Agronomic Division — 2007 Annual Report

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Service (fiscal year summary)

In fiscal year 2007, Agronomic Division laboratories processed more than 395,000 soil, nematode, plant, waste and solution samples, and issued more than 56,700 advisory reports. This workload represents an all-time record. The soil testing and waste analysis laboratories continue to operate under the N.C. Department of Environment and Natural Resources (DENR) Division of Water Quality's laboratory certification program and are qualified to provide critical testing for animal waste permits and nutrient management compliance. The soil testing and plant analysis laboratories remain a part of the North American Proficiency Testing program. Under this program, our laboratory results are compared with those of other laboratories across the country on a quarterly basis.

In summer 2007, the Division revamped its Web site in conjunction with a Department-wide redesign effort. Closely aligned with this project was a much-needed revision of the portal that gives public access to agronomic report data. PALS—Public Access to Laboratory-information-management System—was completely rewritten and designed to improve ease of use, access to data and search features. The public can access the new system to submit agronomic sample information, correct/update address or other contact details, conduct searches on agronomic report data, or view reports generated in real time.

The **Soil Testing Section**, under the direction of David H. Hardy, Ph.D., analyzed 333,512 soil samples and issued 39,155 reports with fertilizer and/or lime recommendations. This workload set an all-time record for the Soil Testing Section, surpassing by 4% our previous record of 321,752 samples analyzed in 2001. Turn-around time never exceeded 7 weeks and, for much of the peak testing period, samples were processed in about 4 weeks or less.

The **Plant/Waste/Solution (PWS) Section**, under the direction of Brenda Cleveland, analyzed 10,876 plant tissue samples. The Section also analyzed 18,656 waste samples and 3,401 solution samples, up slightly from last year. Anaerobic hog lagoon samples accounted for 73% of the total waste samples, followed by poultry house litter at 9%. Most solution samples were either nutrient solutions (46%) or source water (18%).

The lab implemented new potassium (K) sufficiency ranges for cotton tissue analysis based more precisely on growth stage. This change was necessary because growers today typically monitor cotton nutrition by collecting tissue samples over a 4- to 6-week period, rather than collecting a single sample just before bloom. The revised K sufficiency ranges take into account changes in nutrient concentration that occur as the crop matures. For

seedling and early growth, the desired K range remained at 1.5–3.0%. The range was adjusted to 1.2–2.5% for early bloom and 0.75–2.5% for late bloom.

The **Nematode Assay Section**, under the direction of Weimin Ye, Ph.D., processed 27,841 samples and 3,988 reports in fiscal year 2007, including 1,289 research samples, 437 diagnostic samples, 65 out-of-state samples, 168 samples from the NCSU Plant Disease and Insect Clinic and 328 regulatory samples from the NCDA&CS Plant Industry Division. This sample volume was down from fiscal year 2006 by about 2,100 samples. From April through September, samples were processed in about 10 business days. During the busy season of October through March, turn-around time averaged about 30 days.

The nematology lab has acquired new equipment to help diagnose critical nematode species at the molecular level. This equipment includes a PCR (polymerase chain reaction) thermocycler, gel-photo documentation system and microcentrifuge. The lab has successfully identified some cyst and root-knot nematode species by DNA sequencing and is developing a PCR-RFLP (restriction fragment length polymorphism) method for rapid species identification when exact identification is not possible by morphological examination alone. A database containing information on nematicides, resistant varieties and rotational crops has been compiled to help provide growers with appropriate management recommendations based on their report data.

One of the laboratory's Nematology Technician positions was upgraded to a Research Specialist position to provide technical assistance to the laboratory manager and the section nematologist.

Field Services Section personnel made 8,098 grower visits, 7,580 of which were to help diagnose nutrient and/or nematode problems. Regional agronomists handled 518 inquiries regarding environmental issues — primarily waste management plan clarifications, regulatory updates and river basin oversight reviews — and participated in local advisory committees. Agronomists also provided technical expertise and/or training for several regional and statewide environmental projects in cooperation with DENR, North Carolina State University (NCSU), N.C. Agricultural & Technical State University and USDA-NRCS.

Several regional agronomists received recognition for exemplary service this year. Lynn Howard was the department employee of the month for October. The Farm Bureau presented an award to Bill Yarborough for his "tireless efforts in flood recovery, drought relief and farmland preservation." David Dycus received the Friend of Agriculture Award from the Kiwanis Club of Sanford.

Education & Outreach **(calendar year summary)**

Agronomic Division staff, especially the **Field Services Section**, reach thousands of growers, homeowners and agricultural professionals through a wide range of educational activities. This year, in response to the state-wide drought, the division's regional agronomists devoted a significant amount of time to the departmental hay relief effort. Meetings and workshops were held across the state to educate farmers about the situation, inform them about alternative feeds, and help them find and transport available feed from other areas. This effort helped many small farmers and livestock producers stay in business through a year of record drought.

In-house staff conducted 24 laboratory tours for farmers, master gardeners, agribusiness groups, scientists and students, including an international delegations from Honduras. Information on agronomic services was disseminated through more than 27 educational exhibits displayed at farm shows, field days, training events and professional meetings.

Outreach also included 15 news releases in addition to articles in publications such as *North Carolina Turfgrass*, *Better Crops with Plant Food*, the North Carolina Blueberry Council newsletter and *Communications in Soil Science and Plant Analysis*. Many presentations on agronomic services were made to master gardeners, growers, commodity associations, conservation groups, and county and state organizations.

Division personnel participated in local, state, regional and national meetings, including

- Soil Science Society of N.C., 50th annual meeting (Raleigh; January 16–17 2007)
  — presentations co-authored by David H. Hardy, Ph.D.: (1) *Broiler-breeder diet effect on manure-amended soil: phosphorus transformation*; (2) *Responses of corn and wheat to sulfur fertilizer*;
- American Society of Agronomy, 99th annual meeting (New Orleans, LA; November 4–8, 2007)
  — poster co-authored by David H. Hardy, Ph.D. and Brenda R. Cleveland: *Nutrient deficiency diagnosis training using field & greenhouse plants* [winner of the Division A-4 Award of Excellence].
- American Society of Nematologists, 46th annual meeting (San Diego; July 28–August 1, 2007)
  — papers co-authored by Weimin Ye, Ph.D.: (1) *Pyrosequencing for metagenomic analysis of nematode diversity*; (2) *Three new nematode associates from sycones of Ficus colubrinae in La Selva, Costa Rica*; and (3) *Focal sampling of termites to test the latitudinal gradient hypothesis for entomophillic nematode diversity*.

Division staff authored, or co-authored, 18 technical articles. As president of the Soil Science Society of N.C. (SSSNC), David H. Hardy, Ph.D., organized the 50th annual meeting of SSSNC in January 2007.

Research (fiscal year summary)

Division staff routinely conduct cooperative studies with university personnel, farmers and industry specialists. This year, cooperative research involved the processing of 4,839 soil samples; 4,876 plant/waste/solution samples; and 1,289 nematode assays.

The **Soil Testing Section** conducted field work on vinifera grape fertilization jointly with Dr. John Havlin of N.C. State University. An evaluation of the usefulness of the presidedress soil nitrogen test (PSNT) in corn production was continued at one Piedmont location.

The **Plant/Waste Solution Section** began a study to help validate *revised* interpretation indices for leaf blade K determinations. This study was hindered by drought and will continue into the upcoming season. The section is conducting an on-going evaluation of tissue sample data from bramble crops across the state so nutrient recommendations for this group of crops can be fine-tuned. The investigation continued this year into monitoring changes in cotton petiole nitrate concentrations based on time of day and plant growth stage. This study was also hindered by drought and will continue into the upcoming season.

The **Nematode Assay Section** initiated a permanent slide collection of economically important, plant-parasitic nematodes and finished out the year with 1,300 specimens. The section collaborated with N.C. State University on a new proposal for a sweetpotato integrated pest management project. Application was approved for a state government intern to work on molecular diagnosis of major root-knot nematodes in North Carolina. The lab also conducted the following cooperative studies with the **Field Services Section**:

- nematode management in field production of peony,
- corn nematode management by seed treatment and
- molecular identification of tobacco cyst nematode using DNA sequencing.

The **Field Services Section** conducted or participated in about 33 research and demonstration projects in fields throughout the state. These projects were designed primarily to optimize fertilizer rates and improve management of plant-parasitic nematodes.

During 2007, division staff engaged in field studies on

- sulfur fertilization of blueberry, corn and small grain;
- nitrogen fertilization of burley tobacco and corn;
- starter phosphorus study on lettuce (year 2);
- nematode management in peony and Irish potato;
- K_2O requirements of cotton, corn;
- manganese test on soybeans growing in high pH soils;

- corn nematode study;
- soybean variety test for resistance to soybean cyst nematode;
- soybean seed treatments;
- bramble study;
- tissue analysis of cantaloupe;
- Nutrisphere vs. urea on pastures;
- fertility of high-tunnel tomatoes;
- organic vs. conventional fertility of tomatoes;
- forages as receiver crops for swine waste.