Minutes of the 1996 MASTPAWG Annual Meeting
February 21 & 22, 1996
Southern States
Richmond, VA

Wednesday February 21, 1996

- **Welcome and Introductions**

  Steve Donohue called the meeting to order and welcomed everyone and reviewed the agenda for the meeting. Introductions were made and Doug Beegle was designated as the secretary for the meeting.

- **Southern States - Steve Patterson**

  Steve Patterson from Southern States gave an overview of several Southern States programs. He gave us an update on the Grow Master Program and an interesting overview of their efforts in precision agriculture. This topic stimulated discussion among the group and it was suggested that this might be a good topic for a future meeting.

  Steve expressed our appreciation to Southern States for their continued support of this meeting.

- **Sample Exchange - Kathy Moore, Clemson**

  Kathy handed out a report on the sample exchange and there was a general discussion of the results. Highlights of that discussion follow:

  - Generally good agreement - probably better than past years.
  - Some general concern with estimating exchangeable acidity.
  - Large range in lime types from dolomitic to calcitic. Why such a large range?
  - Interpretations unclear because of terminology - discussion deferred until later in the meeting.
  - Discussion about the relationship between Mehlich 1 and Mehlich 3. This relationship is quite variable. This exchange data does not agree with the standard assumptions about this relationship. More evidence against correlating extractants.
  - Discussion about how the results of the exchange are reported. Should we consider dropping the high and low values when calculating the mean or should we use the median to take care of the extremes?
  - There was the usual discussion of volume vs weight basis and concern with assumptions that are made in making conversions.

  Virginia will run the exchange for next year and will try to complete this in a timely manner.

N, P, K Recommendations - Steve Donohue, VA Tech

Steve introduced this topic and reviewed the major points from last year when we focused on the following;

- Maximum P or K recommendation at zero soil test level.
- Soil test level of no further crop response
- Recommendation at the point of no further crop response
- Soil test level where the recommendation is zero

Steve surveyed the group requesting this information for corn. This information was summarize and handed out to the group as the basis for our discussion. Following the meeting Steve will prepare an updated version of these tables with the conclusions from the discussion.

Nitrogen

The nitrogen recommendations were pretty consistent. 9 of 13 labs use approximately 1 lb. of N per bushel of expected yield for their basic N recommendation for corn. The group concluded that a suggested range for a nitrogen recommendation for a 125 bu/A corn crop would be 125-150 lb N/A. This is based on using 1 to 1.2 lb of N per bushel of expected yield. Doug Beegle presented some data from Dick Fox at Penn State which indicated that there is little relationship between actual economic optimum N rate and yield. Similar results from Wisconsin and Maryland were also noted.

There was considerable variation in legume credits between the labs. It was noted that there are many factors that influence this. No conclusion was reached on this.

Phosphorus

Maximum P Recommendation
There was fairly good agreement in what the maximum P recommendation should be. While there is little data to base this on, what data is available indicates that a maximum recommendation for corn of 150 lb P_2O_5 /A would be appropriate and was accepted by the group. I appears that a lower maximum recommendation possibly 100 lb P_2O_5 /A may be appropriate on sandy soils.

Soil test P level of no further crop response
There was generally good agreement on the soil test level of no further crop response between labs using the same test. However, there were exceptions and there was considerable discussion on this point. The main points of discussion follow:

- Fred Cox raised the issue of whether this critical level should vary with the soil texture. He presented data showing that the critical level decreases as the clay content increases. He suggested that two critical levels should be adopted, one for sandy soils and one for higher clay content soils. There followed a discussion of how this could be done in a soil test lab setting. Suggestions were to use soil type information, location, and color. Routine texture determination on samples was rejected as being too cumbersome. The consensus of the group following this discussion was to keep it simple. However if there is good reason to refine the critical level, it should be done within the framework of the levels and definitions that we agree on.

N, P, K Recommendations

Soil test P level of no further crop response. - Cont'd

- There was a discussion on the amount of variability in data used to determine critical levels. This discussion centered around the use of "strict statistical" critical levels as determined from the calibration data versus a "practical" critical level that includes a buffer to account for variation in the critical level. Most labs do use a practical critical level that is somewhat higher than the statistical critical level to minimize errors where the soil test indicates no response but a response is observed. A suggestion was made that a 15 to 20% buffer above the statistically determined critical level be used to take the uncertainty of determining a critical level into account.

P Recommendation at the critical level

The two major points of view here were that the recommendation at the critical level should be zero since no response is expected or it should be related to crop removal to maintain the soil test level near the critical level.

As this discussion progressed it became clear that one of the stumbling blocks was the definitions for these soil test levels. Consequently the agenda was modified to have the discussion on soil test interpretation before we continued with the discussion on recommendations.

- **Soil Test Interpretation - Doug Beegle, Penn State**

Doug presented the attached proposed definitions for soil testing categories. These definitions were developed and adopted by NEC-67 the Northeast Soil Testing Committee. There was general agreement with these definitions among the group. It was agreed that the break between the below optimum category and the optimum category should be the "practical" critical level as discussed previously. While there was agreement on the definition of the above optimum category it was unclear exactly how the point where the recommendation would become zero should be determined. After considerable discussion on this it was concluded that the purpose of using an optimum range, rather than simply an optimum point at the critical level, is to again account for the known variability in soil test calibration data. It was suggested that the width of the optimum range should be related to the amount of expected variability in the calibration data. Fred Cox proposed that the width of the optimum range be two times the standard deviation in the calibration data. Using this criteria 95% of the critical value data would fall within this range. Based on Fred's work, using two standard deviations to define the size of the optimum range would put the break between optimum and above optimum at about 1.5 times the critical level. On this basis the group agreed on the following levels for the soil test level of no further crop response and the soil test level where the recommendation is zero:

	Mehlich 1	Mehlich 3
	---------- mg/ dm^3 ----------	
P soil test level of no further crop response	20	35
P soil test level where the recommendation is zero	30	50

Definitions of soil test categories proposed for the Northeast region. From NEC-67.

a. Crop Response

Category Name (Commonly used terms)	Category Definition	Recommendations
Below Optimum (Very Low, Low, Medium)	The nutrient is considered deficient and will probably limit crop yield. There is a high to moderate probability of an economic yield response to adding the nutrient.	Recommendations based on crop response. These recommendations will generally build the soil into the optimum range over time. Starter fertilizer recommended as appropriate
Optimum, (Sufficient Adequate)	The nutrient is considered adequate and will probably not limit crop growth. There is a low probability of a economic yield response to adding the nutrient.	If soils are tested annually no nutrient additions are needed for the current crop. For other than annual soil testing, recommendations are generally for maintenance applications to maintain the soil in the optimum range. Starter fertilizer recommended as appropriate
Above Optimum (High, Very High, Excessive)	The nutrient is considered more than adequate and will not limit crop yield. There is a very low probability of an economic yield response to adding the nutrient. At very high levels there is the possibility of a negative impact on the crop if additional nutrients are added.	No nutrient additions are recommended. Starter fertilizer may be recommended as appropriate. At very high levels remedial action may be required.

b. Environmental Impact

Potential negative environmental impact	There is the probability that soils testing above this level may result in environmental degradation. This soil test level is independent of the crop response categories in part (a) of this table and may be above or even below the optimum level based on crop response. This level may vary depending on other site specific characteristics.	No nutrient additions are recommended. and should not be applied including starter fertilizer. Remedial action to protect the environment may be required.

Soil Test Interpretation - Cont'd.

There was discussion on whether there are conditions where fertilizer would be recommended in the above optimum range eg. Starter fertilizer. In the some areas, particularly in the northern states, starter may be recommended on soils testing in the above optimum category.

We also returned to the discussion of the recommendation at the critical level or in the optimum range. The consensus of the group was that there were two approaches that could be used in making these recommendations. If soils are tested annually no nutrient additions are needed for the current crop. However, for other than annual soil testing, recommendations are generally for maintenance applications to maintain the soil in the optimum range.

The environmental interpretation issue was discussed briefly. There was concern about the misuse of crop response interpretations for environmental purposes. For example some might try to improperly use the P soil test level where the recommendation is zero as a P limit in a regulatory program. It was suggested that environmental interpretations might be a topic for a future meeting.

N, P, K Recommendations - Cont'd.

Potassium

The discussion on potassium built on the phosphorus discussion and mainly involved a review of the survey data by Steve and then application of the definitions that had been discussed related to phosphorus.

Maximum K Recommendation
There was generally good agreement among the labs concerning the maximum K recommendation. The maximum recommendation for corn was set at 150 lb K_2O/A.

Soil test K level of no further crop response. & K soil test level where the recommendation is zero

The same approach was used for K as was developed for P. The K soil test level of no further crop response was the "practical" critical level. The K soil test level where the recommendation is zero was set at 2 standard deviations above the critical level, approximately 1.5 times the critical level. The agreed upon values are given below:

	Mehlich 1	Mehlich 3
	mg/ dm^3	
K soil test level of no further crop response	80	110
K soil test level where the recommendation is zero	120	165

Thursday February 22, 1996

- **Plans for Next Meeting**

  Steve Donohue was elected chairman for 1997.

  Meeting dates set for February 19 & 20, 1997 in Richmond, VA.

  Plan to finish the effort on standard recommendations and possibly expand to other crops or crop groups.

  Possibly begin a discussion on soil testing and precision agriculture

- **State/Lab Reports**

  Brookside - Mark Flock

  - Using a CM Microwave for plant digestion

  - Working on USGA certification. They are the first lab to go through this process.

  - Yield Monitors, grid sampling, yield maps
    Compiled a list of what is affecting yields from experiences in the midwest.
    1. drainage, moisture stress
    2. crop variety
    3. insect/weed problems
    4. crop rotation
    5. tillage
    6. compaction
    7. pH
    8. herbicide misapplication or drift
    9. subsoil conditions
    10. fertility placement
    11. general fertility - for that year
    12. plant population

    Experience in Illinois on a field with low K areas fertilized to eliminate soil K differences but no effect on yield. Other factors related to soil type were more important.

    Trend in grid sampling is away from mid-point sampling to random sampling with the grid cell. The different sampling patterns can make a dramatic difference in results and conclusions.

  A&L - Paul Chu

  - Now doing Mehlich 3 as an optional test. This is mainly being used for lawn and garden samples. Charging less for Mehlich 3 than for Bray and ammonium acetate. Staying with Bray and ammonium acetate for routine analysis because of customer demand.

  - Now offering soil mapping. They have hired an employee to do this. This person goes to the farm and does everything for the customer.

State/Lab Reports - Cont'd

Maryland - Frank Coale

- Spent the last year mainly fighting for existence. The situation looked bleak but seems to have turned the corner. It came down to an ultimatum that either they were going get the support to do it right or they were not going to do it at all. Looks like they are going to get the support. Their Dean is very sensitive to not competing with the private sector.

- Switching from texture/organic matter for lime requirement determination to a buffer. Likely they will go with Adams-Evans buffer, but they just starting to evaluate this.

- Would like to switch to Mehlich 3 but won't do this until they have an ICP.

- Considering switching from perchloric/nitric acid digestion to microwave for plant and manure samples.

- Doing some research on environmental calibrations for P with Mehlich 1 and Mehlich 3.

Spectrum Analytic - Chuck Robinson

- Developed and are testing a new and improved computer program for handling soil test recommendations. Chuck demonstrated parts of the program and handed out examples of information sheets and reports. This is a DOS based program that they will make available to their clients. They have plans to port this to Windows and other platforms.

- Working to get away from standard lab recommendations and going to more consultant based recommendations.

- They are concerned with the consultants changing the laboratory values and are working on a solution to this problem.

- Developing a program so that the soil test data can be transferred to mapping programs.

Clemson - Kathy Moore

- Bob Lippert left the soil testing program and is now in the Agronomy Department.

- The plant diagnostic clinic is now in with the soil testing lab.

- They have a full-time programmer finishing a rewrite of their recommendation program. They expect to have this finished by July.

- Going to microwave digestion for heavy metals in sludges. Hope to have this in operation by July.

State/Lab Reports - Cont'd

U. S. Borax - Jim Woodruff

- Jim handed out a report on boron sources for foliar fertilization. This was a three state study comparing Solubor with boric acid sources. Concluded that there was no difference.

- Reported on research from Kentucky on and approach to B calibrations for plant analysis for alfalfa fertilization.

- Georgia is recommending B in worm spray (1/4 to 1/2 lb /A) on soybeans

North Carolina State - Fred Cox

- Gordon Miner working on fertigation of strawberries

- Rob Michealson doing N research using the chlorophyll meter on small grains. PSNT not working well in North Carolina.

- Steve Hodges is working on using leaf and petiole analysis for K on cotton. Also working on soil groupings and expect yield system for adjusting recommendations based on soil type similar to Virginia.

- Fred Cox is working on by-products such as lime stabilized sludge and wood ash. Looking at P availability and toxicity from poultry litter and the fate of P in the environment. Also studying Zn and Cu toxicity from by-product applications.

North Carolina Department of Agriculture - Ray Tucker

- In their new lab now for 1 year.

- Have developed a new report form and series of handouts to accompany the reports. Ray handed out examples of these.

- Nutrient management is a major issue in North Carolina. There is now 1 hog for every person in the state! This is the result of dramatic increases in animal production in the state.

  For example:

  Hogs increased from 2,000,000 in 1990 to 8,000,000 in 1995
  Turkeys increased from 5,000 in 1964 to 60,000 in 1994
  Broilers increased from 200,000 in 1964 to 600,000 in 1994

- Seeing increases in Cu and Zn in poultry waste amended soils. This is not a problem yet, but the trend is a concern.

State/Lab Reports - Cont'd

Agri Analysis - Tim Hoerner

- They have a new building for the lab.
- Manure analysis is surprisingly down about 25%. Starting to get involved in compost analysis.
- New NIR for forage analysis.
- Looking for a commercial lab information management system. Any ideas, suggestions, or recommendations would be appreciated.
- Looking for an automatic sampling system for a truck or 4 wheeler. Again, any ideas, suggestions, or recommendations would be appreciated.

Rutgers - Joe Heckman (given by Steve Donohue)

- Working on N fertilization of corn.
- Working on chlorophyll meter for N management.
- Stephanie Murphy is the new lab person at Rutgers.

Penn State - Doug Beegle

- Sample numbers are down about 10,000 samples over the last two years. Originally this was blamed on the spring snow, but last year there was little snow.
- They have a new Perkin-Elmer auto mercury analyzer.
- They are beginning to work on a rewrite of their soil test recommendation program.
- Doug, Dick Fox and Greg Roth are working on a project to evaluate several different nitrogen testing programs for corn. They are working with county agents, dealers and consultants to evaluate the PSNT, the chlorophyll meter, and an at-planting soil test under real field conditions. Most of the cooperators like the chlorophyll meter test.
- Doug has been doing research to compare the N and P availability from manure and manure compost. Finding about 10% N availability of organic N from compost compared to 35% from manure.

Virginia Tech - Steve Heckendorn

- Sample numbers are down slightly.
- They have lost 2.25 people in the lab but are not expecting a further decline. They may be adding an additional person.
- Fee increase from $6 to $7 is planned for 7/1/96.

State/Lab Reports - Cont'd

Virginia Tech - Dave Martens

- The department went from 35 to 500 undergraduate students while at the same time faculty numbers have been declining. About 125 of these students are traditional crops and soils students. The rest are environmental students. They have been recruiting by direct mailing to a list of top students across the US. Anyone who responds gets a personal letter and many students are visiting the department.

- Dave is involved in a long term hog manure study (16 years). They are looking mainly at Cu and P and their movement into the subsoil. Dave asked for input from the group on what method he should be using to monitor the Cu movement. He is leaning toward using the Mehlich 3 but also considering the DTPA test.

Virginia Tech - Steve Donohue

- Steve gave a report on work they are doing with micronutrients on bentgrass golf greens. They did a survey of golf courses about their use of micronutrients on greens. This survey included a soil and plant analysis from one green on each course. Some of the findings follow:

    - 79% of the golf courses use micronutrients on their greens. (56% use a micronutrient mix, while 23 % only use Fe for color.)
    - Soil levels were, on average, about 10X the critical levels for Zn
    - Plant analyses were, on average, over 2X the critical level for Zn
    - There were no greens testing below the critical level for Zn, Cu, & Fe.
    - 7% of the greens tested low for Mn
    - 19% of the greens tested low for B
    - There was generally poor correlations between soil and plant levels.

  Their recommendation is to use plant tissue analysis with soil tests and visual observation to determine micronutrient needs. A soil test alone is not adequate, especially on sand based greens.

Submitted by: Douglas Beegle, Penn State University