



Maryland Nutrient Management

Consultant's Resource Notebook



Maryland Department of Agriculture
Nutrient Management Program
50 Harry S. Truman Parkway
Annapolis, Maryland 21401
410-841-5959

Introduction

This notebook contains a variety of resources that you will turn to over and over as you work with agricultural operators.

The design follows the outline of the "Fundamentals" course, allowing you to add notes and handouts. Space has been left intentionally for you to add materials in the future. The MDA Nutrient Management Program will help you keep your "Law, Regulations and Reference Manual" up to date. This notebook however, is yours. Use the internet references and continuing education courses to keep your notes up to date. Add materials that relate to the type of operations you work with.

Materials for "Fundamentals of Nutrient Management Course"

- 1) Textbook: "Chesapeake Bay Region Nutrient Management Training Manual"
New version just released digitally:
http://www.agnr.umd.edu/users/waterqual/themes/nutrient_management/manmh2006.htm
- 2) Notebook: "Maryland Nutrient Management: Law, Regulations and Manual"
- 3) Consultant's Resource Notebook

Course Description for "Fundamentals of Nutrient Management"

This two-day course provides instruction in the basic concepts of nutrient management required to pass the Nutrient Management Certification Exam. The exam consists of 100 multiple choice questions from nine knowledge areas. Eight of these knowledge areas are covered by the "Chesapeake Bay Region Nutrient Management Training Manual." Each of the Bay states uses this core question pool for its certification exam. The ninth knowledge area is specific to Maryland.

Knowledge Area	Percentage
1. General Nutrient Management	10
2. Basic Soil Science	12
3. Agricultural & Environmental Management	15
4. Sampling, Testing and Analysis	10
5. Basic Soil Fertility	15
6. Fertilizer Management	10
7. Manure Management	12
8. Biosolids (Sludge) Management	6
9. Technical Recommendations, Regulations & Incentives	10
Total	100

Reciprocity Agreements

Maryland, Pennsylvania, Virginia and Delaware have reciprocity agreements on training, exam standards, certification and continuing education credits. Persons seeking certification in Maryland who plan to work in PA, VA or DE need to consult their state nutrient management program for state-specific regulations and requirements.

Questions or comments should be directed to:

Maryland Nutrient Management Program
Maryland Department of Agriculture
50 Harry S. Truman Parkway
Annapolis, MD 21401
Phone: 410-841-5959 Fax: 410-841-5950

Consultant's Resource Notebook

Table of Contents



- I. **Soil Science and Soil Fertility Tools**
 - Maryland Leaching Indices for Nitrates and Soluble Nutrients
 - Rainfall Data for Maryland Counties
 - Sources for Soil Maps
 - Soil pH Management and Determining Liming Rates

- II. **Soil, Tissue & Manure Assessment**
 - Soil Sampling Procedures for Nutrient Management
 - Comparison of Soil Test Labs
 - Equivalent Phosphorus Index Threshold Levels
 - Making Decisions for Nitrogen Fertilization Using PSNT
 - Plant Tissue Analysis
 - Comparison of Some Labs Testing Plant Tissue
 - Sampling Manure for Nutrient Content
 - Comparison of Some Labs Testing Manure
 - Sampling Litter for Nutrient Content in Poultry Houses

- III. **Developing Nutrient Recommendations**
 - MD's Agronomic Soil Capability Assessment Program (MASCAP)
 - Phosphorus Removal by Crops in Mid-Atlantic
 - The Maryland Phosphorus Site Index: An Overview

- IV. **Management of Nutrient Sources**

 - Manure Management
 - Manure Production Rate and Quantity Estimation
 - Density of Bedding Materials
 - Determining the Amount of Manure in a Pile or a Pool
 - Poultry Waste Production & Storage Calculation Sheet
 - Converting From Dry-weight to Wet-weight Basis
 - Biosolids/Sludge
 - MDE: Sewage Sludge Utilization in Maryland
 - Guidelines for Application of Digested Sewage Sludge & Composted Sewage Sludge to Agricultural Land

- V. **Certification and Licensing**
 - Application for Consultant Certification & Application for License
 - Guidelines & Procedures for Inspection of Certified Nutrient Management Plans
 - Guidelines for Continuing Education & Request for Approval Form

VI. Plan Development

- Finding Watershed Codes on the Internet
- Watershed Codes & Watershed Map Order Form
- Plan Reporting Form
- Annual Implementation Report Form & Instructions

VII. Incentives

- Technical Assistance and Cost Share Program
- Income Tax Subtractions

Appendix 1: Software & Internet Resources

- Nutrient Management Resources on the Internet
- Nutrient Management Planning Software

Appendix 2: Nutrient Recommendations not yet in the Reference Manual

- Fertilizer Recommendations for Landscape Trees & Shrubs
- Mineralization Rates for Organic Nutrient Sources

Appendix 3: Telephone Contacts

- **Comparison of Soil Test Labs**
-



Comparison of Soil Test Labs
(Labs Participating in the 2000 Sample Exchange)
(2/28/08 update)

Lab	Cost	Analyses	Comments	Soil Submission Form on Website?	Ordering Supplies
A & L Eastern Agricultural Lab 7621 Whitspine Road Richmond, VA 23237 Ph: 804-743-9401 www.al-labs-eastern.com	\$7.60 (Mehlich-3) without recs \$8.40 (Bray-Ammonium Acetate) without recs	<u>Basic Mehlich Package (S1)</u> OM, P, K, Ca, Mg, Ca, pH, buffer pH, CEC, percent base saturation of cations <u>Basic (Bray-Ammonium Acetate) Package (SA1)</u> OM, P, K, Ca, Mg, Ca, pH, buffer pH, CEC, percent base saturation of cations	Several micronutrient combinations are also available. See Schedule of Fees.	Yes. Go to www.al-labs-eastern.com/agri Choose "Submittal Form" next to Soil Analysis.	Order form is on the website. www.al-labs-eastern.com/agri Choose "Download the Supply Order form."
Agri Analysis, Inc. 280 Newport Road PO Box 483 Leola, PA 17540 Ph: 717-656-9326 www.agrianalysis.com	\$6.50 commercial \$8.25 private \$8.75 commercial \$10.00 private	<u>SBA</u> pH, buffer pH, lime requirement, P ₂ O ₅ , K ₂ O, Ca, Mg, CEC <u>SBOM</u> SBA+OM Also have several analyte lists with trace elements (see website).	Lab has pick-up locations in Cecil County, Walkersville, and Keymar. <10 samples - \$5.00; 10-20 samples - \$0.50 each; >20 samples - \$10.00 See website for routes. Reduced shipping rates are also available through DHL.	Yes. Go to www.agrianalysis.com Click on "Resources." Scroll down to the Soil Information heading and click on "Soil Request Form Page 1."	Call 717-656-9326 or send e-mail to info@agrianalysis.com for bags and info sheets.
Brookside Laboratories, Inc. 308 South Main Street New Knoxville, OH 45871 Ph: 419-753-2448 www.blinc.com	Will be determined by a consultant	<u>SOO1</u> pH, OM, Mehlich-3 P, Mn, Zn, B, Cu, Fe, Al, CEC, percent base saturation of cations, S, Bray, II P	Brookside does not provide recs. Consultants develop the recs. Brookside prefers to receive samples from their consultants only.	Yes. www.blinc.com/ worksheet_pdf/ SoilWorksheet.pdf	Call 419-753-2448 to order soil bags.

NOTES:

- ASSUME PAYMENT MUST BE INCLUDED WITH SAMPLES.
- Organic matter (OM) is an important soil property to track but is not offered in some basic packages. Producers are advised to request OM even if they choose a lab that charges an additional fee for the information.
- Soil texture is not offered by most labs and is very expensive by those who do offer it. Obtain information from soil survey after determining the dominant mapping unit of a field.
- Sample depths should be 8 inches.
- There is no need to request recommendations from the soil test labs.
- Web pages are updated frequently and addresses for the soil information sheets may change. If this occurs, go to the lab's home page and follow the links to the soil information sheet.

AGRICULTURAL NUTRIENT MANAGEMENT PROGRAM

(301) 405-1317 • FAX (301) 314-7375

1145 COLB STUDENT ACTIVITIES BUILDING • ENVIRONMENTAL SCIENCE AND TECHNOLOGY • COLLEGE PARK, MARYLAND 20742-1038

LOCAL GOVERNMENTS • U.S. DEPARTMENT OF AGRICULTURE COOPERATING EQUAL OPPORTUNITY PROGRAMS



Comparison of Soil Test Labs
(Labs Participating in the 2000 Sample Exchange)
(2/28/08 update)

Lab	Cost	Analyses	Comments	Soil Submission Form on Website?	Ordering Supplies
Pennsylvania Agricultural Analytical Services Penn State University University Park, PA 16802 Ph: 814-863-0841 www.aasl.psu.edu	\$9.00	<u>Standard Soil Test</u> pH, Mehlich lime requirement, P, K, Ca, Mg, Zn, Cu, S	See website for more analyses.	Yes. Go to www.nasl.psu.edu/Submissionforms_all.html Click on the desired form.	Call 814-863-0841 to purchase kits.
	\$5.00	<u>OM</u>			
Spectrum Analytic, Inc. PO Box 639 1087 Jamison Road NW Washington Court House, OH 43160 Ph: 800-321-1562 www.spectrumanalytic.com	\$7.00 (dealer)	<u>S1</u> pH, buffer pH, OM, P, K, Ca, Mg, CEC, percent base saturation of cations <u>S2</u> Basic package plus any 3 of the following - B, Cu, Fe, Mn, S, Zn	Dealer price is available to MCE or other consultants. Soil info form would have to indicate "MCE" under "company," and the sample must be sent by the MCE office. Report comes back to MCE, not the grower. Checks from individual growers are OK.	Yes. Go to www.spectrumanalytic.com/services/forms/agsoil.pdf	Order form is on the website. www.spectrumanalytic.com/services/supplies
	\$10.00 (grower)				
	\$10.00 (dealer) \$13.00 (grower)				
University of Delaware Soil Testing Program 152 Townsend Hall 531 S. College Avenue Newark, DE 19717-1303 Ph: 302-831-1392 http://ag.udel.edu/other_websites/DSTP/	\$7.50	<u>M3 Routine Analysis</u> pH, buffer pH, OM, P, K, Ca, Mg, Mn, Zn, Cu, Fe, S, B, Al		Yes. Go to http://ag.udel.edu/other_websites/DSTP/forms/cominfo.pdf	Call 302-831-1392 or e-mail kgartley@Udel.edu Soil bags are purchased for \$7.50, which includes the price of analysis.

NOTES:

- ASSUME PAYMENT MUST BE INCLUDED WITH SAMPLES.
- Organic matter (OM) is an important soil property to track but is not offered in some basic packages. Producers are advised to request OM even if they choose a lab that charges an additional fee for the information.
- Soil texture is not offered by most labs and is very expensive by those who do offer it. Obtain information from soil survey after determining the dominant mapping unit of a field.
- Sample depths should be 8 inches.
- There is no need to request recommendations from the soil test labs.
- Web pages are updated frequently and addresses for the soil information sheets may change. If this occurs, go to the lab's home page and follow the links to the soil information sheet.

AGRICULTURAL NUTRIENT MANAGEMENT PROGRAM

(301) 405-1329 • FAX (301) 214-7375

1145 COLE STUDENT ACTIVITIES BUILDING • ENVIRONMENTAL SCIENCE AND TECHNOLOGY • COLLEGE PARK, MARYLAND 20742-1038

LOCAL GOVERNMENTS • U.S. DEPARTMENT OF AGRICULTURE • MULTIPLE COOPERATING EQUAL OPPORTUNITY PROGRAMS



Comparison of Soil Test Labs
(Labs Participating in the 2000 Sample Exchange)
(2/28/08 update)

Lab	Cost	Analyses	Comments	Soil Submission Form on Website?	Ordering Supplies
Waters Agricultural Laboratories, Inc. PO Box 382 257 Newton Highway Camilla, GA 31730-0382 Ph: 229-336-7216 www.watersag.com	\$6.50	<u>Routine Test 1</u> pH, buffer pH, P, K, Ca, Mg, CEC, percent base saturation of cations plus any 2 of the following – Zn, Mn, Fe, Cu, B	Waters has UPS ARS labels available and will pay for shipping of cartons, which contain 25 or more samples of any kind – soil, manure, or plant tissue.	Yes. Go to www.watersag.com	Order form is on the web site. www.watersag.com
	\$5.50	<u>Basic Test 2</u> pH, buffer pH, P, K, Ca, Mg, CEC, percent base saturation of cations	Waters offers both Melich-1 and Melich-3 extraction methods. All Maryland samples should be analyzed using Melich-1. Confirm the extraction method in the upper left corner of the report. If Melich-3 was used, contact a regional specialist for the appropriate conversion.	Click on the "Soil Analysis" link (#1). Scroll down to the SUPPLIES section and click on the "Sample Submission Sheet."	Click on the "Sampling Supplies" link (#17). (UPS ARS labels can be ordered here.)
	\$10.00	<u>Basic Test 3</u> pH, buffer pH, P, K, Ca, Mg, CEC, percent base saturation of cations, Zn, Mn, Fe, Cu, B Other packages are available. Check web site.			
	\$0.75 (If requested along with other soil tests.)	<u>OM</u>			

NOTES:

- ASSUME PAYMENT MUST BE INCLUDED WITH SAMPLES.
- Organic matter (OM) is an important soil property to track but is not offered in some basic packages. Producers are advised to request OM even if they choose a lab that charges an additional fee for the information.
- Soil texture is not offered by most labs and is very expensive by those who do offer it. Obtain information from soil survey after determining the dominant mapping unit of a field.
- Sample depths should be 8 inches.
- There is no need to request recommendations from the soil test labs.
- Web pages are updated frequently and addresses for the soil information sheets may change. If this occurs, go to the lab's home page and follow the links to the soil information sheet.

AGRICULTURAL NUTRIENT MANAGEMENT PROGRAM

(301) 405-1319 • FAX (301) 314-7375

1145 COLE STUDENT ACTIVITIES BUILDING • ENVIRONMENTAL SCIENCE AND TECHNOLOGY • COLLEGE PARK, MARYLAND 20742-1038

LOCAL GOVERNMENTS • U.S. DEPARTMENT OF AGRICULTURE COOPERATING EQUAL OPPORTUNITY PROGRAMS



Department of Natural Resource Sciences
and Landscape Architecture

Agricultural Nutrient Management Program

**MANAGING OUTPUT FROM VARIOUS SOIL TEST LABORATORIES
NOT INCLUDED IN 2000 SAMPLE EXCHANGE
(12-05)**

A & L (Memphis, Tennessee)

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
	Mehlich-3	Mehlich-3	ppm P (default) lbs P/A (if requested)	<p>If results are expressed in <u>ppm</u>, choose "Penn State, ppm" in <i>NuMan Pro</i> and enter the A&L (Tennessee) soil test values.</p> <p>If results are expressed in <u>lb/A</u> elemental P, K, Ca, and Mg, you must first pre-convert to oxide basis. Multiply – P by 2.3</p>
K, Ca, Mg	Mehlich-3	Mehlich-3	ppm K, Ca, Mg (default) lbs K, Ca, Mg/A (if requested)	<p>K by 1.2 Ca by 1.4 Mg by 1.7</p> <p>Choose "Penn State, lb/A" in <i>NuMan Pro</i> and enter the converted soil test values.</p> <p>You must also enter soil texture for fields to generate recommendations.</p>

(301) 405-1319 • FAX (301) 314-7375

1145 COLE STUDENT ACTIVITIES BUILDING • NATURAL RESOURCE SCIENCES AND LANDSCAPE ARCHITECTURE • COLLEGE PARK, MARYLAND 20742-1038

LOCAL GOVERNMENTS • U.S. DEPARTMENT OF AGRICULTURE COOPERATING

EQUAL OPPORTUNITY PROGRAMS

AgriEnergy Resources

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
P	Bray P1, Bray P2	Bray P1, Bray P2	lbs P/A	For P, use <u>Soluble Tests (Bray 1, P-1)</u> to convert to "A&L, VA, Bray" ppm. (Do NOT use Bray 2, P-2, reported as Exchangeable Extracts.)
K, Ca, Mg	IN NH ₄ OAC	IN NH ₄ OAC	lbs K, Ca, Mg/A	For K, Mg, and Ca, use <u>Exchangeable Extracts (Ca-2, Mg-2, K-2)</u> to convert to "A&L VA, Bray" ppm. (Do NOT use Soluble Tests for K, Ca and Mg.) Multiply the AgriEnergy Resources soil test results by 0.5 to convert them to ppm, and then choose "A&L, VA, Bray" in <i>NuMan Pro</i> , and enter the converted values. You must also enter soil texture for fields to generate recommendations.

CLC

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
P	Bray P1	Bray P1	lbs P/A	Multiply the CLC soil test results by 0.5 to convert them to ppm, and then choose "A&L, VA, Bray" in <i>NuMan Pro</i> , and enter the converted values.
K, Ca, Mg	IN NH ₄ OAC	IN NH ₄ OAC	lbs K, Ca, Mg/A	You must also enter soil texture for the fields to generate recommendations.

Kinsey Ag Services (using Parry Agricultural Laboratory)

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
P	Bray P2, Olsen (routine); Bray P1 by request only	Bray P1, Bray P2 or Olsen	lbs P ₂ O ₅ /A	ONLY Bray P1 P results can be used! Multiply the Kinsey soil test results for P by 0.22 and K, Ca, and Mg by 0.5 to convert them to ppm, and then choose "A&L, VA, Bray" in <i>NuMan Pro</i> , and enter the converted values.
K, Ca, Mg	IN NH ₄ OAC	IN NH ₄ OAC	lbs K, Ca, Mg/A	You must also enter soil texture for the fields to generate recommendations.

397
 Open Labs, LLC

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
P	Mehlich-3	Mehlich-3	lbs P ₂ O ₅ /A	Choose "Brookside, lb/A" in <i>NuMan Pro</i> . <u>Note:</u> Use easily extractable P values.
K, Ca, Mg	Mehlich-3	Mehlich-3	lbs K, Ca, Mg/A	You must also enter soil texture for fields to generate recommendations.

Midwest Laboratories Inc.

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
P	Bray P1	Bray P1	ppm P	Choose "A&L, VA, Bray" in <i>NuMan Pro</i> and enter the Midwest soil test values. You must also enter soil texture for fields to generate recommendations.
K, Ca, Mg	1N NH ₄ OAC	1N NH ₄ OAC	ppm K, Ca, Mg	<u>Note:</u> For P, enter P1 (weak Bray or available P) values into <i>NuMan Pro</i> , NOT P2 (strong Bray) or Bicarbonate P.

Skyview Laboratory Inc. (Samples analyzed after 1/1/03).³

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
P	Mehlich-3	Mehlich-3	ppm P	Choose "Penn State, ppm" in <i>NuMan Pro</i> and enter the Skyview Lab soil test values.
K, Ca, Mg	Mehlich-3	Mehlich-3	ppm K, Ca, Mg	You must also enter soil texture for fields to generate recommendations.

³ Soil test values from all samples received from a Maryland address will be reported in ppm. If you receive a soil test report with other units, contact your regional specialist for information on appropriate conversions.

Virginia Tech

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
P	Mehlich-1	Mehlich-1	lbs P/A	Choose "Waters" in <i>NuMan Pro</i> and enter the Virginia Tech soil test values.
K, Ca, Mg	Mehlich-1	Mehlich-1	lbs K, Ca, Mg/A	You must also enter soil texture for fields to generate recommendations.

Virginia University

NUTRIENT	EXTRACT USED	EXTRACT UPON WHICH NUTRIENT LEVELS ARE BASED	UNITS	ACTION
P	Mehlich-1	Mehlich-1	lbs P/A	<p>Convert from lbs/A of the elemental form to lbs/A of the oxide form as follows:</p> <p style="padding-left: 40px;">Multiply lbs P/A x 2.3</p> <p style="padding-left: 40px;">Multiply lbs K/A x 1.2</p> <p>Then consult Table 2 in SFM-3 to convert to index.</p>
K, Ca, Mg	Mehlich-1	Mehlich-1	lbs K, Ca, Mg/A	<p>Consult Table 2 in SFM-3 to convert Ca and Mg to index.</p> <p>Choose "U. of Maryland" in <i>NuMan Pro</i> and enter these converted values.</p> <p>You must also enter soil texture for fields to generate recommendations.</p>