More and more people are cultivating wine grapes, but what actually goes into growing them? It’s a crop that many may be unfamiliar with, and cultivating grapes requires different practices and goals than corn or soybean. A lot of factors affect the quality of wine grapes—the soils, the climate, and how the vines are treated during the growing season.
More and more people, from homeowners to established farmers, are cultivating wine grapes. For growers in areas such as California where water shortages loom, crops that flourish under drip irrigation are attractive alternatives to more water-thirsty crops. And grapes are one such option.

“Water is a major issue in California,” says Fred Strauss, CCA and branch manager at Crop Production Services in Vernalis, CA. “We will need to grow more things like walnuts, grapes, and pistachios where we can use drip irrigation and manage the water better. Grapes really fit into ecological, low-input crop production.”

But what actually goes into growing grapes? It’s a crop that many may be unfamiliar with, and cultivating grapes requires different practices and goals than corn or soybean. For example, corn growers aim to have higher starches and yield. With wine grapes, there’s a different goal.

“In grapes, it’s all about quality,” Strauss explains. “There’s a yield you try to achieve, but you have to do that while achieving quality.”

A lot of factors affect the quality of wine grapes—the soils, the climate, and how the vines are treated during the growing season. “There is a tremendous amount of minute details in growing grapes,” Strauss says. And those minute details need to be understood through the life of the vines and even before they are planted.

Vineyard planning

One of the first steps in producing quality wine grapes is vineyard planning. There are several considerations even at this early stage. The types of soil and terrain found throughout a vineyard affect how much water and nutrients the vines will encounter, and a single vineyard can hold a number of different soils. The grower must decide what varieties of grapes will be grown and where they will be planted to best take advantage of the soils and landscape.

Deciding which vines to grow in which soils of a vineyard is complex. In addition to the variety of grape, different rootstocks can be used when planting vines. Rootstocks are established root systems onto which the scions, the parts of the plant that will produce the grapes, are grafted. The practice of grafting vines onto different rootstocks began in Europe in the late 1800s, and it is now a common practice.

Rootstocks can influence several aspects of vine production including pest resistance, tolerance for drought or wet soils, and uptake of nutrients. They can be used to customize a vine to match the soil.

“Some rootstocks have adaptations for different soils,” says Stan Grant, CPSS and vineyard consultant at Progressive Viticulture in Turlock, CA. “Some are better adapted to acid soils, some do better on alkaline...
soils, and some have a degree of salinity tolerance."

Rootstocks can also be used to control vigor—the propensity of the vine to grow. Vigor is not necessarily a good thing for grapevines. Soils with high levels of nutrients, for instance, can lead to high vigor, which causes excessive growth of grapevine vegetation. The plant then allocates less energy for production of the grapes, and the quality of the fruit suffers. Instead, growers want to achieve vine balance with the right amount of leaf canopy to support quality fruit.

In addition to rootstock selection, vine spacing can help control or encourage vigor. There are several ways to approach vine spacing depending on climate, soils, and terrain. In California, Grant finds that if soils in an area are deep with high fertility or the growing season is warmer, vines should be given their space and planted further apart. This will allow each plant to become larger as it matures. Alternatively, if soils promote low growth or the area has a cooler growing season, vines can be planted closer together, Grant says.

The grape variety must also be considered when planning the vine spacing. Varieties grow differently, and some vines end up being bigger than others. For instance, a Pinot Noir vine is fairly small, even when fully established, while a Cabernet Sauvignon vine is quite large. "With these varieties, I might plant the Pinot vines 4 ft apart in the row, but I would place the Cabernet vines six feet apart," Grant says.

Impacts of sunlight and climate

Climate is also an important element of both vineyard planning and vine management. Climate plays an enormous role in grape production. In areas such as the Napa Valley, the climate creates an ideal environment for quality fruit. Sunlight hits the grapes during the day, causing the development of phenols—the color, flavor, and aroma compounds. At night, the temperatures drop, the plant’s metabolism slows, and the compounds remain concentrated in the grape.

Sunlight and heat, then, need to reach the berries. But too much sunlight can leave the berries scorched and dried. One way to control the sun’s impact is by determining the best row orientation when planting the vines. The direction that the vines, and therefore the grapes, face moderates the effects of the climate. Growers can determine the direction of the sun...
throughout the day, where shadows from the leaves will fall, and therefore the best placement of the grapes.

Once the vines are planted and growing, leaf pulling can also be used to control climate around the grapes and the amount of sunlight that reaches the fruit. “Leaf pulling is about trying to achieve two goals,” Strauss says. “Probably the most important is grape quality. The other is disease control.”

For these reasons, leaves are often pulled more heavily on the east or north side of vines. This allows early morning sun to hit the grapes, drying off any dew and providing sunlight without high heat. Leaves on the west side of the vines are often left denser, however, to prevent hot afternoon sun from scorching the grapes.

Leaf pulling also helps control various pests and diseases. Fewer leaves allows for airflow through the clusters preventing fungal growth. If leaves are dense, they create a barrier against fungicides and pesticides that may be sprayed onto the vines. Leaf pulling, then, is an important—and often time-consuming—part of vine management. “It’s a constant process,” Strauss says.

Soil considerations

In additional to climate and sunlight, another important factor in wine grape production is actually stress. To create full flavor, color, and aroma, grapes like to be moderately stressed for water. With a little stress, vigor is controlled and more energy is used for grape production. The drainage of the soil, then, has a large influence on how well the vines produce grapes and the quality of those grapes.

“We want the vines to become moderately stressed for water,” Grant explains. “When that happens, the grapes synthesize and concentrate their flavor and aroma compounds. Then we have a direct influence on wine grape quality.”

To influence water stress, many growers use drip irrigation in their vineyards. Drip irrigation allows growers to control how much water the vines see and when they see it, making it an attractive choice in water-poor areas.

Another practice that is often used in grapevine cultivation is regulated deficit irrigation. Originating in Australia, the practice gained popularity in California in the 1990s and is now used to provide mild water stress when and where it is most needed.

“To influence water stress, many growers use drip irrigation in their vineyards. Photo courtesy of USDA-NRCS.”

“Once we have the crop yield we want, we can play with deficit irrigation to achieve the best quality,” Strauss says. “You have to be careful because you may reduce yields, but you can create a more robust, darker, and more flavorful grape.”

In addition to water stress, nutrient inputs are important for vine health and grape production. Soil testing is performed in many cropping systems, but often a soil sample will only get collected if the grower radically changes something in their fields. In vineyards, though, soils are routinely sampled every year, and growers can then change their practices or inputs based on those tests. Growers must also consider what the grape variety they are cultivating needs.

To address the needs of both the soils and the grape variety being grown, a method that many growers are turning to is fertigation. The use of drip irrigation provides a delivery method for targeted fertilizers and a way to deposit both nutrients and water at the same time.

“Drip irrigation not only places the water in the right place, but it also creates a way to apply fertilizer,” Strauss says. “It’s site-specific, vine-specific nutrition. It’s what I call microprescription nutrition.”

Grant also sees great promise in the practice. “Fertigation allows us to apply mineral nutrients in small quantities in proportion to the demand during that period of time. A lot of these soils in the Sierra foothills have been exposed to the elements for a long time, and they’ve been leached of minerals. The ability to fertigate is a very powerful tool.”

Organic and sustainable vineyards

With advancements in irrigation and nutrient application, are grape growers also embracing new prac-
practices such as organic cultivation? Strauss has seen growers produce organic wines, but the payoff appears to be minimal. If two bottles are sitting side by side, one labeled organic and one not, it is unlikely that a wine drinker will pay $4 more for the organic bottle, he says.

“There are few negative thoughts in people’s heads when drinking wine,” Strauss explains. “Most people believe wine is good for their health, in moderation. So growers who tried organic production found that they could not command more money for that bottle.”

Instead of organic production, many growers are moving toward sustainability. But what does that mean? “If I had to define it, it would just be reducing the carbon footprint of your operation and using less intrusive products to accomplish your goals,” Strauss says.

While the methods used in sustainable production are not organic, they help reduce environmental impacts. For instance, pesticides are given a rating level such as caution, warning, or danger. Sustainable growers try to use products with lower ratings—caution or warning—whenever possible. Likewise, they try to use products that will reduce the number of trips they have to take across their fields. Fewer trips mean less use of tractors and other machinery that can contribute to the carbon footprint of their operation.

There are now formal protocols for sustainable practices in grape production in California. A certified organization provides a form for growers to complete explaining their practices—from pruning and labor to tractor diesel burning. The pesticides used and nutrition inputs and protocols also factor into a grower’s sustainability rating.

“The organizations want to know if you do soil samples or if you do leaf samples in season,” Strauss explains. “They want to know if you’re mitigating problems and adjusting what you’re doing to move towards sustainability.”

In Lodi, CA, Grant is involved with the Lodi Rules for Sustainable Winegrowing program. “It has two parts—one part has to do with pesticide impacts on the environment, and the other part has to do with farming standards,” he says. “The goals are to maximize use of on-site resources, optimize use of the resources you apply, and minimize the off-site impacts of your farming practices.”

**Beyond California**

The details of vine management and grape production are clearly complex. They become even more so when different parts of the country and world are considered. As a vineyard consultant and designer at Soil Solutions LLC, James Fisher, CPSS and CPAg, helps growers work with varied climate, soils, and terrain globally.
Other regions present different challenges for grape growers than those seen in California. For instance, cooler climates or more moisture will greatly influence how vineyards are planned and grapes are grown. Compared with Grant’s approach in California, Fisher has seen very different outcomes regarding vine spacing and soil vigor. He finds that in fertile soils, more vines, not fewer, should be planted.

“A greater number of vines in an area can really change the growth of a vine,” Fisher explains. “In high-vigor soils, vines can be planted more densely, yield more fruit, and attain greater vine balance to produce high quality grapes.”

Cooler temperatures also lead to some different vineyard management practices. The climate directly around vines and grape clusters can be altered by using the heat that is stored in and radiates off of the soil. The position of the fruiting wire, the wire that supports the grape bunches as they grow and ripen, can influence the temperature around the vine. Fruiting wires that are placed low take advantage of heat from the ground helping the grapes ripen. Additionally, rocks can be used to help radiate heat up toward the vines.

“Many growers save the rocks that they plow up and line the vineyard rows with them to increase seasonal heat of the vines,” says Fisher.

The complexity of grape production is clearly illustrated when considering the many areas of the country, and the world, in which wine grapes are grown. Practices may differ considerably depending on the climate and terrain of an area. Growers everywhere must consider the variables in their region to understand how best to manage their vines and produce great wine.

A two-year process

With all of the considerations that go into vine cultivation, it is important to note another complexity – grape growing is a two-year process. For many farmers, how they treat their crop in May will influence their harvest just a few months later. But for grape growers, the path to harvest is a bit longer.

While vines drop their leaves and produce a new crop every year, production of the fruit actually takes two years. Once a bud forms on a grapevine, it can either become a grape to be harvested or a tendril that will support the vine. That decision is influenced by all of the factors that influence vine production and the care that the vine received the previous year.

“Bud formation begins one year, but it’s not until the next year that it becomes a grape,” Fisher notes. “Whether a bud becomes a fruit or a tendril depends on how it was farmed the previous year. Management of the leaf canopy dictates the amount of sunlight and heat that will penetrate and affect the buds. So you’re basically farming for the next year since the buds you leave this year will become next year’s grape.”

From the timing of fruit production to the way the crop responds to stress and the in-season management practices, there are clear differences between growing grapes and growing other crops. But in the end, Strauss says, grape growers and corn growers really aren’t all that far apart.

“If you sit down and talk to grape growers, they’re farmers. They know the end product, they know what they want to achieve to get to that end product, and they know what it takes to get there,” Strauss says. “Real growers are real growers anywhere. It’s the same with all crops.”

CPSS and CPAg James Fisher, vineyard consultant and designer at Soil Solutions LLC, helps growers work with varied climate, soils, and terrain globally.