Nutrient management research and education efforts are needed to address major regional problems associated with nutrient losses to surface waters and ground water. The multi-state, multi-agency Nutrient Management Workgroup is prioritizing needs and designing collaborative programs to support coordinated research and development of educational resources.

Nutrient Management Program
The Nutrient Management Program is one of 12 priority program areas identified by the Southern Region Water Quality Planning Committee. A multi-disciplinary regional workgroup of nutrient management experts is improving nutrient management recommendations to enhance both economic and environmental outcomes in threatened and impaired watersheds. Through strengthened regional and multi-agency collaboration, the workgroup identifies gaps in knowledge and resources, defines significant research needs, and conducts strategic planning to develop appropriate educational and technology transfer tools.

This newsletter is an outlet for sharing and showcasing success stories and products from the Nutrient Management Program. It will be posted to http://srwqis.tamu.edu biannually in pdf format. Questions or comments can be directed to the team leaders or the appropriate state contact.

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Improving the Efficiency of Nitrogen Management in Cotton
F.M. Hons1, M.L. McFarland1, R.G. Lemon1, T.L. Provin1, and R.L. Nichols2, Texas Cooperative Extension1, Cotton Incorporated2

Background
Nitrogen (N) is the most frequently applied, and usually the most expensive nutrient input for cotton production in Texas. Nitrogen also is the most difficult nutrient to properly manage because of its reactivity and mobility in the soil environment. Inadequate N reduces the number of fruiting sites and potential yield, while excessive N can delay maturity, also can lower yield, and may contaminate ground and surface water resources. Recommended N rates have traditionally been based on the quantity of N required to produce a crop at a realistic yield goal, and are reduced by credits for the estimated residual soil nitrate (NO₃) to a depth of 6 inches.

To improve nitrogen management, a five-year study was conducted across the major cotton production regions of Texas through support from Cotton Incorporated. Nitrogen application rates ranged from 0 to 150 lbs N/acre in 50 lbs/acre increments and residual soil nitrate was measured to a depth of 4 feet.

Results
Cotton lint yield at only 8 of 39 sites, or about 20%, responded positively to the addition of supplemental fertilizer N (Table 1). Below normal rainfall contributed to lowered response in some years, but the major contributing factor appeared to be high amounts of residual soil NO₃. Amounts greater than 100 lbs of residual NO₃-N/acre were found in 22 of the 39 profiles sampled. Results indicated that where residual NO₃-N was greater than 100 lbs N/acre to a depth of three or four feet, lint response to N fertilization was minimal. The quantity of soil NO₃ above which no response to fertilizer N may be expected may be even lower for dryland locations where water is limiting.

Results from this study also showed that sampling soil to a 24-inch depth as compared to the currently recommended six inches could significantly reduce fertilizer N application rates. For example, recommended N fertilizer rates for yield goals of two bales lint/acre were decreased by an average of approximately 30%.

Program Outcomes
As a result of this research, new soil testing recommendations have been proposed in Texas for nitrogen management in cotton. New soil testing options, including profile sampling to a depth of 24 inches are being developed. And, a new publication titled “Managing Nitrogen Fertilization in Cotton” has been published and is being distributed to growers across the state (http://tcebookstore.org/pubinfo.cfm?pubid=2016).

![Fertilizer applied on high N sites promoted excessive vegetative growth, boll rot, and insect attack, while decreasing boll retention, fiber quality, and defoliation effectiveness.](image)

Table 1. Five-year summary of results for the project.

<table>
<thead>
<tr>
<th>Years</th>
<th>Rainfall</th>
<th>Total</th>
<th>Profile NO₃-N &gt;100 lbs N/acre</th>
<th>Response to N</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>10% of normal</td>
<td>6</td>
<td>1</td>
<td>3†</td>
</tr>
<tr>
<td>1999</td>
<td>normal</td>
<td>7</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>2000</td>
<td>less than normal</td>
<td>7</td>
<td>5</td>
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<td>10</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>2002</td>
<td>normal</td>
<td>9</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>39</td>
<td>22</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

† Indicates a significant positive lint yield response to added fertilizer nitrogen.
Extension professionals are challenged to avoid the ‘same old meeting’ syndrome. PowerPoint-based presentations may be the current norm, but it may help to remember the demonstration roots of the profession. Clients seem to appreciate when educational material is related to something right before their eyes.

A new program was initiated by in South Mississippi in December of 2003 for forage and livestock producers by MSU Extension Service Area Agronomy Agent Stan Pace. It is simply named “Pasture Walks” because that’s what happens for two hours.

Pasture Walks are designed as very informal dialogues where forage and livestock producers take the conversation to their areas of interest. The walks conducted over the past year have been very effective and efficient in educating producers about pastures, livestock production techniques, and management decisions.

Areas of discussion have included summer and winter weeds, soil fertility/nutrient management, rotational grazing, livestock stocking rates, fence design and development, summer and winter annual grasses, legumes and nitrogen production.

Scheduling is underway for the Spring Pasture Walk season.

“Clients seem to appreciate when educational material is related to something right before their eyes.”

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**Mississippi Pasture Walks**

Larry Oldham, Plant & Soil Sciences, Mississippi State University

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**Nutrient Management**

**Leadership:** North Carolina, Texas, and Florida

**Participation:** All states

**Situation and Objectives:** Major regional problems associated with nutrient losses to surface waters (Mississippi and Neuse River Basin hypoxia issues) and specific TMDLs designated for impaired watersheds (Bosque River in Texas) are prevalent across the Southern Region. In addition, groundwater contamination by nitrate continues to be a major concern for domestic wells in many areas. Nutrient management research and education efforts are needed to address soil testing and fertilizer recommendations for new crop varieties and/or cropping systems, such as GMO varieties and conservation tillage, in different agro-ecological environments. Regional efforts are needed to provide essential information in support of state and federal programs (e.g., CAFO/AFO and NRCS 590 standard). The objective of this Program is to support regional planning, collaboration and information sharing to improve nutrient management recommendations and enhance both economic and environmental outcomes in threatened and impaired watersheds.

**Actions:** The regional Program Team will utilize University expertise in Agronomy, Soil Science, Economics, and Engineering, along with partners such as the NRCS, state Departments of Agriculture, and industry, to accomplish the following:

- Identify and compile existing research and educational resources for nutrient management planning and define and prioritize significant gaps to be addressed. Multi-state teams will design collaborative proposals and seek funding to support coordinated applied research and development of educational resources to better implement nutrient recommendations.

- Assemble a comprehensive database of existing and newly developed resources and provide access to those resources through the Southern Region Water Quality Information Database (http://srwqis.tamu.edu).

**Impacts:** Enhanced regional and multi-agency collaboration, improved recommendations and nutrient management BMPs that reduce nutrient loading to surface and ground water and address production economics.
In Alabama, there are very few situations where broiler litter can be legally land applied between November 15 and February 15. Few crops, including cool-season annuals, make sufficient growth during this period to justify an application of broiler litter or any other source of nutrients for that matter. However, some producers may have to clean out a broiler house and a row crop farmer may need to temporarily stockpile the litter near a field for spring application. Best management practices currently recommended by NRCS for litter storage include expensive dry stack facilities and fairly rigid requirements for outdoor storage under polyethylene cover. Cotton farmers in particular complain about the difficulty of keeping 6 mil polyethylene over a pile and the problem the torn plastic causes when it gets caught in cotton pickers and cotton modules. Some producers have observed that litter that is stacked into a cone outside will naturally shed water during the winter once the outer surface is wet. Is there a simpler yet safe way to stack and store dry broiler litter outdoors during the winter when it cannot be spread? A current experiment in Alabama is taking a serious look at alternatives.

Charles Mitchell, Extension Agronomist-Soils, Ted Tyson, Extension Biosystems Engineer, and Alan Torbert, USDA-ARS Soil Scientist started the project on 17 December 2004. They are collecting runoff samples and monitoring litter moisture from mini-piles of litter in an attempt to determine the environmental risks of nutrients leaving piles under different storage systems. Included are poultry broiler litter that is (1) uncovered and roughly stacked, (2) uncovered and cone shaped, (3) uncovered, cone shaped, and sprayed with a liquid polymer to seal the litter, (4) covered with 6-mil, polyethylene, and (5) covered with Western Hay-Gard (r) fabric. The experiment is expected to continue for up to one year.

Moisture sensors imbedded at different depths within the pile will automatically monitor moisture penetration within the pile.

Runoff from mini piles of poultry broiler litter will be monitored for up to one year.

“Is there a simpler yet safe way to stack and store dry broiler litter outdoors during the winter when it cannot be spread?”

Ted Tyson, Extension Biosystem Engineer, sprays a liquid polymer on one mini litter pile to repel rainfall. If this works, it will be a very inexpensive and simple way to protect an exposed pile.
In 1995, major fish kills in the Neuse Estuary caused by excess nitrogen spurred a series of rules to be passed. These rules, whose goal was to reduce nitrogen by 30% within five years, are known as the Neuse Rules. Point sources, as well as nonpoint sources (which included agriculture) had to meet this nitrogen reduction goal. Producers had to either join a local area committee that was responsible for meeting a county-wide nitrogen reduction goal or they had to implement buffers and nutrient management plans. Each county determined how they would meet their goal; some counties primarily relied on buffers or controlled drainage, while other counties relied primarily on nutrient management plans. Members of the Neuse Team, a group of university and county-level professionals, helped counties meet their goals.

In some counties, nutrient management planning was a major thrust of the nitrogen reduction strategy. Neuse team personnel and county extension agents worked directly with cooperating producers from 1999 through 2004 to write and implement nutrient management plans on over 150,000 acres of cropland. In Wayne County alone, close to 100,000 acres received nutrient management plans. To meet the challenge of developing thousands of acres of nutrient management plans, project personnel developed two innovative approaches: 1) A simplified computerized nitrogen fertilizer spreadsheet was developed for commercial fertilizer plans, and 2) Group nutrient management planning sessions allowed greater outreach to more farmers. A group of approximately 10 farmers would meet with their farm records and maps and the project technicians would help them determine the appropriate nutrient management and write the plan.

Farmers embraced nutrient management planning as a useful tool. According to one project farmer “[nutrient management plans are] good for the river and for my pocketbook. I have a real concern for the effects on the environment and people living below me on the river. Just to survive you have to save a dime and this helps control costs somewhat.”

Even though nitrogen was the basis for the plans, soil sample results were used resulting in a complete nutrient management plan. Generally, farmers could reduce their nitrogen (N) application rates by approximately 15%. In one area, the nutrient management planning process, along with aggressive cotton petiole monitoring, convinced some farmers, who were using poultry litter and fertilizer that they did not have to apply additional commercial fertilizer. This decreased nitrogen applications by as much as 100 lbs per acre. Many of the fields sampled required no additional phosphorus and often no potassium. This was reflected in plans with a zero phosphorus and potassium recommendation.


An evaluation of the project found that when nutrient management plans were written for the farmers, they did not use them. On the other hand, when producers were involved in writing their own nutrient management plans, they were much more likely to implement them.
Minimizing Nutrient Discharge from Container-grown Ornamentals

Chris Catanzaro and Sam Dennis, Institute of Agricultural and Environmental Research, Tennessee State University

Background:
Soil-less substrates are used in the production of container-grown ornamentals. In soil-less substrates, nutrient and irrigation management is especially important. A crucial goal during production is to maintain nutrient concentrations at sufficiency levels, yet low enough to minimize nutrient loading to surface and ground water. Therefore, growers must maximize the availability of nutrients applied as fertilizer, while minimizing nutrient loss to the environment. Incorporating calcined clays into soil-less substrates reduces the discharge of nutrients from containers. Arcillite and similar clays are 2:1 clays with relatively high specific surface area and cation exchange capacity. In previous work, arcillite incorporated into a peat-based substrate (10 or 20%, v/v) reduced discharged of excess nutrients from container-grown chrysanthemum without reducing plant quality.

Methodology:
A study was conducted to determine whether soil-less substrates amended with a calcined attapulgite and montmorillinite clay (10%, v/v) affected growth or discharge of nutrients from container-grown ‘Prestige’ poinsettias. Rooted poinsettia cuttings were potted using either a commercial peat-based substrate (Fafard 2) or one containing both peat and pine bark (Fafard 52). Plants were supplied with 9.3 g of controlled release fertilizer, 19N-2.6P-10K, from Osmocote 19-6-12. Plants were irrigated by hand when each treatment dried to a predetermined fraction of container capacity, and plants were irrigated with sufficient volume of water to ensure that containers leached. Leachate was collected at each irrigation period and analyzed for pH and electrical conductivity. Leachate from several sample dates was further analyzed to determine concentrations of nitrate, ammonium and orthophosphate. Final plant growth data was also collected.

Results:
Plant growth and quality were generally unaffected by substrate treatment. Electrical conductivity data also showed little difference among treatments. However, orthophosphate concentrations showed significant reductions with addition of clay, especially early in the crop production cycle (see table). No differences were observed for nitrate or ammonium.

Impact:
Results suggest that low amounts of calcined 2:1 clays incorporated into soil-less substrates sorb excess orthophosphate without decreasing crop quality of container-grown poinsettias.

Acknowledgments:
Our appreciation is expressed to Paul Ecke Ranch for plant materials, Oil-Dri Corporation for clay, and Dr. John Lea-Cox for conducting the speciation work.

Drs. Catanzaro and Dennis are research assistant professors in the Institute of Agricultural and Environmental Research at Tennessee State University. For more information, contact Dr. Catanzaro at ccatanzaro@tnstate.edu, and Dr. Dennis at sdennis@tnstate.edu. Their mailing address is TSU Box 9610, 3500 John Merritt Blvd., Nashville, TN, 37209.
Mr. Mit Walker, an inspector with the Alabama Department of Environmental Management (ADEM) says that the state regulatory agency will begin strictly enforcing annual inspections of all registered concentrated animal feeding operations (CAFOs) in the State. The requirement for annual inspections was part of Alabama's 1999 AFO/CAFO rules but a shortage of personnel by the state agency and a lack of qualified credentialled professionals (QCPs) within the state made annual inspections difficult. According to Alabama's rule, a professional engineer, a Certified Crop Advisor (CCA), or anyone professionally trained in nutrient management e.g., a Technical Service Provider, can do the inspections. On 16 December 2004, over 40 Alabama CCAs were trained by ADEM and staff of the Alabama Cooperative Extension System to do these inspections. Inspections are to be done by the private sector QCPs and not by public employees e.g., staff of USDA-NRCS, Cooperative Extension, and other state agencies. The CAFO owner/operator is required to pay for this service. This is a new opportunity for nutrient management consultants in Alabama. Alabama has almost 550 CAFOs most of which are poultry operations.

Approximately 85% of Alabama's registered CAFOs are broiler operations with 5 or more houses.

"...the state regulatory agency will begin strictly enforcing annual inspections of all registered concentrated animal feeding operations (CAFOs) in the State"

Litter piles exposed to the elements may create nutrient runoff problems as well as degrade the quality of the litter as a fertilizer.

Existing Alabama USDA-NRCS best management practices require that temporary storage follow this schematic and be stored for no more than 180 days.
The goal of this project is to provide training for Technical Service Providers and others desiring to be trained in one or more of the first three of six elements described in the USDA-NRCS Comprehensive Nutrient Management Planning Technical Guidance Manual. Specifically, the two elements in which participants will receive training for certification are Nutrient Management and Land Treatment Practices.

Six Nutrient & Pest Management Module 7 - Florida Practicum Training Courses were delivered. The spring (May/June) sessions were held in Okeechobee and the full sessions (November/December) in Live Oak. These courses were intended for those seeking certification to complete Comprehensive Nutrient Management Plans (Nutrient Management & Land Treatment Practice Elements), Conservation Plans, Nutrient Management Plans, and/or Pest Management Plans. This course was provided at no charge to the candidates.

We have had 139 participants to date. The course is designed as a series of presentations which relate to the development of nutrient management plans. Presenters for the course included personnel from the Institute of Food and Agricultural Sciences (IFAS) at the University of Florida, USDA-Natural Resources Conservation Service (state and national personnel), the Water Management Districts and the Florida Department of Environmental Protection. The training includes description of the laws and regulations, principles of nutrient interaction and movement through the soils of Florida, details of a nutrient management plan, the Florida phosphorus index, soil and manure testing methods, trace metals, land treatment practices, and other relevant topics. In addition, there is a field visit to an animal operation. During this visit the students will collect baseline data for a Nutrient Management Plan. The data collected includes soil survey information, field inventories and land uses, identification of sensitive areas, cropping history and rotations, and current practices and land treatments. There is also discussion on the waste management system, bio-security, and conservation practices. Soils are examined using soil survey data, soils map and by conducting a deep soil borings at several locations. The assessment and calculations in determining the Florida Phosphorus Index (P-Index) are demonstrated. The importance of site specific analysis of soil characteristics with regard to P retention capacities is emphasized. Students will have the opportunity to develop a Nutrient Management Plan for specific fields during the class and discuss the methods and calculations involved.

Knowledge gain which is determined through a pre- and a post-test scoring has averaged 26%. The participants liked the mixture of science, theory and practice. Each participant receives a notebook, workbook and CD of reference material, forms, Phosphorus Indices of all Florida counties, and other relevant reference material. Participants successfully completing this course with an 80% or higher on the post-test must submit one Nutrient Management Plan to NRCS for approval. At this time they will be certified for Nutrient Management.

The next planned course will take place in Okeechobee from May 3-5, 2005.
The Southern Region Water Quality Regional Coordination Project is designed to promote regional collaboration, enhance delivery of successful programs and encourage multi-state efforts to protect and restore water resources. Effective approaches for watershed management, pollution prevention and youth education are identified and shared among states. Ultimately, the project improves public access to the research, extension and education resources available through the Land Grant University System, including 1862 and 1890 institutions, in the Southern Region and nationwide. The project is funded by the USDA Cooperative State Research, Education & Extension Service.

The goal of this Project is to provide leadership for water resources research, education and outreach to help people, industry and governments prevent and solve current and emerging water quality and quantity problems. Programs and resource development efforts target eight major water resource issues:

♦ Drinking Water and Human Health
♦ Environmental Restoration
♦ Animal Waste Management
♦ Nutrient and Pesticide Management
♦ Pollution Assessment and Prevention
♦ Watershed Management
♦ Water Conservation and Ag Water Management
♦ Water Policy and Economics

The Project utilizes multi-state research, education and extension activities to promote watershed management and protection and pollution prevention. For example, the Project has enabled research-based training programs on stream restoration techniques and comprehensive nutrient management plan development to be offered throughout the Region.

Regional coordination and collaboration are further enhanced and state programs strengthened through identification and sharing of successful state programs, water quality training for Extension professionals, and a regional water quality web site that provides comprehensive water resource information to the public and water quality professionals.