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Environmental Stewardship/Efficient Crop Management Go Hand-in-Hand

Environmentally sound strategies for using fluid fertilizers discussed.

Summary: *Through it work in North Carolina,* ***a strategy*** *has been developed to implement an efficient, profitable environmentally sound production system for corn. This study shows that efficient, prudent use of fluid fertilizers helped to protect the environment and improve yields through: 1) new technology that produces more precision in timing and placement of both fertilizers and pesticides. 2) tillage practices that reduce erosion and conserve moisture, and 3) cooperation from growers who not only perceive good economics, but also recognize the need to demonstrate their proficiency as environmental stewards. North Carolina growers have responded positively to our "packaged" programs developed from strategies designed to bene-fit crops and protect the environment. We're optimistic this will continue.*

To ensure that row crop enterprises do not threaten the biological integrity of natural resources, the Crop Science Department at North Carolina State University spearheaded the development of an environmentally sound crop production strategy. Agricultural sediments, nitrogen, phosphorus and pesticides were targeted. Corn was selected as the crop for the initial study.

Development of a "package" of cultural practices for corn grown in environmentally sensitive areas was patterned after a collection of production techniques assembled in the early 1980s for North Carolina's irrigated corn producers. In the highly successful irrigation program, individual practices contributing to yield and profitability were: 1) researched in small plots, 2) combined into a promising system, 3) evaluated in large plots on commercial farms, and 4) refined to achieve a profitable production scheme now used by most of the state's irrigated corn farmers. Growers responded favorably to the package concept because it offered them specific guidelines that could be easily modified for use on their farms.

Included in the "package" of cultural practices were: 1) use of conservation tillage to reduce potential erosion, 2) application of a high N:P starter fertilizer with no preplant or at-planting N to prevent excessive P application on high P soils and reduce potential for early-season N leaching, 3) use of corn hybrids with exceptional seedling vigor to reduce need for insecticides and herbicides, 4) a remedial, all-post-emergence herbicide program to reduce pesticide use and increase profitability, *5)* soil insecticide treatments only when field histories justify, and 6) a "customized" sidedress operation to adjust final N and sulfur application rates.

More precision

It may be possible to determine the right amount of N in sidedressing with new technology. Two options are the pre-sidedress nitrate test or the chlorophyll meter. Preliminary observations suggest that the chlorophyll meter offers the most opportunity for use by growers striving to achieve maximum N efficiency in environmentally sensitive areas.

The chlorophyll meter's potential to predict N fertilizer needs of corn has been recently described. Our experience with IPM and irrigation technology is that such a tool will be used to its potential *only* when it is offered as a service at a reasonable cost. The expectation is it can be used cost-

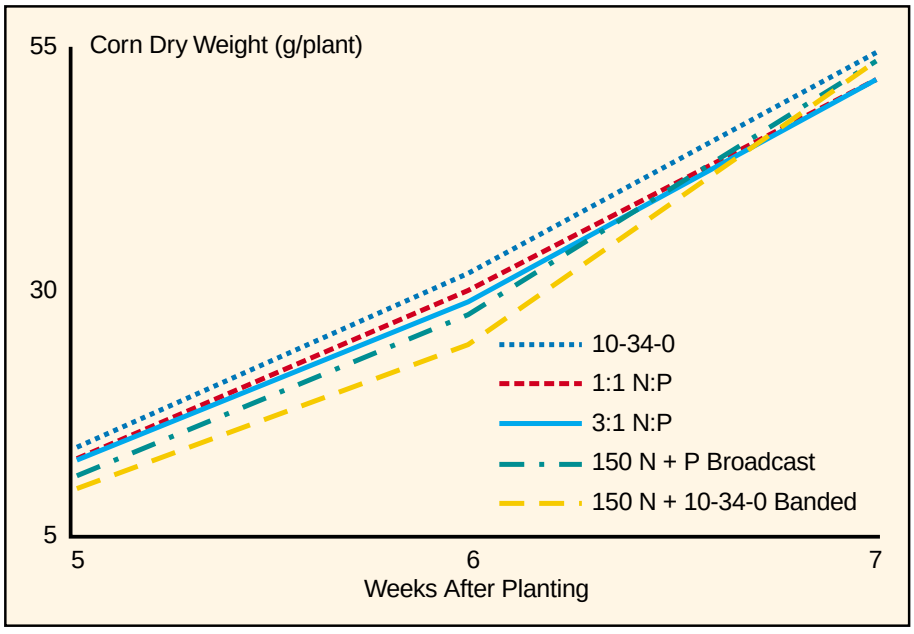

Figure 1. Effect of starter fertilizers (15 gal/A) on early-season corn growth, Bertie County, NC, 1991.

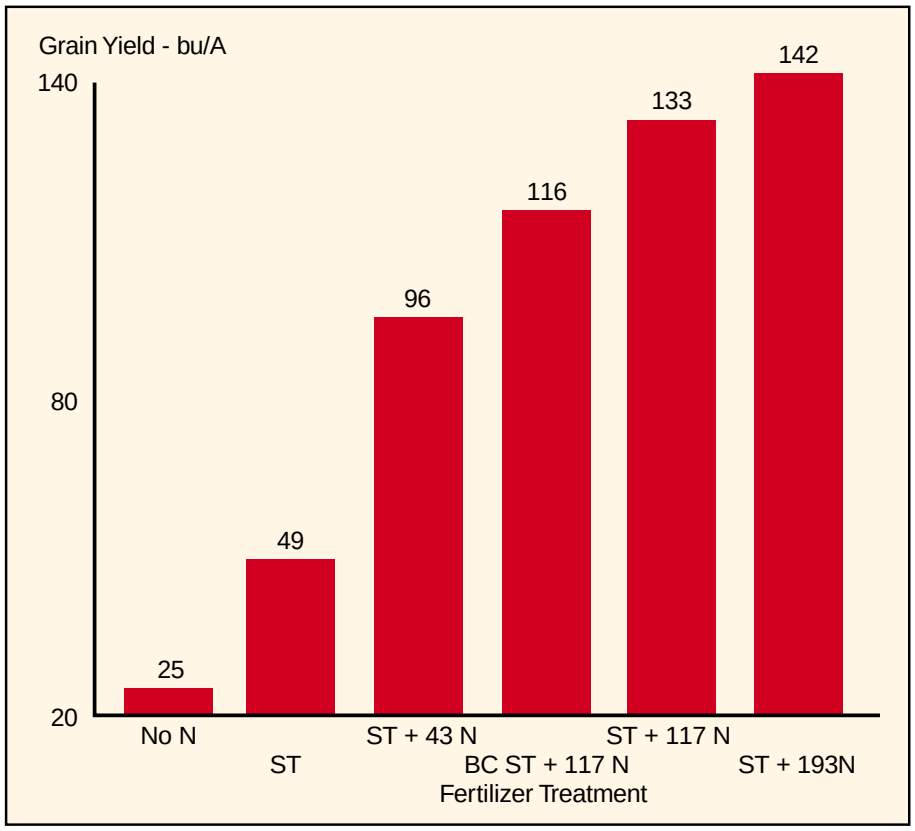

Figure 2. Effect of starter fertilizer and sidedessed N rate on corn grain yield, Test 2, Bertie County, NC, 1991.

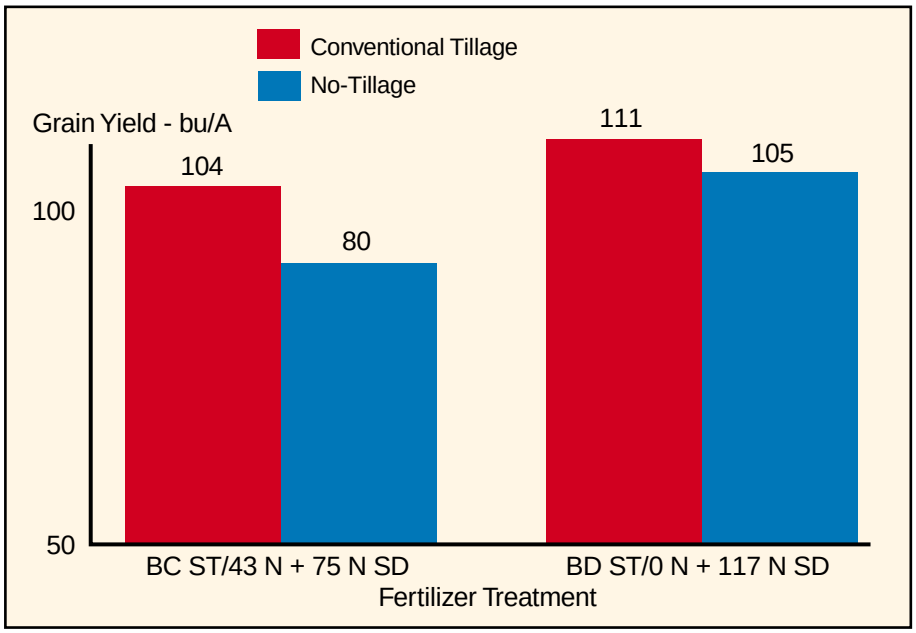

Figure 3. Effect of tillage and fertilzer management on corn grain yield, Gates County, NC, 1991.

effectively in a service mode. In fact, several agricultural consultants in North Carolina are tooling up to offer corn sidedressing recommendations to their customers. Fluid fertilizers will play a significant role in their efforts.

Environmentally beneficial

The above conclusions and ideas were supported by data collected in a multi-year project funded by the Fluid Fertilizer Foundation and Foundation for Agronomic Research. Of particular interest is an experiment conducted in 1991 on a high P soil in Bertie County, North Carolina. Results indicated that 15 gallons per acre of three starters (Figure 1) could support, for 42 days, corn dry weight equal to that produced by the same starter mixture plus 117 lbs/A N broadcast and incorporated prior to planting. Thus, the potential for off-site movement of N in response to spring thundershowers can be reduced significantly by use of only a starter fertilizer at planting (i.e., a substitution of timing and placement for rate). In addition to providing potential environmental benefits, use of a banded 10-34-0 starter increased yield by 17 bu/A at the Bertie County site (Figure 2, Test 2).

It should not be overlooked that the 1:1 N:P starter, in contrast to the conventional 1:3.4 N:P 10-34-0, offers the opportunity to modestly reduce P application rates where soil P is very high. It is equally important to remember that P remains an essential component of the starter and that modest starter P applications are justifiable even on soils testing high in P.

Obviously, total dependence upon starters for early-season corn nutrition demands that sidedressing be timely and well-planned. Although numerous studies, including our 1990 experiments, have demonstrated the benefits of split N applications on North Carolina's coarse-textured and organic soils, there was no advantage to sidedress versus at-planting N applications in 1991 at the Bertie County site, which was a loamy-sand soil. Failure of corn to respond to split N at that site was attributed to high residual N following peanuts and a lack of early-season rain.

Don't overlook weeds

Development of a profitable corn production system with minimal environmental impact demands a holistic approach that embraces both fertility and pest management decisions.

Our 1991 experiments conducted at a site in Gates County, North Carolina, indicated that a remedial, all-postemergence herbicide program is viable and can be used to: 1) reduce overall pesticide use by decreasing "pounds on the ground," 2) reduce total pesticide costs, or 3) replace controversial herbicides with materials believed to be more "environmentally friendly." Our data suggested that more competitive, more insect-tolerant corn can be grown with starters. Data also indicated that postemergence herbicides should be applied early in their application window before corn grows to a size that will prevent good herbicide cover-age of weeds developing atop the fertilizer band. Accent, or Accent plus atrazine, or Accent plus Banvel works well in an all -postemergence program. Recent research shows that use of new, selective, post-emergence herbicides on corn may reduce pesticide requirements while decreasing environmental risk and ground water contamination.

Account for tillage

Tillage effects were examined at the Gates County site in 1991. Corn and grain yields were typical of those obtained by growers in the area. Grain yields were similar when a system using a banded 1:1 N:P starter, with no additional N applied until 42 days after planting, was compared to a broadcast system using 50 percent of the N applied at planting (Figure 3). When no-till planting was introduced into the experiment, grain yield decreased to 80 bu/A with broadcast fertilization. No-till and conventional tillage (disk/field cultivator) produced similar yields when no-till treatments were supplemented with a starter and a higher rate of sidedressed N.

Accordingly, our working hypothesis is that no-till will be successful, even on poorly drained soils, if appropriate starter fertilization is combined with vigorous corn hybrids and adequate residual fertility.

Catching on

There is tremendous interest in the idea that fertilization and pest management may be integrated to produce high-yielding corn less expensively in an environmentally sound way. Growers arc excited that new management techniques, such as soil nitrate tests or chlorophyll meters, may make both economic and environmental improvement possible in corn. Also, the environmental climate has changed markedly in recent months. There is little doubt that growers now recognize the need to demonstrate proficiency as environmental stewards.

It follows that agronomists must provide solutions to environmental problems, aggressively encourage farmers to adopt cultural practices favorable to the environment, and strive to communicate their documented successes to *both* the farm sector and the non-farming public.

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