

**Minutes Mid-Atlantic Soil Test Workgroup**  
**Southern States Building**  
**Richmond, Virginia**  
**February 15-16, 1989**

Meeting called to order by Chairman, Ray Campbell. Southern States Rep. Charlie Hubbard welcomed the group.

- A. Bob Lippert discussed sample exchange. Some variation in lime recommendations across states. Va, highest; uses pH and soil texture to determine lime rate. New lime publication (Ga) can be obtained from Owen Plank. Considerable discussion on method of determining lime rate.

Generally good agreement obtained across labs using same extraction procedures. Considerable variation in the rate of wastes to apply/acre along with differences in availability factors.

Tom Sims - (Del) Discussed activities of NEC-67 work group (MD, Del, Conn., R.I., N.Y., W Va, Pa, N.J., N.H., Vt, Me, Mass). Following similar activities in exchange as (MASTWG). Compared Men 3 to Meh I. Set up several objectives to work toward in fertilizer recommendations. Provide a forum for information exchange across N.E. States are:

Objectives: (1) Fertilizer Recommendations, (2) New challenges Environmental questions (3) methodology. Considerable diversity in soil test methods and crops grown. Considerable interest in Meh 3 extractant.

Some concern expressed about the need for uniformity in soil testing to maintain integrity of soil test across U.S. New action on part of USDA, SCS in water quality necessitates uniformity in soil testing. (Secretary's comment). Concern is that non-soil scientists may get involved in setting regulations and policies for fertilizer and manure application as it affects water quality and surface water contamination.

Bandel (Md) Advancing in computer application. Involved in new methods from the standpoint of waste (manure) application and municipal sludge. Developed (expert system) spread sheet for determining application rates based on lab results, soil test results, type of manure etc. Phosphorus restricted application rate: set N as the rate regulation with high soil test phosphorus noted. Request soil test prior to manure recommendation (must have ST to make rec rate). Available coefficients (mineralization factor) based on mid-west guidelines.

Program calculates cost savings resulting from manure application.

Plank (Ga) Presented an expert system addressing soil test recommendations at county level. Allows flexibility in crops and fertilizer recommendations. Information generated can be printed. Includes a number of production factors such as previous crop, manure application starter fertilizer etc - makes immediate adjustments. Program can be changed easily and is user friendly.

Tucker(NC) Discussed use of soil test summaries as an educational tool. Showed data on high P reserves on tobacco, potatoes, etc, and a reduction in the amount of  $P_2O_5$  based on soil test summaries.

Campbell (NC) Discussed changes in equipment and computer application in plant lab. Plant and waste analyses growing due to increased interest in crop nutrition monitoring field and greenhouse crops. Changes made in converting sufficiency ranges to an index interpretation system. Showed examples of crops where sufficiency ranges converted to index, ratios, DRIS, etc.

Mark Flock (Brookside Lab) Discussed new procedure for O.M. determination. 1 cm<sup>3</sup> sample ashed in muffle in muffle furnace (1600 samples/2 furnaces). Digested in crucibles. Determined O.M. by weight loss. Uses Blue M furnace (\$1600 each) Ashing @ 350° C. Percent O.M. calculated on an actual weight (weight loss).

Storer, Agrico - Showed correlation between O.M. - C/O.M. 360 ( $r = 0.904$  for O.M.-C 7.0%), (1 cm<sup>3</sup> sample)  $Y = 0.5878 + .775 X$ ,  $X = O.M.-C$ ;  $Y = O.M. 360^\circ C$   $N = 105$ . Titrated WB O.M. correlation well with O.M.-C by actual weight O.M. used for N-credit, herbicide rate, lime recommendations.

Plank, Owen (Ga) Expanding lab services.

1. Broadens scope of educational programs.
2. Greater efficiency in use of lab chemists.
3. Maintains stable work force year round.
4. Increases efficiency of laboratory equipment.

Factors to consider: Needs, equipment, facilities, educational role, personnel resource, administrative support, GH test, pot media, H<sub>2</sub>O, Meh 3 manure analyses, H<sub>2</sub>O, feed forage, nematode, herbicide etc. Statistics: Soils analyzed 126,622; GH, 312, leaf analysis 7600 by contract.

Campbell, Ray, (NC) Discussed u-wave digestion. Special protection equipment (\$5200). CEM Corp. Single closed vessel digestion (Teflon container) with vent system or scrubber, using open vessel system at the moment. Currently use 10 ml conc HNO<sub>3</sub> in erlenmeyer 35-40 minutes, build to volume, filter - ICP; results in 1 hour. Procedure in literature (AOAC)(page 5). Uses 1 gm sample compared with muffle furnace. Mark Flock uses Amana microwave with good results. Digest 13 minutes with 1 ml H<sub>2</sub>O<sub>2</sub> + 5 HNO<sub>3</sub> (set overnight in H<sub>2</sub>NO<sub>3</sub>) digestion after oxidation overnight. Not used routinely for digestion (Amana 800 watts).

Greg Evanylo (Va) Potash response on wheat/soybeans rotation/tillage, optimum time of application. Tillage/time/rate experiment design. CT, NT, 100% Fall/50%F - 50% Spring at Zodak 25; 50% Fall/50% Spring, Rates = 0, 40, 80 lbs K<sub>2</sub>O N (wheat) (20 lbs Fall + 80 lbs Spring Zodak 25). Sampled wheat Z-25, Soybeans R-10 stage. Time of K application had no effect on yield. All K in Fall was same as split application no significant effect of tillage or rate on soybeans, yield. No till showed higher yields of soybeans due to better moisture levels than conventional till.

CT = conventional till

NT = No till

met

Tom Simpson (Del) Discussed sulfur on sandy Delaware soils. Field studies conducted on irrigated corn (4 rates/multiple applications). Little response to sulfur fertilization. Subsoil sampling better soil test prediction. Little value to topsoil sampling for predicting response to sulfur.

Don Storer, Agrico: Use of plant analysis to evaluate nutrient content of high yielding corn. Copies of analytical data distributed. All methods of diagnosis, DRIS, sufficiency, critical etc have their value and at the same time their limitation. Roy Lockman data.

Greg Evanylo (Va) Potatoes - appear to be excessively fertilized with N. presented data on split N (Currently rec. 140-180 kg N/ha) to improve N recommendations. N rates ( $\text{NH}_4\text{NO}_3$ ): 0, 56, 112, 168 kg/ha @ first cultivation. 0, 56, 112 kg/ha at midbloom. Banded P and K (at planting with seed piece). No yield response beyond 56 kg/N ha at first cultivation (at least 1/3 the amount of N that is recommended). Top yield were obtained with reduced N rates. Time of application can also increase N utilization due to reduced N leaching. Implication is: too much nitrogen is being used on potatoes. Research shows more reasonable N rate 75 to 95 kg/ha based on crop requirement.

Rec. 25 N/A banded (1/4 - 1/3 at planting)  
Knife 75-100 lbs/acre prior to drag off cultivation

Mulchi, C. L. (Md) Comparison of extractants for sludge amended soils on tobacco. Tobacco absorbs heavy metals very readily. Investigated heavy metal content in tobacco leaf from sludge amended soils from 11 different soil series.

Extractant: Meh 1, DTPA, Meh 3.

Plant sampled at flowering. Showed results of three extractants. Extractable generally much lower than total with exception much lower than total, with exception of cd in which extractable was very close to total. Lime reduces plant metal content as pH increased. Good "r" between extract and leaf metal for most metals. Low "r" with Pb. in leaf and extractant. Ni, good "r" with Meh 3 and DTPA. Cd, good "r" with Meh 1, not correlated with Meh 3 and DTPA.

Conclusion: all three extractants are suitable for predicting plant uptake on tobacco.

\* Tom Sims responsible for sample exchange 1990.

Meeting 1990, February 14-15, Wednesday - Thursday, Southern States Bldg., Richmond Va.

John Walker - EPA (Washington) New EPA

Jim Evans - EPA Guidelines and Role of Labs in Waste Amended Soils.

Discussed Sludge Regulations -

1984 (EPA) sludge management program committee developed new guidelines related to sludge disposal. EPA encourages beneficial utilization of sludges. Current publication is a "Draft" guideline - has not been reviewed by peers. Proposed standards contain pollution limits, management practices, - but is still a proposed document. Distributed guidelines of "proposed" sludge land application limits, cautioned group the "draft" regulations as published as a "draft" and are subject to change after or during peer review. More compounds will be required to be tested - problems with detection limits of current methods. Distributed various publications of methods to be used if "draft" becomes the law. Many testing requirements will be involved (toxicology, metal content etc).

Dave Martens (Va) Est. Nutrient availability in waste materials. Mineralization rates and nutrient loss.

Fifty percent sludge produced in Va is land applied. About  $7.7 \times 10^{-6}$  metric tons N annually from manures. (Assume this is national estimate). Manure rates to supply N, results in excess phosphorus.

$$\text{Amt N} = \text{Org N} + (\text{const})(\text{org N})$$

Pratt et al (1973). Published in CA. Agriculture. Contact Dave Martens for reference.

Va. constants: 20, 10, 5 & 3% anaerobic sludge  
50, 15, 20, 5, 10, 3% animal manure.

Discussed effects of temperature, air, pH, incorporation on loss of N. Incorporation loss negligible. C/N ratio influences immobilization or mineralization. Wood shavings mixed in poultry litter. Poultry manure mineralizes rather rapidly but will vary with field condition, moisture, temperature etc.

Heavy Metals (sludges)

280 kg Cu/ha  
560 kg Zn/acre      applied from sludge

Movement of Zn and Cu in depth essentially nil below zone of incorporation regardless of rate of application.

Extractable metals (DTPA) increased with rate across all soils one year after application. Elements were Cu, Zn, Ni, Cd with pH in range 5.9-6.0. Poor relationship between extract metals and plant uptake at pH 6.0. Yield response between yield and application rate (corn)(3500 kg/ha total N) (7000 kg P/ha) coming from sludge. No detrimental effect of high Zn and Cu on yields of corn.

Discussion centered around the need for analyzing fractions of nitrogen or total N. Stimulated a lot of discussion.

Any questions regarding EPA - Dr. John Walker  
EPA, Office of Municipal Pollution Control (OMPC)  
Performance Assurance Branch (WH-595)  
Washington, DC 20460  
Phone (202)382-7283

STATE REPORTS

Md - Updating computer

Sims (Del) - Written version enclosed

Donohue (Va) - Written (enclosure)

Ga: Plank - Moving into new building in March, sample load up;  
Jan, 25,000 samples at 2-day turn around time....  
Bill on legislative floor to close up of Ga lab  
and all public facilities.

A & L: Computerized 2 years ago ... Easier for technicians. Run  
1000 samples in 4 hours.

N.C. N. C. Reports enclosed.

S.C. - Plans to get ICP, if approved by Legislature. Vacant positions  
being filled so research should come back on line in near future.

Evanylo (Va) - Will circulate pertinent data on papers presented.

Campbell N.C. - Report enclosed

Respectively Submitted by:

M. Ray Tucker, Secretary  
MASTWG, 1989 Meeting  
Richmond, Virginia

## State Report

Ray Tucker: N.C.

February 1989

Soil samples flood the laboratory space in the Agronomic Division. To date we have analyzed 116,980 samples and have at least a 70,000 backlog. The increased sample load is a result of the positive agricultural outlook coupled with warm and dry weather which allows farmers to be in the field. At the moment we are processing about 2000 sample/day for pH, Ac, P, K, Ca, Mg, Mn, Zn, Cu, HM and Wt/Vol.

Information wise, a revised Christmas tree note has been published and a revision of the GH tomato note is being printed. Other notes will be revised as time permits.

Several states have requested information on Mehlich 3 extractant, some in Canada, some private labs in Illinois. Still think this group should consider going to a strict volume soil test measure.

PLANT, WASTE AND SOLUTION SECTION

N. C. DEPARTMENT OF AGRICULTURE

C. Ray Campbell

The plant, Waste and Solution Section analyzed 10,024 samples during the 1987-88 fiscal year. Sample load is presently increasing at approximately 15% annually.

A Perkin-Elmer ICP (PII) and NA1500 nitrogen analyzer were installed, tested and brought on-line in the plant, waste, and solution section during 1989. A mini processor and network of PC's were also installed to automate data collection and report generation. Software development has now been completed and the system is being tested. The new operating system should be on-line within the next month. Copies of new information sheets and expanded report forms for the three services are provided for members of the Mid-Atlantic Group.

A procedure has now been developed for open vessel microwave digestion of plant tissue and waste samples. We hope to be using this procedure during the 1989 growing season. Using the new procedure, 24 samples can be digested in thirty-minutes. Sulfur is not lost during digestion so this element can be determined along with others on the ICP.

Separate report forms for the three services have now been developed. Carbonates, bicarbonates and chlorides have now been added to the solution report. The SAR is also being calculated and reported.

For waste samples, we now plan to report available nutrients for the first crop based on estimates of mineralization rate and nutrient loss for the type waste and application method chosen by the farmer. A narrative will also be included to focus attention on potential problems with waste.

The new plant analysis report form has been expanded to include the sufficiency range and DRIS interpretation approaches. An interpretation index has been developed to improve the sufficiency range interpretation. Important ratios are also calculated and provided on the report.

University of Delaware Soil Testing Laboratory  
State Report, 1988-1989

Mid-Atlantic Soil Test Work Group  
Richmond, Virginia

February 14-15, 1989

1. The number of paid samples processed in FY 1988 was up 15% over 1987. Of all samples received, 46% were "lawn and garden". To date in 1989 we are 28% ahead of 1988 in terms of number of samples received.
2. Research comparing the Adams-Evans, Mehlich, SMP-SB, SMP-SB, Yuan and "pH-Texture" methods of estimating lime requirement has been completed and will be published in Volume 20 of Communications in Soil Science and Plant Analysis. Based on the results of this study we will be converting to the Adams-Evans buffer method in 1989.
3. New computer equipment has been purchased for the office and will be used for data entry and printing of soil test report forms. We have purchased a IBM PS/2 Model 70 and a HP Laser Jet II for these tasks.
4. A three-year, four-site study on irrigated corn response to S fertilization has been completed. Based on this research we will not offer surface soil tests for sulfur - instead we will establish a subsoil sampling program similar to that in place at VPI and recommend that it be used in conjunction with early whole plant analysis.



Activities During The Past Year

Virginia Tech Soil Testing & Plant Analysis Laboratory

Stephen J. Donohue

February 16, 1989

Mid-Atlantic Soil Test Work Group

1. Soil Sample Receiving Room - additional counter space built to permit up to four people (vs. 2) to open mail/sort samples.
2. Sample Holding (Storage) - built additional racks to increase maximum holding capability from 4,500 to 12,000 samples.
3. Soil Sample Drying - built a second drying cabinet which doubled drying capacity from 600 to 1,200 samples per day.
4. Soil pH - rebuilt pH station.
5. Personnel - hired three additional technicians for winter-spring rush period to increase sample setup, pH determination and expand hours of ICP operation.
6. As a direct result of above, laboratory processed samples more quickly in 1988 than any previous year in past two decades. Typical backlog during spring rush was 2-4 days (vs. weeks). Current sustainable daily maximum = 900-1,000 samples (Current yearly total = 105,000 samples).
7. Current Efforts - interfacing new Zenith pc's (3) into laboratory operations.