

Organic and Biodynamic Winegrowing In Coastal California

Glenn McGourty, Winegrowing and Plant Science Advisor
University of California Cooperative Extension
Mendocino and Lake Counties
890 North Bush Street
Ukiah, California 95482
gtmcgourty@ucdavis.edu

Introduction

The interest in organic and biodynamic winegrowing has grown greatly during the past two decades. There are now over 4400 hectares of wine grape vineyards that are certified under the United States Department of Agriculture's National Organic Program (USDA NOP). There are an additional 400 hectares of biodynamic vineyards (Demeter Certified). Most Demeter certified biodynamic vineyards are also co-certified as organic under the USDA NOP program.

The commonalities between the two farming systems include:

- The philosophy of the farm as an ecosystem in which the web of life is recognized and used to maintain productivity, plant and animal health, and an abundance of life forms in all ecological niches
- the use of cover crops, compost and naturally occurring plant nutrients to provide plant nutrition and to build soil organic matter as a way of improving soil and water quality
- the prohibition of any synthetic pesticides, growth regulators or fertilizers, as only a list of naturally occurring compounds are allowed for these purposes
- the use of Integrated Pest Management (IPM) to encourage biodiversity and biological control of insect and mite pests, and minimize the use of pesticides;
- the reliance of canopy management and other cultural practices for both improving fruit quality and preventing conditions that cause plant disease

Biodynamic farming was actually the first alternative farming movement in the 20th Century started by Rudolph Steiner, noted for his Anthroposophic Philosophy who also created the Waldorf School system of education, and homeopathic medicine. Many biodynamic practices have not been validated by conventional reductionist science, and consequently are considered as a "faith based" form of agriculture. As practiced by biodynamic winegrowers, it differs from organic winegrowing in the following ways:

- The belief that life exists in a nexus between the ethereal (gases and light) and the inanimate (darkness and earth)
- The farm should be a self contained system as much as possible, designed to provide fertility, self regulating resilience to pests and diseases, and to minimize off-farm inputs
- The importance of the farm as a unique place for expression of terroir (many biodynamic vineyards and wineries only produce estate labeled wines)
- Creation of habitat on the farm to promote biodiversity (a requirement for certification)
- The integration of animal and plant agriculture to take advantage of complimentary benefits for health and fertility of both kingdoms

- The recycling of animal and plant by products as compost to maintain soil health and fertility
- The use of the Biodynamic Preparations (or bio regulators) for making compost, treating the soil and the foliage of plants to promote balanced growth and improve crop quality
- The use of celestial events to plan farming activities. This includes the sun cycles (day, months, spring and fall equinoxes, summer and winter solstices); three moon cycles (lunar phases, lunar rising and setting and sidereal constellations); and the sidereal cycle (zodiac constellations). These calendars are used to schedule pruning, fertilizing, planting of vines and cover crops, application of the biodynamic preparations, harvest, pressing, racking and other cellar operations

Organic and biodynamic wine growing have tangible benefits that can be measured:

- Improvement of soil quality including increased organic matter content, improved soil structure, soil water holding capacity, cation exchange capacity, soil micro and macro fauna, water infiltration and gas exchange
- Reduced use of pesticides and soluble fertilizers compared to conventional farming
- Improved water quality in adjacent surface water bodies and ground water
- Improved numbers of beneficial predators and parasitoids
- Improved environmental safety for farm workers and farm families due to the reduction in exposure to toxic farm chemicals
- Improved wine quality due to balanced yields, particularly when farming problematic soils (initially, low organic matter, poor soil structure, poor water infiltration and retention, imbalance in calcium/magnesium ratios)
- Improved public perception of the farming system exposing neighboring properties and communities to potential risk from toxic materials

Practices

Soils Management:

- Initially, deep tillage is practiced to loosen and mix the soil to a depth of 0.5 m to insure that there is no barrier for vine rooting such as plow pans or other compacted areas.
- In California's North Coast, soil testing is performed to determine pH and base saturation of the cation exchange complex (CEC). Ideally, calcium should make up 60-70 % of the CEC. There should be a ratio of 5:1 of calcium to magnesium. Many of our soils are high magnesium affected, and the ratios can be as low as 1:1. If this is the case, we will need to apply extra compost and calcium to improve soil structure and alter the CEC to more favorable ranges. Applications of gypsum (calcium sulfate) are used on very high magnesium soils dominated by clay textures at rates of 5-25 tons per hectare. Soils that are less magnesium affected may only require rates of 1-5 tons per hectare of lime (calcium carbonate). Target pH is between 5.5 and 7.0, which is fairly easy to maintain under our relatively high rain fall (about .7 to 1.2 m of precipitation per year).
- Compost is applied at the rate of 2.5 to 7.5 tons/ha on an annual basis until we have above 3-5% organic matter in the soil. Compost is usually made from recycled pomace and manure. Biodynamic farmers also add biodynamic preparations to facilitate curing of the compost.

- Soils are planted to cover crops and protected from erosion. Rainfall is usually from late October until early May most seasons followed by a very dry summer with negligible precipitation most years. Depending on the slope of a site, there may be other measures used to protect to divert water and prevent erosion including grass filter strips, drop inlets and drains, and hardened water conveyances, water retention basins during high precipitation events, and subsurface drains. Water may be diverted to ponds for use as a source for irrigation and frost protection water.

Cover Cropping:

- There are four broad categories of cover crops: legumes to fix nitrogen and stimulate plant growth; grasses to help aggregate and protect soil from erosion, as well as compete with vines if there is excess vigor; species that are used to grow carbon and protect the soil such as mustards and *Calendula*; species planted primarily as insect habitat and pollen/nectar sources such as *Phacelia*, members of the Umbelliferae and *Alyssum*.
- Cover cropping systems fall into three broad categories: Those needing annual tillage, which usually are mixes of small grains (oats, wheat, triticale, barley) and legumes (common vetch, purple vetch and field peas), mustards and radishes; those that are farmed without tillage utilizing self reseeding annuals including legumes (bur clover, subterranean clover, rose clover, balansa clover, Persian clover) and grasses (annual fescues and annual brome grasses); and finally, perennial no-till cover crops focused on grasses (tall fescue, perennial rye grass, red fescue, sheep fescue and hard fescue) and some legumes (white clover, strawberry clover and birds foot trefoil). Selection of these species is based on site vigor and water holding capacity, with the tilled system using annual species best suited for sites with limited water, and the perennial system best for soils with high water holding capacity and potential vine vigor.
- Some growers may choose a system that uses tillage ever other row, with no tillage every other row.
- Many of these cover crop selections are also useful as feed for grazing animals, and especially biodynamic growers may choose to graze sheep, rabbits and chickens (in movable pens) in the vineyards during the winter period when feed is available.

Vineyard Floor Management

- Most growers till beneath the vine as a way of reducing competition between the cover crops and vines for moisture. It also reduces habitat for rodents that might damage vines, such as gophers and voles.
- There are various hydraulically controlled implements that have articulating blades or tillage devices that move in and out the vines.
- Hand hoeing and mowing with string trimmers are also used in places where a “cleaner look” is desired.
- In locations where moisture is limited, often row middles are tilled and firmed to conserve moisture. Growers also use tillage if they are trying to improve soil nitrogen status for higher yields, and will plant legumes and apply compost to help improve the fertility of the soil (mostly for white varieties).
- In no-till systems, row middles are mowed during the summer and the cover crop is allowed to dry to form a mulch.

Insect and Mite Pest Management

- Most growers use IPM practices of monitoring for key pests, and spraying insecticides only if absolutely needed
- Key pests in our region include leaf hoppers, Willamette mites and Pacific mites.
- For mite control, growers try to limit the use of sulfur dust, and augment control with predacious mites
- Generalist predators and parasitoids can have a very positive effect on controlling pests, as much as 60% of an economic control. Creating habitat by planting insectary plants in both the vineyard and on the margins is helpful to increasing biodiversity for these insects.
- Low toxicity “soft” insecticides are some times used including light summer oils, soaps, and plant extracts (pyrethrums and other botanical compounds).
- Generally, most organic and biodynamic growers rarely need to spray for pests.
- Irrigation management and fertilizing also are important in an IPM system. Vigorous vines tend to attract leaf hoppers and other piercing-sucking insect pests. Vines that are drought stressed and dusty tend to attract mites. Keeping vines in a non-stressed condition with judicious use of irrigation is helpful in preventing pest problems.
- The accidental introduction of new exotic pests is a serious threat to continuing a low toxicity farming system. The European Grapevine Moth, the Vine Mealy Bug and the Glassy Wing Sharp Shooter are all very difficult to control using organic pest management approaches

Disease Control

- Powdery mildew is the most prevalent disease. Sulfur dust and wettable sulfur are the most widely used materials to keep vines from being infected. Stylet oil is also used. Biological materials are only moderately effective. Canopy management is also used to create good air circulation around clusters.
- Trunk rotting organisms including Eutypa, esca and other fungi are also a problem in older vineyards and for some varieties (especially the Bordeaux varieties). Late pruning and lime sulfur sprays during dormancy are used to suppress infections.
- Pierce’s disease is a periodic problem in some areas. Normally, riparian areas are the most problematic for this disease where various sharp shooter vectors are found. Kaolinitic clay sprays offer some protection from feeding. Some varieties are more susceptible than others. Resistant varieties are being bred by UC Davis for areas prone to infection.
- The movement of viruses is a new concern as vine mealybugs are infesting more acreage in the North Coast region. There is no control strategy for viruses developed at this time, other than propagating new nursery stock with clean material.

Canopy Management and Trellising

- There are many different training systems used from traditional head pruning (gobelet) for heritage varieties like Zinfandel, Carignane and Petite Sirah; California three wire

sprawl systems (“flop and drop”) to more modern vertical shoot positioned trellis and divided canopy systems.

- Most all use leaf pulling around the clusters and removal of sterile shoots to open the canopies for dappled light and good air movement around the clusters. This helps to reduce mildew and bunch rot, allow for better coverage of any sprays, and easy access to fruit for harvesting.
- VSP trellis systems are favored for the ease of mechanization for pre-pruning, leaf pulling around the clusters, and harvesting

Practices Specific for Biodynamics

- Biodynamic wine growers have specific criteria require for their farming systems plan that they must address in the organization of their vineyard and winery operations
- First, they are encouraged to minimize off-farm inputs, so recycling of winery waste, animal manures and crop residues are required
- Most have a very active composting program, and they use compost on their production areas almost annually
- Most have animals. The most common species used are chickens and sheep. Chickens are moved around in portable coops in which the birds are confined at night to prevent predation by wild predators including coyotes, bob cats and raccoons. Eggs are collected and used for fining wine and food for the vineyard and cellar workers. Sheep are used to graze the vineyard floor at certain times of the year. Some wine growers have also used aversion training with lithium chloride to train the sheep not to graze on vine foliage. When not grazing the vineyard floor, the sheep are confined in separate pasture areas.
- Biodynamic growers must also provide at least 10 percent of their land as habitat planted to non-crop plant material for wild life and other species. Usually, these are remnant native forests, although some growers also plant hedgerows and fruit trees to create habitat for beneficial insects.
- Many also provide bird boxes, bat boxes, perches for raptors and other species to help increase biodiversity and provide control of unwanted vertebrate species.
- Biodynamic producers apply their preparations to their soil (500 in fall), foliage (501 in spring) and a mixture of preparations during compost making. They may make their preparations themselves, or they may be purchased from specialists who make them for them (such as the Josephine Porter Institute).
- Other practices vary greatly by individual farmers to suit their particular site and way of farming. Biodynamic winegrowing is not highly prescriptive, and considerable latitude is left to the individual farming on their suite of practices to follow.

Certification:

- Organic certification is regulated under the United States Department of Agriculture’s National Organic Program (NOP) to insure that producers conform to the same standards nation wide.
- Producers must select a third party certifier that will insure that the farming practices that they use are consistent with the law. This will involve on farm inspections, and review of their pesticide and fertilizer applications

- Producers must also develop an organic farming plan that outlines the procedures and materials that they will use to become organically certified
- If the farmers are using conventional farming materials, they must go through a 3 year conversion in which they stop using synthetic pesticides and fertilizers, and convert to organic practices. At the end of three years, they are through “transition” and will become certified if they use only materials allowed under the NOP laws.
- Most biodynamic farmers will start with organic certification
- Biodynamic certification is not legally recognized under the USDA NOP program.
- Biodynamic certification is done by the Demeter Association, a non profit trade organization.
- Biodynamic growers must also develop a farm plan, including how they will organize their farm, how they will use preparations, and any other material that they will use for their production system

Markets:

- Unlike some produce, there is not necessarily a premium paid for organic or biodynamic wines and wine grapes. Rather, the products are judged on their intrinsic quality and paid accordingly.
- Some winegrowers use certification as a way of product differentiation for niche markets, such as high end restaurants, wine shops or other outlets where customers are likely to care about quality and production practices.
- Many organic and biodynamic wine producers sell directly to the public who care about environmentally sensitive farming, and purchase products specifically because they are produced in an environmentally friendly way.

Conclusions:

There is a growing and healthy sector of the wine growing industry producing organic and biodynamic wines and wine grapes in California’s North Coast. These techniques allow growers to produce quality wines and make decent profits for their efforts. There is an increasing market demand for these wines, and as wine growers continue to produce good wine, wine drinkers increase their demand for more products. There is every reason to believe that these production practices will continue to be adopted by more growers in the future.