.

Ruddick has a management team of three people: one focuses on personnel, another on equipment and a third on chemical use and viticultural methods. Ruddick's vineyard management philosophy echoes Crossland's: "Spend a lot of time in the vineyard."

Ruddick's experience has led him to some conclusions about the matching of variety with soil type and spacing configuration. "We've found that Chardonnay does well on deep loamy soil, and Cabernet Sauvignon and some of the other red varieties do best on gravelly soils. In general, our plantings have been along these lines.

"Most of our vineyards are spaced narrower than is common. We feel it improves the quality of the fruit. Also, some soils just won't support the big vines you need on wider spacing. We have no problem getting equipment through — you can use a 50-inch wide tractor with plenty of horsepower.

In the vineyards Ruddick manages, most varieties are cordon-trained, although he is experimenting with cane pruning for Gewurztraminer and Sauvignon blanc to improve yields.

Shoot positioning in the Mendocino vineyards is done in late May when the shoots are long enough to be picked up with the catch wires. Leaf removal is done in early June and July, particularly on Sauvignon blanc and Chardonnay, to reduce the susceptibility of the young grape clusters to botrytis and also to minimize the use of chemicals. Some cluster thinning is done on Chardonnay and Gewurztraminer to encourage full maturation of the remaining clusters.

Working together for quality

Besides advances primarily attributable to technological developments, Beckstoffer, Crossland, and Ruddick all cite increased communication between growers and winemakers as a critical factor in improved grape and wine quality.

Winemakers purchasing Beckstoffer grapes have an open invitation to visit the vineyards. Both

Crossland and Ruddick have small laboratories where field samples are analyzed for Brix, pH and TA as harvest approaches. Many wineries also have their own personnel to monitor the fruit.

"The wineries have become much more quality conscious," asserts Crossland. Ruddick agrees, "They are much more careful in choosing harvest dates now, they're interested in true maturity. The traditional 22° Brix doesn't mean much anymore."

Crossland regularly tastes the wines made from the vineyards he manages, and he and the winemakers discuss how to achieve desired fruit characteristics.

"For example," says Crossland, "we are doing three levels of de-leafing on Sauvignon blanc to achieve three different levels of vegetative character for the wineries. Some of them like grassiness in their Sauvignon blanc and want the lowest level of de-leafing. Some wineries don't want any grassy character at all."

"We are concentrating on several things now," says Beckstoffer. "We have proved we can increase yields while maintaining quality. Now we want to find ways to enhance quality.

"We are looking for ways to increase the mechanization of our vineyard operations. We are becoming more sensitive to environmental concerns. And we are coordinating things much more closely with the wineries.

"The next revolution will come in the winery. There is actually more control there than we have in the vineyard — they have more opportunity to affect quality.

"This is the best industry to be a part of in California. The people eat well, drink well and tell good stories. And they really care what you're doing. I always thought that the worst thing you could do was to be off in a corner somewhere with no one caring what you were doing. That doesn't happen here. People really care."

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