Sustainable and Organic Farming Systems for Wine Grape Production

Glenn McGourty, UCCE Mendocino and Lake Counties
Microclimates of Northern California

- Distance from the Pacific Ocean is key
- Climates range from maritime to continental
- Topography is rugged
- Geology is highly variable
- Elevation, slope and aspect vary greatly
- Vines start growth late, ripen late
- Stratification of air at night
- Convection by day, breezy
Climate and Sun Light Energy

In the Fog

Above the Fog

Beyond the Fog
## Approximate Degree Summation

<table>
<thead>
<tr>
<th>Location</th>
<th>$\sum &gt;50^\circ F$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dijon, France</td>
<td>2400</td>
</tr>
<tr>
<td>Châteauneuf-du-Pape, France</td>
<td>2800</td>
</tr>
<tr>
<td>Bordeaux, France</td>
<td>2800</td>
</tr>
<tr>
<td>Yorkville, Mendocino County</td>
<td>2900</td>
</tr>
<tr>
<td>UC Hopland Research and Extension Center, Mendocino County</td>
<td>3150</td>
</tr>
<tr>
<td>Red Hills Vineyard, Lake County</td>
<td>3600</td>
</tr>
</tbody>
</table>
## Distance from Pacific Ocean and Winkler Regions (Latitude 38 degrees)

<table>
<thead>
<tr>
<th>Place</th>
<th>Distance from Ocean in miles</th>
<th>Winkler Region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Philo</td>
<td>14</td>
<td>I, II 2200-2400</td>
</tr>
<tr>
<td>Boonville</td>
<td>18</td>
<td>II, low III 2400-2800</td>
</tr>
<tr>
<td>Yorkville</td>
<td>24</td>
<td>II, low III 2600-2900</td>
</tr>
<tr>
<td>Ukiah</td>
<td>27</td>
<td>III 3200</td>
</tr>
<tr>
<td>Hopland</td>
<td>31</td>
<td>III 3150</td>
</tr>
<tr>
<td>Big Valley</td>
<td>38</td>
<td>high II, 2700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>low III 3000</td>
</tr>
<tr>
<td>Red Hills</td>
<td>44</td>
<td>High III 3400</td>
</tr>
<tr>
<td>High Valley</td>
<td>48</td>
<td>high III, low IV 3400-3600</td>
</tr>
</tbody>
</table>
Pt. Arena, Pacific Ocean
Anderson Valley
Mendocino Ridge
Russian River Valley, Hopland
Clear Lake
Big Valley Sauvignon Blanc
Red Hills Cabernet Sauvignon
Not codified by law, but is philosophically adhered to by many producers
Sustainable Winegrowing

- Broadest category of farming practices
- System that assures a steady supply of natural resources for the farm...soil, water,& air quality....workers and community.
- Efforts to reduce petrochemical inputs, pesticide applications- “Last Resort”
- “Least toxic” approach—Soft, Safe and Sound
Some Qualities and Features of Sustainable Winegrowing

- Follow IPM guidelines to reduce pesticides
- Reduce tillage if possible
- Create habitat for beneficial insects, spiders and mites
- Reduce use of residual herbicides
- Water conservation, regulated deficit irrigation
- Encourage biodiversity by providing habitat
- Owl boxes, blue bird boxes, bat boxes, raptor perches
Code of Sustainable Winegrowing Workbook

- Broad effort by CAWG, Wine Institute
- Based on Lodi Woodbridge and CCVT efforts for self evaluation and improvement
- Now being implemented by California Winegrowing Alliance
- Widely subscribed by growers
- Certification available
Definition of “Organic” Farming

Organic farming is “an ecological production management system that promotes and enhances biodiversity, biological cycles, and soil biological activity. It is based on minimal use of off-farm inputs and on management practices that restore, maintain and enhance ecological harmony.” (National Organic Standards Board, 1998)
Concepts in Organic Farming

- The farm is a living system
- Managing organic matter is critical to plant health
- Synthetic chemicals are to be avoided
- Nature can control pest and disease problems best, and cultural practices are used to keep the crop from being susceptible to problems
- Each property is unique and needs a custom approach to organic farming based on resources that are present
Organic Winegrowing

- Grapes grown without the use of chemical fertilizers, pesticides, herbicides, hormones & fungicides.
- All remedies and pest control materials are done with naturally occurring compounds.
- Strict State and Federal Guidelines
- Third Party Evaluation & Verification
Objectives in Organic Pest Management

- Increase beneficial insect activity
- Decrease use of toxic sprays
- Increase monitoring of pests
- Increase biodiversity of habitat in the vineyard
Insect Pest Control

- Predators and Parasitoids
- “Soft” insecticides
Creating Biodiversity in the Vineyard

- Cover crops
- Managing hedgerows and noncrop areas
- Diverse habitat for beneficial insects and spiders
Weed Control

- Tillage under the vines
- Hand hoeing
- Weed eating
- Grazing with animals
Vineyard Floor Management

- Tillage
- Flaming
- Mowing
- Grazing
Grazing Animals
Why Farm Organically?

- Express Terroir
Organic Winegrowing
Soil Management Goals

- Utilize as much of the soil profile as is possible
- Slow mineralization of nutrients
- Adequate but not excessive fertility
- Well structured soils with good tilth
- Raise organic matter content due to its ability to hold water and nutrients
Organic Matter

- Decomposed plant and animal residues
- Helps bind soil particles together to give the soil “structure”
- Good source of plant nutrients
- Gives the soil its dark color, as it coats the mineral portion of the soil
- Improves CEC and water retention
Organic Winegrowing Soils Management Tools:

- Initially, deep tillage
- Cover crops
- Compost
- Lime and Gypsum
- Naturally occurring nutrients, such as mined minerals, animal and plant by products
- Tillage and mowing, grazing
Managing Soil Fertility

- Building up organic matter
- Cover crops: grasses for tilth, legumes for nitrogen
- Initial deep tillage to open soils for an extensive root system
- Added minerals are slowly soluble
Carbon Sequestration and Global Warming:

- Increase of atmospheric CO$_2$ from human activity
- Loss of carbon from soil by tillage = 30% of total CO$_2$ generated
Soil Organic Matter by Percentages

- Biomass
- Residues
- Humus
## Vineyard Organic Matter Per Year, kg/ha

<table>
<thead>
<tr>
<th>Item</th>
<th>Conventionally Farmed</th>
<th>Organic/Biodyn. farmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prunings</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>Leaves</td>
<td>1400</td>
<td>1400</td>
</tr>
<tr>
<td>Weeds/cover c.</td>
<td>1200</td>
<td>1200-12000</td>
</tr>
<tr>
<td>Compost</td>
<td>0</td>
<td>2300</td>
</tr>
<tr>
<td>Total, kg/ha</td>
<td>3600</td>
<td>5900—17900</td>
</tr>
<tr>
<td>Total, tons/acre</td>
<td>0.75</td>
<td>1.2—3.5</td>
</tr>
</tbody>
</table>
Compost and Organic Matter—Helping Your Soil Come Alive

- Recycled Pomace
- Manure, lime, gypsum
- Produced on Farm or Winery
- Process takes about one year
- Applied at one or two tons/acre
Three Stages of Compost Fermentation Towards Humus

1. Smell disappears, takes on woodsy odor.
2. Color Becomes Uniform Dark Brown
3. The original texture disappears and look like soil. Full of life!
Compost Applied Row or Vine: 1 to 5 tons per acre
Cover Crops Can Assist in Growth Regulation of the Vineyard

- Competition, especially with perennial grasses
- Improved N fertility with legumes
- Improve water infiltration, gas exchange in the root zone
Cover Crop Types
Grass and Legume Mixes

- Important to have N to build SOM
- Much of biomass is respired into the atmosphere
Peas, Vetch, Bell Beans and Oats Cover Crop
Too much of a good thing!
Rose Clover

*Trifolium hirtum*
Bur Medic

Medicago polymorpha
Subterranean Clover
*Trifolium subterraneum*
Crimson Clover *Trifolium incarnatum* ‘Flame’
Persian Clover

*Trifolium resupinatum*
Balansa Clover

*Trifolium michelianum*
Spring time mowing
Summer Vineyard Floor Management
Alternate Row Cover Cropping
Alternate Row Farming
Every other row tillage
Perennial Covers

- Can greatly reduce vigor
- Recommended for fertile sites
- Grass and legume mixes useful, but not annual and perennial species
- Grasses: turf-type tall fescue, sheep fescue, creeping red fescue, hard fescue, perennial ryegrass
- Legumes: white Dutch clover, Ladino clover, strawberry clover
Canopy Management Objectives

- Light Penetration
- Temperature – keep fruit from direct sun exposure if possible
- Decrease humidity and improve air circulation
- Balance vines: 5 lbs of fruit: 1 lb of shoots
- Prevent disease and insect infestations
Overly Vigorous Canopy
Divided Canopies
The Balanced Shoot

- About 36 to 40 inches long
- Around 2 clusters per shoot
- 12 to 16 leaves
- No lateral shoots
- No second crop
- Mature wood before harvest
- Shoot tips aren’t growing at veraison
 Shoot Thinning

√ Reduces shoot density, but impact on canopy density is often temporary
√ Efficient method of crop thinning
√ Assists in the establishment of spur positions
√ Reduces pruning costs
√ Cost per acre - $125 – $300/acre
Two Shoots Per Spur Ideal
Basal Leaf Removal

- Originated in table grape industry
- Timing & severity adopted from table grape growers, trellises, vigor
- Appropriate for earlier wine grape plantings on sprawl
- Consists of the removal of basal leaves and lateral shoots opposite clusters on the primary shoot
- Avoid deleafing on afternoon side of the vine
Disease Control

- Powdery mildew controlled with sulfur dust, wettable sulfur, various other “soft” fungicides, stylet oil
- Botrytis bunch rot controlled with leaf pulling
- Possible additional control with Serenade and Sonata (Bacillis sp.)
Whatever befalls the earth befalls the sons of the earth. Man did not weave the web of life, he is merely a strand within it. Whatever he does to the web he does to himself.”
Chief Seattle, 1852