Building Healthy Soils
Composting in Vineyards

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What is Composting?

- Simple definition: Managed Decomposition
- Composting is a natural form of recycling, which continually occurs in nature. This is how nutrients are recycled in an ecosystem.
- This natural decomposition can be encouraged by “managing” ideal conditions.
- End products are: compost (humus), CO₂, water and heat
Sonoma Compost Site Overview
Site Considerations

- Allocate enough space
- All weather accessibility
- Water supply
- Proper water runoff management
Composting Permit

http://www.calrecycle.ca.gov/Laws/Regulations/title14/ch31.htm

Excluded: Agricultural materials from site applied to the site. < 1000 cy given away or sold or notification with inspections

Notification: Recommended for any decent sized compost operation Will result in one inspection and a small fee per year.

Full permit: For those facilities using municipal yard debris, etc. >12,500 cy
Don’t use?

Human Feces
Cat/dog Feces
Large Pieces of Wood
Diseased Plant Material (mealy bug)
Large Quantity of Grease or Oil
Persistent Pesticides
Toxins
Compostable plastics
OK to Use

- Grape pomace
- Prunings
- Weeds
- Manures (pesticides, permit issues)
- Grape lees (irrigation substitute)
- Diatomaceous Earth
Compost Pile at Benziger Winery, Glenn Ellen, CA

- 15-25% of grape mass
- Bulk density 675-1350 lbs/ft³
- Moisture after pressing: 20-30%
- C/N from 15:1 to 45:1
Food: Carbon to Nitrogen Ratio

- Ideal carbon to nitrogen ratio (C:N) = 30:1
- Browns and greens
- Availability: Wood chips vs head of lettuce
- Layering vs mixing
- Use resources and experience

http://compostingtechnology.com/resources/compost-calculator-tool/
C/N Calculation

- **Add Feedstock**
  - Wood Chips, Softwood
    - Qty: 200
  - Green Waste
    - Qty: 100
  - Manure, Dairy Cow
    - Qty: 1000
  - Grape Pomace
    - Qty: 1000

- **Calculate**
  - Density: 0.63
  - Moisture: 59%
  - C:N Ratio: 22:1

**Total Quantity (kilograms):** 2300
Stockpiling of Grape Waste

Areas of concern:
- pH (3.5-6.0)
- Small particle size
- Self sealing
The Composting Process

- A biological process
- Water 40-60 %
- Oxygen/Porosity (Aerobic)
- Food
- Time
• Particle size
• Water
Moisture By Feel

Squeeze a handful of compost

- > 60% Water drips out
- 55-60% Sheen on surface
- 50-55% Ball stays when tapped
- 45-50% Ball falls apart when tapped
- 40-45% No ball forms
- < 40% Hand feels dusty dry
Before – Factory Nozzles

After – Customized Nozzles

From: UC Compost Council, Compost Operators Training Course
Evaluate the Health of the Pile

- Evaluating the Temperature
- Size of Pile
- Moisture by Feel
- Food Composition
LOS ANGELES

Indoor compost pile ignites house

A 1,700-plant marijuana grow house in the San Gabriel area erupted in flames when a living room compost pile ignited Monday.

Detective David Mertens said a man was seen running from the home but there are no arrests. Mertens says gangs rent out homes to raise pot and investigators find a couple of similar marijuana grow houses each month.
## Temperature/Turning Log

**Sonoma Compost Temp/Turning Log**

<table>
<thead>
<tr>
<th>Cell:</th>
<th>Window: 43</th>
<th>Length: 270°</th>
<th># of Readings: 2</th>
<th>1st Reading: 67°</th>
<th>Subsequent Temps: 135°</th>
<th>Depth: 24&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>DATES</td>
<td>10/27</td>
<td>10/24</td>
<td>10/21</td>
<td>10/18</td>
<td>10/15</td>
<td>10/12</td>
</tr>
<tr>
<td>Higher</td>
<td>170</td>
<td>168</td>
<td>164</td>
<td>162</td>
<td>160</td>
<td>158</td>
</tr>
<tr>
<td></td>
<td>156</td>
<td>21.1</td>
<td>22</td>
<td></td>
<td>154</td>
<td>152</td>
</tr>
<tr>
<td></td>
<td>154</td>
<td>146</td>
<td>142</td>
<td>138</td>
<td>136</td>
<td>134</td>
</tr>
<tr>
<td></td>
<td>134</td>
<td>132</td>
<td>130</td>
<td>129</td>
<td>126</td>
<td>124</td>
</tr>
<tr>
<td></td>
<td>121</td>
<td>111</td>
<td>108</td>
<td>106</td>
<td>104</td>
<td>102</td>
</tr>
<tr>
<td></td>
<td>98</td>
<td>96</td>
<td>94</td>
<td>92</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>Lower</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Strat 10-23-03*

*Signed by [Signature]*
1-2-3 Rollover
Compost (and mulch) will be meeting these standards:

- Will be kept at a temperature of at least 131 degrees Fahrenheit for at least 15 days during which time the piles will be turned at least 5 times.
- Fecal coliform tested state certified shall be less than 1000 MPN/dgr, and salmonella sp. shall be less than 3 MPN/4 dgr.
- Metal Concentrations
- Pesticides
- Compost Maturity
The Role of Organic Matter in Soil: Promote Soil Health

- Soil Structure
- Nutrient management
- Conservation of soil
- Soil moisture management
- Diversity of Microorganisms
Soil Structure

Can’t change texture:
Make soil workable

Increases water infiltration rate/
holds water

Enhances root penetration

Optimizes soil aeration

Stimulates microbial diversity
Soil Aggregation

- Aggregation Formation
  - Clay charge
  - Root web
  - Organic glues
  - Fungal hyphae

- Aggregation Destruction
  - Mulch
Nutrient Management

- Increase CEC
- Immobilize Water Soluble Nutrients
- Long Term Nutrient Release
- Nitrogen Fixing Microorganisms
Soil Moisture Management

- Increased Water Holding Capacity (Sandy)
- Increased Water Permeability (Clay)
Diversity of Soil Microorganisms
Diversity of Soil Microorganisms

- A Tool in IPM
  - Increased Competition/Predation
  - Site Occupation
  - Nutrient Management
  - Fungal Presence for Aggregation
## Microbial Diversity

### Combined Foodweb Results

<table>
<thead>
<tr>
<th>Soil Amendment</th>
<th>ID</th>
<th>Dry Weight</th>
<th>Active Bacteria</th>
<th>Total Bacteria</th>
<th>Active Fungi</th>
<th>Total Fungi</th>
<th>Hypnial Diameter</th>
<th>Flagellates</th>
<th>Protozoa</th>
<th>Nematodes</th>
<th>VAM</th>
<th>TF/TB</th>
<th>AF/TF</th>
<th>AB/TB</th>
<th>AF/AB</th>
<th>Nitrogen</th>
<th>Actino Bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDCSF Mar</td>
<td>01-107003</td>
<td>0.50</td>
<td>84.8</td>
<td>1007</td>
<td>13.6</td>
<td>466</td>
<td>2.85</td>
<td>11529</td>
<td>11529</td>
<td>567</td>
<td>3.69</td>
<td>0.46</td>
<td>0.03</td>
<td>0.08</td>
<td>0.16</td>
<td>100-150</td>
<td>6.61</td>
</tr>
<tr>
<td>BDCSSF Mar</td>
<td>01-107004</td>
<td>0.460</td>
<td>133</td>
<td>775</td>
<td>28.1</td>
<td>492</td>
<td>2.9</td>
<td>59799</td>
<td>29899</td>
<td>299</td>
<td>7.31</td>
<td>0.64</td>
<td>0.06</td>
<td>0.17</td>
<td>0.21</td>
<td>100-150</td>
<td>17.8</td>
</tr>
<tr>
<td>BDCPSF Mar</td>
<td>01-107005</td>
<td>0.430</td>
<td>117</td>
<td>913</td>
<td>13.5</td>
<td>992</td>
<td>2.85</td>
<td>13372</td>
<td>32217</td>
<td>3221</td>
<td>19.3</td>
<td>1.09</td>
<td>0.01</td>
<td>0.13</td>
<td>0.12</td>
<td>100-150</td>
<td>115</td>
</tr>
</tbody>
</table>
Feed the Cover Crop
# Compost Rate Worksheet

**Date:** 2/18/2012  
**Vineyard Block:** Example  
**Compost Source:** Comgro Soil Amendments  
**Compost Type:** Grape Pomace  
**Source Contact:** Johnny Massa

<table>
<thead>
<tr>
<th>Compost Nutrients</th>
<th>Estimated Nutrient Available Year 1</th>
<th>Estimated Release lbs/Ton Compost</th>
<th>Desired Nutrient Per Acre (lbs.)</th>
<th>Compost Rate Tons/Acre</th>
<th>Total Acres</th>
<th>Total Compost Order (tons)</th>
<th>Total Compost Order (yd³)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>N</strong></td>
<td>2.62% 21.2 lb/yd³ 52.4 lb/ton</td>
<td>0.20</td>
<td>10.48</td>
<td>50</td>
<td>4.8</td>
<td>5</td>
<td>24</td>
</tr>
<tr>
<td><strong>P</strong></td>
<td>0.99% 8.0 lb/yd³ 19.8 lb/ton</td>
<td>0.40</td>
<td>7.92</td>
<td>38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>K</strong></td>
<td>3.13% 25.4 lb/yd³ 82.8 lb/ton</td>
<td>0.60</td>
<td>37.56</td>
<td>179</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Ca</strong></td>
<td>1.14% 9.2 lb/yd³ 22.8 lb/ton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mg</strong></td>
<td>0.56% 4.5 lb/yd³ 11.0 lb/ton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>S</strong></td>
<td>0.20% 1.6 lb/yd³ 4.0 lb/ton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Na</strong></td>
<td>0.11% 0.9 lb/yd³ 2.2 lb/ton</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Al</strong></td>
<td>0.0% 0.0 lb/yd³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fe</strong></td>
<td>0.0% 0.0 lb/yd³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mn</strong></td>
<td>0.0% 0.0 lb/yd³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Cu</strong></td>
<td>0.0% 0.0 lb/yd³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>B</strong></td>
<td>0.0% 0.0 lb/yd³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Zn</strong></td>
<td>0.0% 0.0 lb/yd³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Wt/Vol:** 810 lb/yd³  
**Range is 800 to 1000 lbs**  
**pH:** 7.2

**Notes:**  
Compost rates based on (limited by) desired N rates  
Actual N based on 20% release in year 1. 1st year release considered only.  
P and K release estimated as 40% and 60% respectively.  
PPM converted to %: 1% is equal to 10,000 ppm or 1 ppm is 0.0001%
### Mulch/Compost Calculations. Only change in the yellow cells

<table>
<thead>
<tr>
<th>Nitrogen LBS/ton*</th>
<th>Rate Applied T/Ac</th>
<th>Total N Applied</th>
<th>Availability (T-2)</th>
<th>Availability Application Method (T-3)</th>
<th>Total Available N/Ac</th>
<th>Total N From Last Year</th>
<th>Available from Last Year</th>
<th>Total From 2 Years Ago</th>
<th>Available from 2 Years ago</th>
<th>From Existing SOM**</th>
<th>Total N Available</th>
</tr>
</thead>
<tbody>
<tr>
<td>52.4</td>
<td>5</td>
<td>262</td>
<td>0.4</td>
<td>0.6</td>
<td>62.88</td>
<td>28</td>
<td>4.2</td>
<td>56</td>
<td>2.8</td>
<td>25</td>
<td>69.88</td>
</tr>
</tbody>
</table>

*From Lab Report  **line 36 below

### T-2 Availability of Nutrient Based On Time Of Application Before Planting

<table>
<thead>
<tr>
<th></th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Month Before</td>
<td>0.5</td>
</tr>
<tr>
<td>3 Months Before</td>
<td>0.4</td>
</tr>
<tr>
<td>6 Months Before</td>
<td>0.25</td>
</tr>
</tbody>
</table>

1=100%

### T-3 Nitrogen Availability Based On Application Method

<table>
<thead>
<tr>
<th>Method</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Injected</td>
<td>1</td>
</tr>
<tr>
<td>Worked In, Or Rained On Same day</td>
<td>0.8</td>
</tr>
<tr>
<td>Worked In, Or Rained On Next day</td>
<td>0.7</td>
</tr>
<tr>
<td>Left on Surface For More Than 2 Days</td>
<td>0.6</td>
</tr>
</tbody>
</table>

### Existing Soil Organic Matter (SOM)

<table>
<thead>
<tr>
<th>Texture</th>
<th>Pounds of N Released Per Acre for Each 1% of SOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loamy Sands &amp; Sandy Loams</td>
<td>40 to 60</td>
</tr>
<tr>
<td>Loams &amp; Silt Loams</td>
<td>15 to 30</td>
</tr>
<tr>
<td>Silty Clay Loams &amp; Clay Loams</td>
<td>10 to 20</td>
</tr>
</tbody>
</table>

Example: A clay soil with a SOM of 2.5% will release approximately 10 lbs of N for each 1% of SOM or a total of 25 lbs/Ac. Use either H7 and J7, or K7, but not both.

Source: Sonoma Compost, Will Bakx, 707-664-9113
Compost in the Field
Thank you Questions?

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