Nutrient Management for Vineyards

Annual Meeting
Maryland Wine and Grape Industry
February 15 & 16, 2013

Department of Environmental Science and Technology
• Do you have a nutrient management plan?

• Have you ever collected a soil sample?

• Have you ever collected a petiole sample?
Need a plan? Need to attend nutrient voucher training?

• Who needs a plan?
  – anyone who grosses $2,500 or more from ag operation, or
  – who has 8 or more animal units
  – operator needs the plan, not the owner

• Who need a nutrient application voucher?
  – anyone who applies nutrients to 10 or more acres
  – provided by Extension educators, commodity groups, fertilizer companies
Perennial woody crops vs. annual crops...What’s the difference?

- root morphology
- storage of nutrients within plant from year to year
- longer life cycle
- soil testing 0-8” may not tell the true availability story at all stages of the life cycle; plant tissue analysis is more informative
Perennial fruit crops are a different matter…

Nutrient recommendations for perennial fruit crops depend upon the production stage:

- biorenovation
- pre-plant
- non-bearing
- bearing
Production Stages

-2

Non-bearing

1 year

1 year

2 years

12 years

20+ years

Biorenovation
(1 – 2 years)

Planting
(0 years)

Bearing

Department of Environmental Science and Technology
Biorenovation

• assessment tool: soil test
• goal: get soil in good physical condition, optimize soil fertility and reduce nematode population
• goal: increased longevity & high productivity
• crop choice?
  – rape – nematode reduction
  – sudangrass – organic matter and soil quality
Pre-Plant Renovation and Soil Conditioning For New Vineyard and Small Fruit Plantings
Pre-plant stage

• assessment tool: soil test

• goal: adjust pH & enrich the soil with P and K for most or all of the bearing years – no N
Non-bearing stage

• assessment tool: none
• goal: encourage strong growth of young vines
  – no fertilizer unless specifically advised
Bearing stage
(Now the fun begins!)

• define “blocks”
• sample petiole
• sample soil
• sample any organic nutrient sources
  – pomace, lees

Department of Environmental Science and Technology
What is a block?

• an area within an vineyard that:
  – consists of plantings of the same age, variety and rootstock
  – has the same or similar soil types
  – maintained under the same cultural practices
    • vigor control, irrigation, fertility management

• a block is best determined by the vineyard manager
An area in a hypothetical vineyard…

Chardonnay

Road

Chambourcin

Creek

Pinot

Department of Environmental Science and Technology
Differences in varieties, age of vines, and soils

- Chardonnay (4 yrs)
- Chambourcin (6 yrs)
- Pinot (6 yrs)

- Murrill gravelly loam
- Thurmont gravelly loam

Department of Environmental Science and Technology
General guidelines for petiole sample collection

- sample each bearing block

- collect petiole samples:
  - at the recommended time
    - at full bloom
    - follow-up, 70 – 100 days post bloom
  - the recommended plant part - petiole for grapes
  - the recommended number of samples
  - from a wide selection of plants throughout the block
  - randomly or without bias

- avoid diseased leaves

Department of Environmental Science and Technology
## Grape Tissue Sample Collection

<table>
<thead>
<tr>
<th>Time to Sample</th>
<th>Number of Samples/Plant Part</th>
<th>Location on Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>At full bloom</td>
<td>50-75 petioles (large) 75-100 petioles (small)</td>
<td>petiole from the leaf across from the first blossom cluster</td>
</tr>
<tr>
<td>* 70-100 days post-bloom (mid to late August)</td>
<td>“</td>
<td>petiole of most recent fully-expanded leaf</td>
</tr>
</tbody>
</table>

* Follow-up if problems were discovered at bloom.

Department of Environmental Science and Technology
Tissue Sampling For Vineyards

Grapevine nutrition plays a major role in the vineyard, including vegetative vigor, yield, fruit quality, cold hardiness and longevity, therefore the nutrients in the soil and plant must be monitored and controlled for optimal efficiency. Since this is a constantly changing situation, it is best to set up a regular program of soil and petiole sampling and analysis, so that appropriate...
Why Time of Sampling is Critical

Department of Environmental Science and Technology
Preparing samples for shipment

• most labs recommend placing the sample in a paper bag

• label the bag with the block and variety name
  - make sure the label is consistent with the sample submission form and orchard map!

• allow the sample to dry for several days in the open bag

• tape the bag closed and ship to the lab

Department of Environmental Science and Technology
### Comparison of Some Labs Testing Plant Tissue
(4/13/12 update)

<table>
<thead>
<tr>
<th>Lab</th>
<th>Cost</th>
<th>Analyses</th>
<th>Comments</th>
<th>Sample Preparation</th>
<th>Tissue Submission Form on Website?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A &amp; L Eastern Agricultural Lab</td>
<td>$24.00 w/o</td>
<td>PL2</td>
<td>Air dry if very wet and place in paper bag –</td>
<td>Yes. Go to</td>
<td></td>
</tr>
<tr>
<td>7621 Whitepine Road Richmond, VA 23227</td>
<td>recommendations</td>
<td>P12</td>
<td>no plastic.</td>
<td><a href="http://www.al-labs-eastern.com/agricultural.html">http://www.al-labs-eastern.com/agricultural.html</a></td>
<td></td>
</tr>
<tr>
<td>Ph: 804-743-9401</td>
<td></td>
<td>N, P, K, Mg, Ca, Na, Fe, Al, Mg</td>
<td></td>
<td>Choose the appropriate form</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.al-labs-eastern.com">www.al-labs-eastern.com</a></td>
<td></td>
<td>B, Cu, Zn</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agri Analysis, Inc., a division of Pioneer Water Testing Laboratory, Inc.</td>
<td>$24.00</td>
<td>PLT</td>
<td>Do not dry samples. Place in paper bag.</td>
<td>Yes. Go to</td>
<td></td>
</tr>
<tr>
<td>280 Newport Road</td>
<td></td>
<td>N, P, K, Ca, Mg, Cu, Fe, Mn, Zn, B, Al, Na, S</td>
<td></td>
<td><a href="http://www.agrianalysis.com">www.agrianalysis.com</a></td>
<td></td>
</tr>
<tr>
<td>Leola, PA 17540</td>
<td></td>
<td>PLT plus Molybdenum</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph: 717-656-9326 or 1-800-464-6019</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="http://www.agrianalysis.com">www.agrianalysis.com</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>AgroLab, Inc.</td>
<td>$30.00 (10% discount for soil customers)</td>
<td>Standard</td>
<td>Air dry and place in a paper bag.</td>
<td>Yes. Go to</td>
<td></td>
</tr>
<tr>
<td>1009 Mattland Way Milford, DE 19963</td>
<td>$35.00 (10% discount for soil customers)</td>
<td>N, P, K, Ca, Mg, S, Zn, Fe, Mn, Cu, B, Na, Mo</td>
<td></td>
<td><a href="http://www.agrolab.us/pdf/MiscSampleInformationForm.pdf">http://www.agrolab.us/pdf/MiscSampleInformationForm.pdf</a></td>
<td></td>
</tr>
<tr>
<td>Ph: 302-265-2734</td>
<td></td>
<td>Peitole</td>
<td></td>
<td>Choose “Misc Sample Information Form” on the Home page.</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.agrolab.us">www.agrolab.us</a></td>
<td></td>
<td>%N, P, K, Ca, Mg, S and ppm NO3, Zn, Fe, Mn, Cu, B, Na</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brookside Laboratories, Inc.</td>
<td>N/A</td>
<td>N/A</td>
<td>Brookside prefers to receive samples from their consultants only.</td>
<td>Samples should be taken by a Brookside consultant.</td>
<td>N/A</td>
</tr>
<tr>
<td>308 South Main Street</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Knoxville, OH 45871</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ph: 419-753-2448</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><a href="http://www.blinc.com">www.blinc.com</a></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**
- Assume payment must be included with samples.
- Web pages are updated frequently and addresses for the plant tissue information sheets may change. If this occurs, go to the lab’s home page and follow the links to the plant tissue information sheet.
<table>
<thead>
<tr>
<th>LABORATORY NUMBER</th>
<th>NAME (PLEASE PRINT)</th>
<th>NAME OF COMMERCIAL FIRM</th>
</tr>
</thead>
<tbody>
<tr>
<td>SERIAL NO.</td>
<td>STREET OR R.D. NO.</td>
<td></td>
</tr>
<tr>
<td>DATE</td>
<td>CITY</td>
<td>ZIP CODE</td>
</tr>
</tbody>
</table>

PLANT ANALYSIS INFORMATION SHEET: ALL FRUIT CROPS

Note: Payment of $24.00 must be submitted with plant sample (check payable to Penn State).

County: ___________________________; Field No.: ___________________________; Crop: ___________________________; Variety: ___________________________; The soil is: Gray soil; Clay; Loam; Silt; Heavy; Quickly; ...

Was a leaf sample submitted from this block last year? Yes [ ] No [ ]; (If yes, enter sample number _____________.)

Was a soil sample submitted with this block last year? Yes [ ] No [ ]; (If yes, enter sample number _____________.)

Sampling time for grapes: bloom sample [ ]; veraison sample [ ]; harvest sample [ ]; Will the fruit be used for fresh market [ ]; or processed [ ]; Spacing __________ ft x __________ ft (For blueberries, size of bed in feet) [ ]; The berries are: Very short [ ]; Medium [ ]; Long [ ]; Very compact beds are: Poor [ ]; Vigorous [ ]; Excessive [ ]; The color is: About right [ ]; Light Green [ ]; Yellow [ ]; Brown [ ];

COMPLETE THIS SECTION FOR SPECIAL PROBLEMS ONLY:

If the leaf is discolored, does the color variation occur:

Along leaf margin [ ]; Between main veins [ ]; Between small veins [ ]; Along veins [ ]; Over the entire leaf [ ]; In spots [ ];

Leaves were first affected at shoot: Tip [ ]; Middle [ ]; Base [ ];

Symptoms were first seen: June [ ]; July [ ]; August [ ]; September [ ];

Leaf drop was: Early [ ]; Late [ ]; Normal [ ];

Leaves dropped first on: New wood [ ]; Spurs [ ]; Shoot tip [ ]; Shoot base [ ];

Fruit color is: Poor [ ]; All right [ ]; Unusually well colored [ ];

Fruit quality is: Poor [ ]; Acceptable [ ]; Excellent [ ];

Crop size is: Poor [ ]; Average [ ]; Heavy [ ];

Rootstock (If applicable): ___________________________; Age of plants sampled: ________________

Lime: ___________________________; Fertilizer: ___________________________; (date)

(or) ___________________________; applied on ___________________________; (analysis) ___________________________; (date)

Were foliar nutrients applied this year? Yes [ ] No [ ]; If yes, list rates/acre ___________________________;

Weed control:

Chemical used ___________________________; Amount of active ingredient/acre ___________________________; Date applied ___________________________;
What is different about soil sampling in bearing perennial fruit crops?

• a soil sample should be collected from each bearing block

• soil samples should be taken from the same general areas where tissue samples were taken

• soil samples can be taken in the fall following tissue sampling when sampling is easier
Developing recommendations for vineyards

• based primarily on tissue analysis
• soil tests provide clarification or confirmation
How soil and tissue analyses are used together

• Let’s say:
  – tissue analysis indicates that P was deficient
  – soil analysis indicates that plant-available P is in the excessive range
  – suggests a root uptake issue like nematodes or a disease
  – adding additional P fertilizer is not advisable
How often must samples be collected?

• soil
  – in biorenovation areas
  – pre-plant
  – every 3 years in bearing blocks

• tissue (in bearing blocks)
  – at least every 3 years
  – more often if nutritional problems are observed
  – if nutrients were added to correct a problem

• organic waste (as close to application time as possible)
  – yearly until a baseline is established
Preparing for Plan Development

• assemble relevant information

  – soil samples
  – tissue samples
  – organic nutrient source analysis (pomace)
  – maps of operation and each block
  – farm information sheet
  – field information sheet
# Farm Information Sheet

Operator Name: 

Address: 

Phone: 

County: 

<table>
<thead>
<tr>
<th>Farm</th>
<th>Address (street and town)</th>
<th>Acreage Farmed</th>
<th>Tax Account ID Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Field Information Sheet for Vineyards

**Farm:** 

**Plan Year:** 

**Farm Name:** 

<table>
<thead>
<tr>
<th>BLOCK ID</th>
<th>ACRES</th>
<th>Variety</th>
<th>GROWTH STAGE¹</th>
<th>YIELD GOAL</th>
<th>TILLAGE METHOD</th>
<th>NOTES²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ PREPLANT (P), NONBEARING (NB) OR BEARING (B)
² VIGOR AND PRUNING WEIGHT
Strawberries

Blueberries

Alternative Crops

Tree Fruit

Calendar

Grants

Web Links

Classified Ads

WMREC Home

**Dormant** (Early Dormant January-February)

- Final Pruning, Pre-Emergence
- Herbicides, and Planting New Vines
- Grow Tubes
- Online Sustainable Viticulture Resources from USDA-NAI
- Warm Weather and Deacclimation
- Balanced Pruning II - Timing
- Balanced Pruning III - Pre Pruning

(Return to top of page)

**Pre-Bloom** (March-April)

- Avoiding Injury to Grapes from Off Target Herbicide Exposure
- Brown Marmorated Stink Bug (BMSB) - Part 2 (Revised 7/18/11)
- Brown Marmorated Stink Bug (BMSB) - Part 3 Fruit Damage and Juice Wine Taint (7/22/11)
- Canopy Management - Shoot Thinning and Positioning
- Early-Season Disease Management
- Phomopsis
- Pre-Bloom to Post Bloom Disease Management
- Managing Frost Damage: Background, Compensation, and Potential Options
Tissue Sampling and Testing

Step 5. Tissue Sampling and Testing (if applicable)

Tissue analyses are the bases for nutrient recommendations for fruit nutrient management plans.

The following worksheets and information sheets will assist you with the tissue sampling and testing step of nutrient management plan development.

- Sample Collection and Preparation for Perennial Fruit Crops Instruction Card
- Comparison of Some Labs Testing Plant Tissue (Updated 4-13-12)
- Field Information Sheet for Perennial Fruit Crops
- Fertilizer Recommendations for Bearing Perennial Fruit Crops
- Fertilizer Recommendations for Non-Bearing Perennial Fruit Crops
- Tissue Sampling for Vineyards

For more information, contact Trish Steinhilber

Last updated: 05/8/2012
Other Ag Activities in Your Operation?

• horses, beef cattle, other ag animal?
• pastures?
• fields in crops other than grapes?
• all ag production activities must be included in plan
Leasing Part of a Larger Ag Operation?

- plans are operator-specific
- other operators on part of property/tract?
  - They need their own plan!
Information Needs

• quantity of various waste produced
  – pounds of pomace per ton of grapes

• composition of various wastes produced and land-applied on operation
  – build a library of info so “average values” can be generated
Any questions or concerns?