Wilson County farmer uses advanced technology to closely regulate tobacco crop fertilization

David Hinnant of R. J. Hinnant and Sons in Wilson County is always looking for new solutions to old problems.

Hinnant was one of the first farmers in his area to adopt precision agriculture, in which fields are mapped by satellite and detailed nutrient management plans are developed for lime, phosphorus (P) and potassium (K) requirements using computer technology.

But Hinnant was concerned about nitrogen (N), the key element in crop growth and water quality, and the inability of existing precision agriculture technology to manage nitrogen.

N has a greater effect on tobacco yields and quality than any other nutrient. Too little reduces yield and results in pale, slick, cured leaf; too much may increase yields, but also can boost sucker and insect pressure, delay maturity, extend curing time, lower leaf quality and lead to use of excessive maleic hydrazide for sucker control. N is also very leachable and excessive rates may contribute to groundwater pollution.

To further complicate matters, N fertilization recommendations for tobacco are based on topsoil depth: the deeper the topsoil, the more N can be applied.

This means that to accurately manage N, farmers need to be able to change application rates across a field.

In an effort to solve this problem Hinnant cooperated in a joint effort among the Neuse Education Team, the Neuse Crop Management Project, Wilson County Cooperative Extension and the N.C. State University Crop Science Department to develop a precision N application unit for tobacco.

Hinnant and Neuse Technician Jeremy Barnes built a variable-rate N applicator and mounted on it a tractor.

Technicians measured topsoil depth — the depth from the soil’s surface to underlying clay — across one of Hinnant’s fields by taking core samples at 50-foot intervals. Depth to clay ranged from 8 to 30 inches across the field.

Three N rates were applied across the field to determine crop response: a uniformly high N rate, a uniformly low N rate and a variable N rate were applied on the plot’s deep topsoil portion of the plot and a uniformly low N rate was applied on the plot’s shallow topsoil portion.

N.C. State researchers saw no yield differences between treatments, but the percentage of variegated tobacco grades was much lower for the variable N rate (25 percent) and the low rate (14 percent) than for the high N rate (42 percent).

Tobacco buyers place a premium on quality tobacco that is mature, and penalize growers for low-quality tobacco, such as a variegated grade. Variegated grade is due to green in the cured leaf, an indication that the leaf was harvested while immature or contained excessive N.

These results indicate that precision N application to tobacco will increase N efficiency, lower production costs, increase uniformity, maintain yields, improve tobacco quality and protect groundwater quality.

“Last year we used only about 61 pounds of nitrogen per acre,” Hinnant said, “and we had better yields and quality.”

—William Lord
N.C. State researchers will test runoff from roof

The news media frequently carry stories about NeuseTeam activities. One such story, reprinted here by permission, ran recently in the Kinston Free Press.

By Steve Martini
Kinston Free Press Staff Writer

Finding a well-groomed lawn in some of Kinston’s neighborhoods isn’t abnormal. However, finding a well-kept lawn on a roof top these days is out of the ordinary, although a group of N.C. State University researchers hope some day it won’t be.

Neuse Education Team (NET) members hope a vegetated rooftop – a “green roof” – they constructed in March will help improve water quality in the Neuse River. They built the green roof on one of three roofs at the Neuseway Planetarium, now under construction near the Neuseway Nature Center in Kinston.

“We hope a vegetated rooftop will decrease the flow of nitrogen (N) into the Neuse River,” said NET member Bill Hunt, a biological and agricultural engineering specialist with N.C. Cooperative Extension. “We’ll have reportable data in about four months and publishable data in about a year.”

Mike Regans, NET member and an Extension area specialized agent in environmental education, hopes that since plants use N as a food source, the green roof will help decrease N levels in rainwater that flows into the soil.

The green roof, a joint project of Kinston, NET and Extension, and Kinston-Lenoir County Parks and Recreation, is the first of its kind in Eastern North Carolina.

“This is the first green roof in America that will be studied for nitrogen reduction,” Hunt said. “We’re going to compare nitrogen levels in the runoff between this roof and a normal roof.”

Lenoir County was named a N-sensitive county by the state Division of Water Quality last March.

“Kinston was one of 15 cities in the Neuse River Basin that had to reduce nitrogen levels in the river,” said Steve Miller, Kinston civil engineer. Businesses moving into Lenoir County that have the potential of adding N levels from their roofs must pay penalty fees to city and state governments. If a business dispenses 3.6 pounds of N per acre per year, they must either pay a one-time penalty fee to the state and an annual fee to the city, or build other alternatives that would decrease N runoff, such as grass buffers or ditches. The one-time fee is $330 per pound of N dispensed per acre per year.

“I felt like this was a good project to show developers how to grow a green roof on their buildings,” said Bill Ellis, parks and recreation director. “This would help the environment and reduce the cost of fees applied by the government.” The idea for the green roof started about a year ago when Hunt and

Regans discussed the practice, which is common in Germany.

“We went to Germany to study green roofs,” Hunt said. “They’re used over there to produce oxygen, provide insulation and reduce flooding. We thought we also could reduce nitrogen levels here in the Neuse.”

Extension agents are planting sedum at the planetarium, a plant native to Afghanistan and Turkey. The plant’s ability to survive in a dry climate made it a great candidate for rooftop residency.

“We can’t have a plant that needs too much water because the water adds weight to the rooftop,” Hunt said. “When you add weight, you have to make the roof stronger and that adds to your cost.”

Stormwater runoff will empty from the roof into the Neuse River, while samples will be collected on various places along the runoff route.

Hunt hopes the use of green roofs catches on in North Carolina, provided they’re proven effective.

“Green roofs are common in urban areas that have high land costs,” Hunt said. “This would be great in places like Raleigh, Charlotte and Greensboro.”

The 250 square-foot rooftop was completed in March.

“Initially, this will be something to look at, but it won’t be accessible for the public to walk on,” Hunt said. “After the sedum grows for about a year, the City of Kinston will open it for public access.”
Wayne County has more to brag about than soaring F-15’s. On farm fields below the fighter jets, a new nutrient management process has taken flight.

Since the passage of the Neuse River Rules, Neuse River Basin farmers’ nitrogen application rates must be based on two criteria: the commodity grown, which farmers have always done, and now the predominant soil type of the land. And thanks to the Neuse Crop Management Project, this additional requirement is being met in a very efficient, collaborative manner.

The new approach, developed by Wayne County Agricultural Agent Bob Pleasants, has already yielded impressive results. More than 60,000 of the nearly 100,000 acres of land with nutrient management requirements have received plans.

Here’s how it works: Fertilizer dealers spread the word about the nutrient management sessions and get producers to the sessions at their warehouses in groups of 10 to 12. During the sessions, Pleasants and Andy Herring, a Neuse Crop Management field technician, work with producers to locate their fields on a county soil survey map. The farmers complete a worksheet that details field acreage and soil series information that the field technician enters into a computer spreadsheet program to generate the nitrogen management plan.

Pleasants feels that this a great approach for covering a lot of acres and getting fertilizer dealer buy-in and support of the process. “We have had dealers request more than one planning session in order to assist more of their clients,” Pleasants said. “Without the monies to support our field technician and the cooperation of several fertilizer dealers, the challenge of developing nutrient management plans for what is required of Wayne County would have been overwhelming,” said Dr. Deanna Osmond, soil scientist at North Carolina State University and lead coordinator of the Neuse Crop Management Project.

Farmer response, too, has been encouraging. Clark Daw, a producer from the Belfast area, was unable to attend one dealer planning session, but put some field work on hold to attend another one. He spent more than two hours working with Herring and Pleasants reviewing the soil survey and completing worksheets for his farm.

“We are very appreciative of the proactive fertilizer dealers who have helped us with this process. They have been vital in promoting the importance of these sessions,” said Osmond, who added, “Bob Pleasants and Andy Herring have been terrific. This experience demonstrates the potential that can be realized when good, science-based thinking and Cooperative Extension know-how connect with solid funding dollars.”

—Andy Fisher