

Minutes of the 1994 MASTPAWG Annual Meeting
February 23 & 24, 1994
(Revised Edition)

Wednesday, February 23

● **Welcome and Introductions**

Mark Flock called the meeting to order at 8:15, reviewed the meeting agenda, started a list for addresses and made several announcements:

- Mark introduced Irene, the contact at Southern States.
- Individuals were needed to serve as MASTPAWG Chairman for 1995-1996, and sample exchange coordinator for 1995.
- Meeting dates for 1995 would be selected on Thursday and members should review their calendars.

● **ASA Meeting Summary**

Mark discussed the report on MASTPAWG that is made each year at the Soil Testing and Plant Analysis Breakfast during the ASA Annual Meeting. In the discussion that followed, the development and improvement in regional nutrient recommendations and analytical procedures were suggested as the goals/functions of this group. Steve Donohue explained how nutrient rates were compared in the early years of this group and suggested that it was again time for review. Doug Beegle agreed and suggested that even if we don't agree on the same number, we should agree, at least, on the approach for developing recommendations and interpretations.

● **Sample Exchanges**

Vernon Pabst presented the results of the 1994 soil and plant sample exchange. Samples 1, 2 and 3 were soils from southern Ohio. Samples 4 and 5 came from Eastern New Jersey. In general, comparisons between the laboratories were good. Soil nitrate results, however, varied widely. This raised concern as other soil nitrate exchanges (i.e. NEC-67) have not shown such variation.

Mark Flock presented the results of the manure and sludge sample exchange.

Future Exchange Needs:

Soil nitrate exchange - should include both soil samples and soil extracts to determine if differences are the result of extraction method, instrumentation or

a combination of the two.

Sludge exchange - more labs are getting requests for sludge analysis. Exchanges help labs with less experience fine-tune their technique.

● **Complying with Nutrient Management Regulations - The Soil Testing Lab's Responsibility - Doug Beegle**

Nutrient management regulation (NMR) is an important issue facing many aspects of agriculture, including soil testing. In most states, NMR is under consideration or in the future. In Pennsylvania, NMR has become a reality. Doug Beegle presented an overview of NMR issues and concerns which must be addressed by the soil testing community.

1. **Education** - Appropriate and successful use of soil testing requires an understanding of the field; specifically, its role and use, its limitations and misconceptions. Soil testing laboratories have a responsibility to educate the public about soil testing.
2. **Ongoing Evaluation** - New research, approaches or goals require re-evaluation of current recommendations.
3. **Environmental Impacts** - The purpose of nutrient management has shifted from maximizing economic benefit to balancing maximum economic benefit with minimum environmental risk.
4. **New Research Needs** - Soil testing programs are increasingly being asked to make environmental interpretations of soil test results, but little data is available to make those decisions. Research on the critical values from an environmental perspective is needed.
5. **Legal Ramifications** - As soil testing moves into the realm of regulation, the issues of quality control, quality assurance, accreditation, etc. become more important.

The soil testing community needs to take an active role in the development and implementation of NMR to insure that soil testing issues are realistically and appropriately handled.

NOTE: Handouts were provided.

● **The New Virginia Tech "Values Program" - Steve Donohue**

Steve Donohue presented a summary of the Va. Tech "Values Program", an innovative nutrient management system for agriculture. VALUES stands for "Virginia Agronomic Land Use Evaluation System". The system was developed in response to several issues including:

- Concern about water quality
- Possibility of regulation
- Concern that N and P are nutrients most often associated with NPS pollution
- Concerns that, in the past, fertilizer recommendations were based on unrealistic yield goals due to a lack of hard core soil/yield data and resulted in overestimates of nutrient needs.

VALUES was developed to relate soil series yield potential, confirmed yield data and best rates of N. Three thousand observations were collected from sites in Virginia and nearby states where soil series, yield results and accurate nutrient records were kept. Soils were divided into 43 management groups on the basis of physical, chemical and mineralogical properties. realistic yield goals were established for each management group from the yield database using the median yield and a mathematical model which predicts the optimum economic yield. Management groups with similar yields for certain crops were further grouped into productivity classes. Soil-related crop recommendations were then developed along with appropriate nutrient management recommendations.

In practice, the VALUES approach requires that the grower list the three most predominant soil types and the approximate percentage in the field being soiltested. VALUES calculates a weighted yield potential based on the soil productivity classes. If the grower doesn't have the soil information, he can estimate the yield potential or have the program do it. Also, if the grower has good yield records which contradict the VALUES yield, those records can be used to override the program.

Currently, VALUES is being put into use. Plans are being developed to advertise and promote the program to growers.

● **The Virginia Nutrient Management Program - Russ Perkinson**

The Virginia Nutrient Management Program (VNMP), is part of the Virginia Natural Resource Agency which oversees programs including agricultural management, soil and water conservation, and agricultural cost-share. Participation in the NM program is encouraged through both incentive programs, tax breaks and as a requirement for cost-share programs.

The VNMP was established in 1990 in response to various NM issues:

- A 1990 report by the EPA stated that 60% of the rivers in Virginia were impaired by agriculture.

- Studies in the Chesapeake Bay have shown that N and P are causing excessive algae growth and that sediment and runoff are causing additional problems.
- Concerns about the impact of agricultural practices on groundwater.

The VNMP has several different components:

1. 10 nutrient management specialists whose responsibilities include writing site-specific nutrient management plans, presenting grower informational meetings and establishing field demonstrations to highlight new or alternative techniques.
2. assistance with conservation practices - design and installation
3. authorizing VPA permits - two types:
 - a. concentrated livestock facilities (> 1000 animal units)
 - * a 5 year permit which requires a NMP
 - b. intensive livestock facilities (> 300 and < 1000 animal units)
 - * a 10 year permit which does not require a NMP

NOTE: Poultry operations are not regulated by VPA permits.
4. cost-share programs
5. Virginia tax-credit reimbursement - provides a tax credit reimbursement for certain types of improved farm equipment.
6. Nutrient management training, testing and certification

As of March, 1994, detailed, site-specific NM plans had been written for over 250,000 acres. Approximately 400 tax-credit reimbursements had been used and work was continuing to promote the program.

NOTE: Handouts were provided.

● **Environmental Testing for Phosphorus - Karen Gartley**

Excessive soil phosphorus is a concern in many parts of the United States. Runoff and other losses of P from those soils have been linked to the degradation of surface waters. The first step in effective management of high P soils is identification. The most obvious technique for doing that is soil testing as all labs which routinely analyze soil test for soil P. This approach has several concerns: methodology, sampling protocol and interpretation.

- The extracts used for a routine soil test (i.e. Mehlich 1 or 3, Bray P1, Olsen, etc) were designed for a different purpose (measurement of plant-available P) and may not be suitable for measuring the forms of soil P which are important from an environmental standpoint. Alternative tests such as algal available P, readily desorbed P, and P adsorption isotherms which may be more useful for environmental P testing are

often more intensive than routine techniques and less suitable for the production laboratory. The use of routine tests as "screening agents" or surrogate test may be a viable alternative but more research is necessary.

- The sampling protocol used for a traditional sample may be inappropriate. Routine soil samples are usually collected from a depth of 6-8" while research has shown that the most important zone may be the surface 2".
- Current interpretations are based on field calibration studies and the likelihood of plant response. Environmental interpretations require a rating of loss potential which considers both the risk from runoff, desorption, etc and the distance to a susceptible water body. Very little data exists for environmental interpretation at this time.

The soil testing community needs to take an active role in the development of P management guidelines, especially in the area of testing. We are more familiar with our own needs and limitations than are those not involved in the field. We need to help develop the sampling and testing protocols, the interpretations and the management recommendations which will be employed in the future before such decisions are specified by someone else.

One tool currently under development for the management of high P soils is the Phosphorus Index. The P Index, a matrix system which predicts P loss from a specific field, rates various system components including P source, application technique, runoff and erosion potentials and includes a soil test component. As the system undergoes further development, the soil testing community will likely be approached to help select the best technique and interpretations for that section. Copies of the P Index were distributed to members in attendance for further review and comments.

● **Corn Response to Chloride - Joe Heckman**

Chloride is involved in several metabolic processes in plants including photosynthesis, enzyme reactions and water relations. As a result, it has been suggested that fertilization with Cl may improve partitioning in the plant and subsequently, increase yield and/or improve grain quality. A field study was conducted to evaluate the effect of Cl fertilization on yield and other parameters in irrigated corn. Chloride was applied as KCl at rates up to 400 lbs Cl ac⁻¹. Potassium was balanced with KOH and/or K₂SO₄. Other nutrients were applied to maximize yield. The sites were planted at a population of 43,560 plants ac⁻¹ (1 plant/square foot).

Results:

Chloride fertilization increased:

- grain yield
- earleaf Cl concentration
- leaf volume
- ear size
- moisture content at harvest

Chloride fertilization decreased:

- dry matter production
- incidence of stalk rot

Silking and maturity were delayed. The K applied along with the Cl was thought to influence the harvest index, extend grain fill and facilitate transport processes in the plants.

● **Current Research and Developments in Boron - Jim Woodruff**

Updates on US Borax:

- The main office has moved from Wilshire Blvd to Valencia, CA.
- Boron and Its Role in Crop Production has been updated; specifically, the chapter "Technology and Application of Boron Fertilizers".

Updates on Research:

- Foliar application of B on soybeans
 - * Gary Gascho (GA) has shown consistent increases in yield when B is applied late in the season (from pod development to the beginning of seed formation).
 - * GA now recommends 0.25 lbs B ac⁻¹ in insecticide spray for worms.
 - * Applying Mg in conjunction with B further increases the benefits of late season B applications.
 - * Mixing Solubor[®] with N and Galaxy™ herbicide has been shown to prevent leaf burn from foliar application from N or herbicides.

NOTE: Handouts were provided.

● **Heavy Metals in Contaminated Soils - Ray Tucker**

Concerns regarding heavy metals in soils abound but data on management and fate are limited. In NC and other states with poultry industry, for example, there are potentially serious problems with Cu and Zn. Poultry feed and manure are high in Cu and Zn due to feed additives. Metals accumulate because manure is often applied on the same fields, especially those close to the poultry house. A similar situation is occurring with soils used for tomato production because Cu is commonly used as a tomato fungicide. Metals are a concern because of the associated health risks, the threat to soil productivity (i.e. Cu toxicity) and because the metals do not leach or dissipate. The agricultural industry needs to foresee these problems and continue to develop techniques to manage high metal soils so that they stay productive. The industry also needs to decide how intensive management should be and set corresponding limits. For example, set conservative limits on metals so management is less of an issue or set broader limits and require intensive pH management with lime.

NOTE: Handout was provided.

● **Comparing Extraction Methods for Heavy Metals - Ann Wolf**

Many of the techniques used to measure heavy metals are intensive and time consuming. However, growing concerns about the impact of heavy metals on human health and crop production/uptake make it highly desirable to find less intensive technique such as a routine soil test extractant which could be used as a "screener" for soils to determine when more intensive tests are necessary or justified.

At Penn State, soil samples analyzed for heavy metals are also extracted with Mehlich 3 for plant-available nutrients. For this comparison, 500 samples were analyzed on a weight basis for heavy metals by EPA 3050 method, the Penn State Diagnostic Test for Heavy Metals and Mehlich 3. Plots (statistical analysis) of the data showed good correlations between Mehlich 3 and the other two methods in most cases. Mehlich 3, however, was not a good extractant for Pb. Based on these results, it appears that Mehlich 3 may be a good "screening" technique for certain heavy metals but further analysis is needed.

NOTE: Handout was provided.

Social and Dinner at Steak and Ale Restaurant (courtesy of US Borax) completed the evening.

Thursday, February 24

● **Welcome and Introductions**

Mark Flock called the meeting to order and made several announcements:

- February 22 and 23, 1995, are the meeting dates for 1995.
- Steve Donohue will serve as chairman for 1995-1996.
- NCDA Lab will handle the sample exchange for 1995.
- Mark Flock will a sample exchnage for soil nitrate tests this summer. Soil samples and extracts will be provided.

● **Update on the Council on Soil and Plant Analysis - Ann Wolf**

Ann updated the group on the lab proficiency and accreditation programs being instituted by the council. The accreditation program is being established as a way of identifying qualified laboratories and in response to indications that future regulation may require that analyses be conducted by laboratories that have been "accredited". The CSPA position is that it may be more practical and cost effective to design and implement the accreditation process within the soil testing community rather than having some outside organization or government agency impose it. At the annual CSPA meeting in

November, 1993, it was decided that the processes would be implemented in steps.

The first step in the accreditation program will be the implementation of a proficiency testing program which could be in place as early as July, 1994. The proficiency testing program would set guidelines for rating laboratories as acceptable or unacceptable for a particular analysis. In the first year, analyses would be limited to soils. Plants will be added in the second year. Ann will provide updates as details on the program are finalized. Watch CSPA newsletters for further information. Laboratories/individuals who are not currently members of CSPA are encouraged to join. Contact Ann for further information.

- **Nitrogen Availability from Manures and Sludges (Mineralization of Waste Products)**
- Greg Evanylo

The prediction of nitrogen availability from manures and sludges is a significant component of effective N management. A key component in predicting that availability is the mineralization rate. A summary prepared in 1993 of mineralization rates currently used by states in the mid-Atlantic region showed both some similarities and some broad differences, even among nearby states. Differences were most pronounced for poultry manure mineralization. A meeting was held in August, 1993, at the Maryland Department of Agriculture to discuss these findings, the justification behind the figure used and what and how changes should be made, if necessary. Representatives from universities, Cooperative Extension, and state governments of DE, MD, NC, PA and VA were present. Discussions centered on past and recent research, the influence of climatic differences, management effects, etc. At the end of the meeting, the consensus indicated that many rates were reasonably acceptable at this time, that MD's mineralization rates for poultry manure would move closer to those used in DE and that further work was needed on effects of manure and sludge management (e.g. application technique, storage) on N availability and losses. Greg presented a summary of the August, 1993 meeting and led a discussion of the modified tables.

NOTE: Handout was provided.

- **Strawberry Nutrition - Ray Campbell**

Most strawberry production in NC is conducted using annual hill culture in which disease free transplants are planted into disease-free, fumigated beds in the fall for spring harvest. Trickle tubes are installed beneath the beds for irrigation and fertigation. The use of annual hill culture has increased yields and reduced the incidence of weed and disease problems.

Traditional nutrient management of strawberries in NC has consisted of a preplant broadcast application of 1000 lbs ac⁻¹ 10-10-10 plus 100-150 lbs N ac⁻¹ as a slow release

material such as sulfur coated urea for a total of 200-250 lbs N/acre/year.

Field studies were conducted using randomized complete block designs to evaluate the effects of N on yield and quality of strawberries. Three criteria were evaluated:

1. Preplant N rate (0, 30 or 60 lbs N ac⁻¹),
2. N source (100:0, 77:33, 33:77 and 0:100 of NH₄-N:NO₃-N), and
3. Dripfeed rates of N and K (0-2 lbs N and K/acre/day).

Crown number, berry size, and yield were rated or measured on all plots. Tissue and petiole analysis were also evaluated as a means to track in-season plant nitrogen needs. Tissue samples were collected every two weeks. Phosphorus, K and B were applied based on soil test results. Additional K was dripfed but had no effect.

Results:

1. Greater response to dripfeed than to preplant. Response occurred with the first increment of N (30 lbs N ac⁻¹). No difference between 30 and 60 lb rates. The response rate was 0.6 lbs N/ac/day.
2. Crown number, berry size and yield were significantly affected by planting date.
3. Dripfeed reduced the number of culls, regardless of N rate.
4. N sufficiency levels for tissue testing may need to be lowered over the course of the season.
5. Increasing %NH₄-N in the source increased total N concentration in the leaf.
6. Greatest yield occurred with 2/3 NH₄-N and 1/3 NO₃-N.

New BMPs for Strawberry Production:

1. Adjust pH to 6.2 and apply P, K and micronutrients as recommended by soil test.
2. Apply 50-60 lbs N ac⁻¹ at bedding.
3. Begin petiole leaf testing in the spring when spring growth occurs. Start applying 1 lb N and 1 lb K/ac/day. Where early marketing is desirable, feeding should start about the middle of March.
4. Apply 1 lb S/ac/week on sandy soils.
5. Make corrective adjustments as indicated by leaf and petiole analysis.
6. During fruiting, maintain petiole NO₃-N concentration between 3000 and 4000 ppm.

This intensive approach reduces over-application of nutrients and may also be suitable for other crops such as grapes and cotton.

● General Laboratory Discussion

Manure Analysis

- * Nitrogen analyzed "as is"; elemental is run on a dried, ground sample - A&L, Brookside,
- * NH₄-N analyzed "as is"; Total N and elemental run on a dried, ground sample - MD
- * One digest for all - Agri-Analysis

Nitrogen Analyzers

- * Carlo-erba - PSU, Spectrum Analytical, NC, Brookside
- * LECO - MD

Also discussed Ann's automated pH meter

Laboratory Reports:

North Carolina:

Soils Laboratory

Ray Tucker reported that NC is nearing completion of their new building. With the additional space, changes or updates in instrumentation and computerization are being planned. The soils lab will soon purchase 3 new ICPs capable of analyzing 19 elements including the plant nutrients and heavy metals - TJA and ARL are the vendors under consideration. Even with all these changes, soil tests will continue to be free to NC residents.

Sample volume has remained steady. As of February 23, the laboratory had a backlog of 30,000 to 40,000 samples waiting for analysis resulting in a 4-5 week delay. Fall sampling is being heavily promoted to help minimize this situation in the future.

Plant, Water and Waste Laboratory

Ray Campbell reported that the PW&W laboratory is also planning changes as a result of the new facility with the biggest change in the area of computerization. With the opening of the new facility, all equipment and databases from both labs (soils and PW&W) will be integrated. This change will result in more complete archiving and will allow a grower to dial in to one number and obtain results for any sample type he has in the laboratories. Different software options are currently under consideration and a decision will be made soon. It is expected to be a \$300,000 to \$500,000 job. Sample volume in the PW&W labs have increased. In the past year, about 10,000 plant samples and 15-1600 water and waste samples were analyzed. Greater use of tissue testing and of float bed production of tobacco transplants have contributed to those increases.

Maryland:

Joe reported that MD has a new laboratory director - Frank Coale - who started in August, 1993. Frank has requested funding to upgrade the lab and add additional tests but has not heard back at this time. In particular, MD would like to add a soil lead test. They will probably use test and recommendations developed by Rufus Chaney of the USDA-ARS.

Soil samples increased in 1993 over the previous year. Manure and plant samples were stable with approximately 800 and 6000 analyzed, respectively.

US Borax:

Jim reported that many of the updates were covered earlier. He did, however, mention two points here:

1. US Borax is looking at B contributions from manures and estimates that these materials contain 20-30 ppm B and supply approximately 0.06 lbs per ton of manure applied.
2. Jim discussed a case in Sparta, Tennessee where a grower requested 0-9-27 and received the wrong material. Granbor was applied to alfalfa grown on a silt loam at a rate of 420 lbs ac⁻¹ which supplied 60 lbs B ac⁻¹ soil analysis (HWB method) measured 11.5 ppm B in the soil. Tissue testing from surviving plants showed a B concentration of 700 ppm B. 850-950 ppm B in the tissue is general accepted as the lethal critical value for B toxicity. Results at this site seem to indicate that an application rate of 40 lbs B ac⁻¹ seems to be below the point of B toxicity.

NOTE: Jim let me know if I've interpreted my notes incorrectly - I'll issue a correction if that's the case.

Agri-Analysis, Inc:

Tim stated that he appreciated being invited and provided an overview of his company. Agri-Analysis is a commercial laboratory located in Pennsylvania. The company began offering forage testing in 1984. In 1989, manure testing was added. In 1993, Agri-Analysis installed a combination ICP and began to offer soil analysis. In 1993, between 4,000 and 5,000 samples were analyzed in the laboratory.

The company works closely with Penn State to provide reliable analyses and recommendations in line with those of the university. Agri-Analysis is also working with feed companies in the area to promote agricultural testing. Information and education about testing is provided to local growers through a series of "science classes" sponsored by the company.

Clemson:

Bob reported that the laboratory just got a new roof and is currently upgrading its

computer system (equipment, software, and programming). Bob visited GA to look at their system and has drawn up a comprehensive plan for the upgrade which has been submitted to the University for funding. Copies of the plan were distributed to meeting participants.

Penn State:

Ann reported that she has automated her pH measurements using a system designed to her specifications. Each system (she has two) is capable of measuring 80 samples per sampler rack and reads both the water and buffer pH. The sample is working reasonably well after some minor adjustments. The environmental lab is adding a graphite furnace for measuring As and Se which have been added to the EPA 503 regulations for sludge amended soils. Ann is also planning a computer system upgrade which will shift the lab from the university mainframe system to a pc-based system.

Rutgers University:

Joe reported that the soil testing lab has switched to Mehlich 3 but is having trouble measuring P on their DCP. The same problems continue in the lab due to a lack of support from the university, state, etc. The PSNT is being conducted through the county offices and will be offered for sweet corn starting this summer. A related Fact sheet was provided to members. Soil test kits are now \$6.00 per sample at Rutgers.

Spectrum Analytical:

Vernon reported that Spectrum Analytical (formerly Agrico) has changed name and ownership. All other aspects are the same.

A&L Eastern Analytical Laboratories:

Paul reported that there were no major changes. A&L may switch to Mehlich 3 but is facing some customer resistance.

Brookside Labs:

Brookside added two labs - a computer lab with 7 microcomputers (October-November, 1993) and a physical testing lab. The computer lab is being used to train staff and consultants on software and data analysis (QPRO, mapping and recommendations programs, etc). Brookside has also added an archive database which all consultants have access to through their pc's. The physical testing lab is being used primarily to analyze golf course samples by the ASTM methods specified by the USGA.

Sample volume from consultants has remained the same during the past year. Samples from universities has increased 100% over the past 3 years.

Virginia Tech:

Steve D. and Steve H. had to leave before the state reports so this information is very short: The VA Tech lab lost a ICP spectroscopist and was looking for a new one. The VALUES program was due to be released just after this meeting.

Delaware:

The lab has not had any major changes in staffing or instrumentation during the past year. College and outside research samples have increased dramatically, however, as a result of the addition of the ICP and Technicon Autoanalyzer installed in late 1992 and early 1993, respectively (from approximately 5,000 in FY92 to 14,900 in FY93). The greatest increase has been college research samples and that trend seems to be continuing. The lab has begun offering EPA3050 analysis to meet the needs of clients applying for state permits. The lab is also pursuing funding for a carbon-nitrogen analyzer and hopes to purchase one this summer. A summary bulletin about 37 years of soil testing in Delaware was published in October and copies are available from Karen. Tom and Karen are also working on a revision of Delaware's fertilizer recommendations and hope to have the new bulletin completed this fall.