Minutes
Mid-Atlantic Soil Testing
Plant Analysis Workgroup

February 14-15, 1990
Southern States Building
Richmond, Virginia

Meeting was called to order by Chairman Ray Campbell. The group was welcomed by Southern States representative Charlie Hubbard. Meeting schedule and topics presented follow:

Tom Sims (Delaware): Presented sample exchange data. Soil samples for exchange came from manure application plots where corn, soybeans and grain sorghum were being grown. Laboratories using Mehlich-1 showed some variance which may be attributed to method of measuring soil or in dilution of samples within the lab. Three laboratories using Mehlich-3 were consistent across all elements. Plant and waste analyses was very consistent across laboratories. Sims raised some question about the value of sample exchanges while others in the group expressed an interest in continuation of sample exchange as a means of monitoring quality control. The general consensus was that more time be allocated in the future for discussing the subsequent fertilizer recommendations that arise from sample exchange date. Sims proposed directing sample exchange more toward uniformity in recommendations. (This may not be feasible or practical without uniformity in laboratory techniques.

Steve Donohue (Va): Update on Mehlich-3.
South Carolina and Georgia satisfied with Mehlich-1. Expressed Virginia's interest in converting to Mehlich-3 when time permits. An increase in Mehlich-3 data has occurred over the past few years. Collected recent publications on Mehlich-3 some originating from Mid-Western states. Laboratories currently using Mehlich-3 in their soil testing program are: North Carolina, Kentucky, Oklahoma, Agrico Chemical, Brookside, Arkansas, Prince Edward Island and Ontario Canada.

Ray Tucker (NC): Methods Determining Lime Rates. Discussed various methods used by states for making lime recommendations. Some use buffer-acidity measurements, others by visual and textural classification. Some states use a number of parameters such as CEC, B.S., % Ca, % Mg etc for lime recommendations. Some give residual credit and specify type of lime to use depending on Mg% in soil along with quality of lime. Survey of methods used by each state shown below.

Donohue (Va): Std N, P, K Rec's. Expressed some concern about N rates, ie, too much N is being recommended. Suggested more time in future meetings for more in-depth discussion of N recommendations. Showed data comparing fertilizer rates at soil test "zero" level versus soil test level where fertilizer recommendations would be reduced to zero.

Evanylo, Greg (Va): Soil/Plant Calibration. Showed data comparing N rates and corresponding effects on nitrogen carryover in subsoil.

Rufus Chaney, USDA: Presented slides and discussed land application of organic sewage sludge and the associated benefits and/or precautions with respect to human consumption and/or toxic effects on plants. Has numerous publications on file for reference sources. Disucussed the detriment or misleading information one may obtain from small pot greenhouse studies. Discussed the relationship between pH and nutrient availability (particularly heavy metals).

Mark Flock (Brookside): Discussed application and modifications of ICP. Can analyze 800 sample/day (max) best results obtained with 450 samples/day. Runs a variety of matrices (Mehlich-3, Bray, Olsen, NH_4OAc) within any matrix problems.

Don Storer (Agrico): Discussed application of DCP. Much smaller instrument, much simpler electronic system, high salt tolerance (50% salts). Sample chamber of DCP ;much smaller than ICP resulting in shorter sample memory from sample to sample. Thermal regulation much better on newer models of DCP. Plasma temperature runs about 10,000 degrees F. Can analyze 1600 samples per day (full 8-hours operation).

David Aho (Va): Discussed Va's experiences with Jarrell-Ash Autoscan ICP. Run 105,000 soil samples/year. Uses Technican autosampler. Cu and Al affect P, Fe in sample affects Ca. Have three people in laboratory that are trained to run ICP. Standardize instrument 2-3 time/day. Cost of analysis about 0.06 cents/sample element.

Ray Campbell (NCDA): Discussed ICP methods for running plant, wastes and water. Discussed turn around time (2 days) -laboratory time due to shorter digestion of microwave digestion equipment. Total ICP unit cost $160,000 (total package). Mentioned time required after installations to get instrument on line for routine operation.

Don Storer (Agrico): Quality control distributed literature on Quality Assurance (QA) with mention that QA ;may become a requirement in the future, particularly with increased concern about chemical contaminants within the food chain. This implies the need for standardized, good analytical technique (secretaries note). Storer discussed application of specific ion electrodes for NO_3 using NH_4 specific ion electrode. Contact Don on questions regarding this method (secretaries note).

Paul Chu (A & L): Discussed Kjeldahl method for determining total nitrogen. Determines NH_4 by distillation using $CuSO_4$ as catalyst. Extracts NO_3 with H_2 analyzes with specific ion electrode. Better method for NO_3 determination appears to be ion - chromatographic techniques.

Ray Tucker (NCDA): Presented pine bark data with Mehlich-3 extraction. Compared Mehlich-3 data with saturated extract. Stimulated discussion on particle size effect on Mehlich-3 extraction. Requests for pine bark analyses increasing in North Carolina with increase in container-grown nursery crops. Discussed micronutrient status of pine bark and questioned the need for blanket application of micronutrient packages. Evidence exists to indicate some problems associated with nutrient imbalances and/or toxicities. Suggested pine bark be included in future exchange samples.

G. S. Miner (NC): Discussed experiment for correcting Mn deficiency on tobacco with soil and foliar application. Applied Mn at 0.45% Mn at different times and combinations of time. Soil applied Mn (BC and Bd) applied at different rates. Data published in Tobacco Sci. 31:28-31 (1987). Distributed reprints on effects of acid starter fertilizers on Mn uptake by Corn. Reference: Agronomy J. Vol. 78:291-295 (1986).

Evanylo, Greg (Va): Presented results of fertility study on cucumbers comparing Mehlich-1/Mehlich-3. Used the single rep. boundary line approach. Abstract of research presented below

Tom Sims (Del): Manure Management: Has developed a bulletin on manure management. Delaware concerned about effect of agriculture on ground water pollution. Wells in Delaware have $NO_3 > 10$ ppm, some field study wells greater than 20 ppm NO_3. Problems appear to be more perception than scientific fact. Started enclosing manure stockpiles with buildings in order to reduce groundwater pollution. Delaware has 500,000 acres of crop - this would accomodate the major portion of manure production. Presented data on field studies with various rates of manure/acre. Nitrogen in soil profile gone after 9 months -indicates leaching.

STATE REPORTS

Steve Heckendorn (Del): Gave a report on the laboratory and some changes in the making or already made. Summary statement shown below under "Delaware".

Miner, G. S. (NC): Soil fertility/soil testing work declining. Major focus at the moment is on heavy metal/waste application, effect on crop growth with varying degrees of acidification.

Tucker, Ray (NCDA): Ran record number of soil samples for fiscal year 1889 (> 220,000). Hired new laboratory supervisor. Received $7,000,000 funding for new facility - equipment upgrading in plans (ie ICP or DCP), electronic data capture and transfer to central processing unit (CPU).

Campbell, Ray (NCDA): Discussed the upcoming increase in number of plant, waste and solution samples.

Lippert, Bob (SC): Hired new lab manager requested $150K to update instrumentation. Lots of interest in sludge application in S. C. New staff member in Soil Fertility. Charge $15.00 per sample for irrigation water. SRIEG meeting in June 1990 open to all MASTWG participants. Ran 65K soil samples in last fiscal year.

Bobeck, Joe (N. J.): Several changes at Rutgers, new dean, change name of department, combined with Horticulture and called Plant Science. Looking at possibility of going to Mehlich-3 in future. Indicated Rutgers soil test program in need of new equipment and facilities.

BUSINESS SECTION

Bob Lippert was elected chairman for 1991-92. Sample exchange for 1991 to be handled by Joe Beckman (NJ) and A & L for 1992. Beckman stated that exchange samples could be taken from long term fertility plots in New Jersey. Chairman Ray Campbell brought up the subject of who should attend meetings. After some discussion Ray Tucker moved that attendance be restricted to the original states that attended this workgroup with the Chairman being given the discretion to decide who would be allowed to attend outside the regular members.

Any errors or misrepresentation regarding any subject were unintentional on the part of the secretary.

M. Ray Tucker, Secretary
February, 1990

FACTORS USED FOR MAKING LIME RECOMMENDATIONS

State/Lab	Target pH	CEC	Text	% Ca	% Mg	Ac	Type of Lime	RC	Tillage	Lime Quality	Footnote
Agrico	X				X	X	X	X	X	X	1
Brookside	X	X		X	X	X	X	X	X	X	2
Clemson	X					X					3
Delaware	X		X			X		X		X	4
Georgia	X					X					5
Maryland	X		X				X		X	X	6
New Jersey	X		X	X	X	X	X	X	X	X	7
North Carolina	X		X			X		X		X	8
Virginia	X		X	X	X		X	X		X	9
West Virginia	X		X		X	X					10

Statements in notes from questionnaire or by phone.

Footnote

1 Tillage (plow depth) corrections made by dealers; quality corrections for purity ($CaCO_3$ equiv) and particle size.

2 Did not specify type of method for measuring acidity. Assumed a 1:1 water pH.

3 Acidity measured by modified Adams-Evans buffer; (1:1 water pH).

4 Level of Ca+Mg, Adams-Evans buffer and target pH as influenced by organic matter.

5 Acidity measured by Adams-Evans buffer.

6 Reduces lime rate by ½ on pasture and no-till fields (sample 2-4" pasture, 2" on no-till). Rates by texture.

7 Use water pH and an estimate of texture by feel for estimating lime rate.

8 Mehlich buffer acidity, residual credit 0.08%/mo, 0.16%/mo for mineral and organic soils respectively: specify type of lime in $ Note, quality regulated by NCDA lime law. Target pH 5.0, 5.5 and 6.0 respectively for ORG, MO, and MIN soils. Higher than pH 6.0 for certain crops.

9 Water pH (1:1), texture, ppm Ca & Mg from soil test. Type of lime, RC and lime quality (Quality established by Va lime law 90% CCE).

10 Assume a water pH, acidity determination method not stated.

Summarized by M. Ray Tucker
for MASTWG 1990 meeting

A.9 D.

STANDARD P_2O_5 AND K_2O FERTILIZER RECOMMENDATIONS AND SOIL TEST BREAK POINTS FOR CORN, SOYBEANS, AND SMALL GRAINS

MID-ATLANTIC SOIL TEST WORK GROUP

March 2, 1978

Prepared by S. J. Donohue, VPI&SU

At the March, 1978 meeting of the Mid-Atlantic Soil Test Work Group, critical soil test levels and fertilizer recommendations were compared and extensively discussed in an effort to increase uniformity in fertilizer recommendations in this region. From these discussions, critical soil test levels were defined for the region and standard P_2O_5 and K_2O fertilizer recommendations were developed. Tables 1 and 2 contain the present soil test levels and recommendations currently in use. Tables 3 and 4 contains the standard soil test levels and recommendations that were developed.

These recommendations are for gradual implementation by the states in this group, and both recommendations and critical soil test levels will serve as a basis for future work in this area.

Table 1. Comparison of P Recommendations and Soil Test Breakoff Points for Corn (100 bu)*

		SC							
	NC	Clayey	Sandy, C. Loamy, F. Loamy	VA	WVA	MD	NJ	DEL	PENN
Max. lbs P_2O_5/A Recommended at 0 Soil Test P	165	100	80	100	120	110	110	120	160
Soil Test P level (mg/dm^3) of No Further Crop Response	23	13	19	22	32	16-30	30	30?	40-45
Lbs P_2O_5/A Recommended at Point of No Further Crop Response	60	50	50	40	50	80-50	45	45	45
Soil Test P Level (mg/dm^3) Above Which No Further P_2O_5 Recommended	45	50	75	68	**	**	**	45	60

*All states except PENN use double acid procedure to extract P. PENN uses Bray P_1.
**Starter fertilizer (0-20 lb/A) recommended at very high soil test levels.

Table 2. Comparison of K Recommendations and Soil Test Breakoff Points for Corn (100 bu)*

		SC							
	NC	Clayey, F. Loamy	Sandy C. Loamy	VA	WVA	MD	NJ	DEL	PENN (CEC=10)
Max. lbs K_2O/A Recommended at 0 Soil Test	155	100.	80	100	120	110	110	105	200
Soil Test K Level (mg/dm^3) of No Further Crop Response	45	45	45	110	76	>60	60-70	60	50-60
Lbs K_2O/A Recommended at Point of No Further Crop Response	75	50	50	40	40	80	80	50	100
Soil Test K Level (mg/dm^3) Above Which No Further K_2O Recommended	140	120	120	194	150	**	**	110	110

*All states except PENN use double acid procedure to extract K. PENN uses 1N NH_4OAc.
**Starter fertilizer (0-20 lb/A) recommended at very high soil test levels.

Table 3. Fertilizer Recommendations at "Strategic" Soil Test Levels for Corn (100 bu), Soybeans (40 bu), and Small Grains.

	Phosphorus	Potassium	
		CEC = 0-5	CEC >5
Fertilizer Recommended at 0 Soil Test Level (In lbs oxide/A)	150	100	150
Soil Test Level (mg/dm^3) of No Further Crop Response	20-25	50	75
Fertilizer Recommended at Point of No Further Response (lbs oxide/A)	50	60	60
Soil Test Level (mg/dm^3) Above Which No Further Fertilizer Recommended	50	100	150

Table 4. Standard P_2O_5 and K_2O Fertilizer Recommendations According to Soil Test Level for Corn (100 bu), Soybeans (40 bu), and Small Grains.

Ext. P, mg/dm^3	P_2O_5 Recommended, lb/A	Ext. K, mg/dm^3	K_2O Recommended, lb/A	
			CEC = 0-5	CEC >5
0	150	0	100	150
20-25	50	50	60	
50	0	75		60
		100	0	
		150		0

Table 1. Comparison of P Recommendations and Soil Test Breakoff Points for Corn (100 bu)

	Mehlich 1					DEL
	SC	VA	MD	NJ	STD	
Max. lbs P_2O_5/A Recommended at O Soil Test P	100	80	150	120	150	100
Soil Test P level (mg/dm^3) of No Further Crop Response	39	22	39	31	20-25	35
Lbs P_2O_5/A Recommended at Point of No Further Crop Response	0	30	40-60	40	50	0-20
Soil Test P Level (mg/dm^3) Above Which No Further P_2O_5 Recommended	39	69	78	56	50	45

Table 2. Comparison of P Recommendations and Soil Test Breakoff Points for Corn (100 bu)*

	Mehlich 3 or Bray P_1			
	NC	Agrico	Brookside	Penn
Max. lbs P_2O_5/A Recommended at O Soil Test P	150	110	80-90	160
Soil Test P level (mg/dm^3) of No Further Crop Response	60	~~50-63~~ 40-50	60	38
Lbs P_2O_5/A Recommended at Point of No Further Crop Response	10-30	65	0	20
Soil Test P Level (mg/dm^3) Above Which No Further P_2O_5 Recommended	84	~~75-100~~ 60-80	90	44

Table 3. Comparison of K Recommendations and Soil Test Breakoff Points for Corn (100 bu)

	Mehlich 1						
	SC	VA	MD	NJ	STD CEC 0-5	STD CEC >5	DEL
Max. lbs K_2O/A Recommended at O Soil Test	100	80	150	120	100	150	90
Soil Test K level (mg/dm^3) of No Further Crop Response	98	110	53	156	50	75	80
Lbs K_2O/A Recommended at Point of No Further Crop Response	0	30	80	40	60	60	0-20
Soil Test K Level (mg/dm^3) Above Which No Further ~~P_2O_5~~ K_2O Recommended	98	194	131	168	100	150	102

Table 4. Comparison of K Recommendations and Soil Test Breakoff Points for Corn (100 bu)

	Mehlich 3 or ~~Bray P$_1$~~ NH_4OAc							
	NC	Agrico CEC 0-5	Agrico CEC >5	Brookside CEC 0-5	Brookside CEC >5	Penn CEC 0-5	Penn CEC >5
Max. lbs K_2O/A Recommended at O Soil Test	150	160	160	150-200	~~400~~ 250	110	210
Soil Test K level (mg/dm^3) of No Further Crop Response	80	113	150	100	175	50	100
Lbs K_2O/A Recommended at Point of No Further Crop Response	30-50	120	120	0	0	20	20
Soil Test K Level (mg/dm^3) Above Which No Further K_2O Recommended	156	169	269	130	200	59	109