



THE SOIL PROFILE

A newsletter providing information on issues relating to soils and plant nutrition in New Jersey

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USING THE PRESIDEDRESS SOIL NITRATE TEST TO CUT COSTS FOR NITROGEN FERTILIZER

How much nitrogen to apply to corn is an important crop management decision. Corn is very responsive to nitrogen. When too little nitrogen is applied, corn will readily show signs of nitrogen deficiency and lower crop yields. However, it is never profitable to apply more nitrogen fertilizer than can be used by the crop. Pollution of water supplies is also a concern from over-application of nitrogen.

Nitrogen supplied by manure applications can cut fertilizer cost but corn growers need reliable information to determine how much nitrogen fertilizer rates can be reduced. The amount of nitrogen that will be supplied by a soil during the growing season is difficult to predict at time of corn planting. Nitrogen is sometimes over-applied at planting to guard against deficiency, without knowing how much nitrogen will become available from the soil.

Corn growers that delay most of the total nitrogen application to time of sidedressing can use the Presidedress Soil Nitrate Test (PSNT) as a guide to improve nitrogen recommendations. This in-season

soil test does an excellent job of determining whether there is adequate nitrogen available in the soil to meet the needs of the corn crop. The PSNT is especially useful on manured fields where it is expected that there should be adequate nitrogen available from the soil to meet the needs of the crop. The PSNT provides assurance that sidedress nitrogen fertilizer rates can be reduced without affecting yield on soils that are high in available nitrogen. On soils that test low in available nitrogen, the PSNT will indicate that sidedress nitrogen is needed. The procedures for the PSNT are explained in a fact sheet available through Rutgers Cooperative Extension (FS 569 - Nitrogen Recommendations for Corn Using the Presidedress Soil Nitrogen Test). Field trials to demonstrate the PSNT on manured and non-manured fields will be on display at the Penn/Jersey Crop Management Field Day.

SUMMARY OF 1991 - PSNT FIELD TRIALS

Field trials were conducted at six locations in 1991 to evaluate the PSNT on New Jersey soils. At each location only 20 lbs of nitrogen was applied at planting in the row. When the corn plants were 12 inches tall (6 leaf stage) soil samples were taken from the 0-12 inch depth. The soil samples were dried and analyzed for nitrate according to the procedures for the PSNT. At each location, the field was divided into plots which received different rates of sidedress nitrogen (0, 25, 50, 75, 100, 125, 150, 175, 200, and 225 lbs N/Acre as NH_4NO_3). These treatments were replicated 4 times in each experiment. Grain yields were determined by harvesting 70 ft. of row length in each plot by hand. The various locations represent a range of soils, cropping histories, manure application, tillage practice, etc. The grain yield responses to sidedress nitrogen rates are presented in figures 1-6 for each location. The yield responses to sidedress nitrogen can be compared to the PSNT recommendation (Table 1) that is based on the soil $\text{NO}_3\text{-N}$ concentration and corn yield goal.

resulted in a significant decrease in corn yield at any of the field trial locations. This research indicates that using the PSNT recommendations would have reduced the cost for N fertilizer by an average of \$16.00 per acre compared to the traditional practice of applying 1 lb of N per bushel of expected yield. Among the manured sites, the PSNT successfully predicted when sidedress nitrogen was not needed. The PSNT also helped to identify soils where sidedress nitrogen was needed. For example, the PSNT show that in some cases the manured soils were lower in nitrogen availability than might be expected. One of the

field trials, however, showed that the PSNT did not adequately credit the nitrogen contribution from a previous alfalfa crop. More research is needed to improve the PSNT for use when forage legumes are in rotation with corn.

Field trials to further evaluate the PSNT are being conducted at two on-farm locations and at four NJAES locations in 1992. Research is also underway at Rutgers to develop soil nitrogen tests for use on sweet corn and turfgrass.

Table 1. Sidedress Nitrogen Recommendations for Corn Using the PSNT*,**					
Corn Yield Goal, grain (bu/A), silage (T/A)					
Soil Test Level	100/17	125/21	150/25	175/29	200/33
0-10	100	130	160	190	220
11-15	75	100	125	150	150
16-20	50	75	100	125	125
21-25	25	50	75	100	100
25+	0	0	0	0	0

* Acknowledgement Pennsylvania State University

** When more than 100 lbs. of sidedress N are recommended on very light sandy soils, apply half of the sidedress when the corn is 6 to 12 inches tall, and half when the corn is 18 to 24 inches tall.

WARREN COUNTY

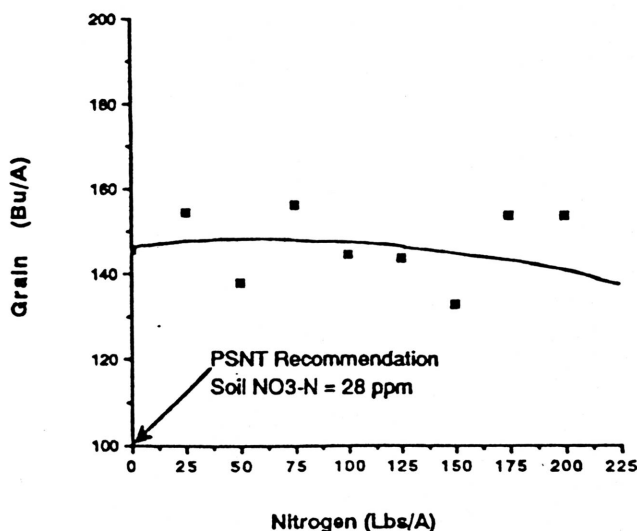
This PSNT trial was conducted in a field that received dairy manure before corn planting. Because the soil NO₃-N concentration was 28 ppm in the top 12 inches of soil before sidedressing, the PSNT recommended 0 lbs. N/A. The lack of a yield response indicates that the PSNT provided a good measure and credit for N availability in this manured soil.

Nitrogen Fertilizer Cost Per Acre

Cost of applying 1 lb. N per bushel: \$42
 Cost of PSNT recommendation: 0

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1991 On-Farm PSNT Field Trial
 Warren Co., NJ

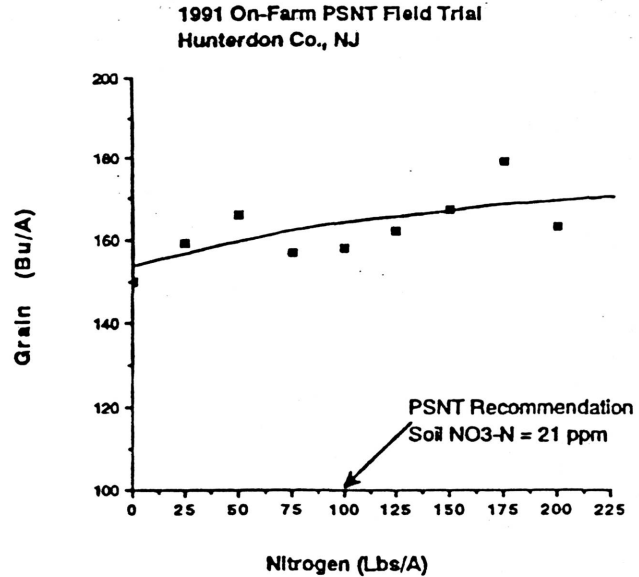


HUNTERDON COUNTY

This PSNT trial was conducted in a field that received cattle manure with newspaper bedding. The soil $\text{NO}_3\text{-N}$ concentration was 21 ppm. The PSNT would recommend 100 lbs N/A sidedress for a yield goal of 175 Bu/A. The yield response to sidedress N rates indicates that the PSNT would have provided a recommendation for 96% maximum yield.

Nitrogen Fertilizer Cost Per Acre

Cost of Applying 1 lb. N per bushel: \$48
 Cost of PSNT recommendation: \$29

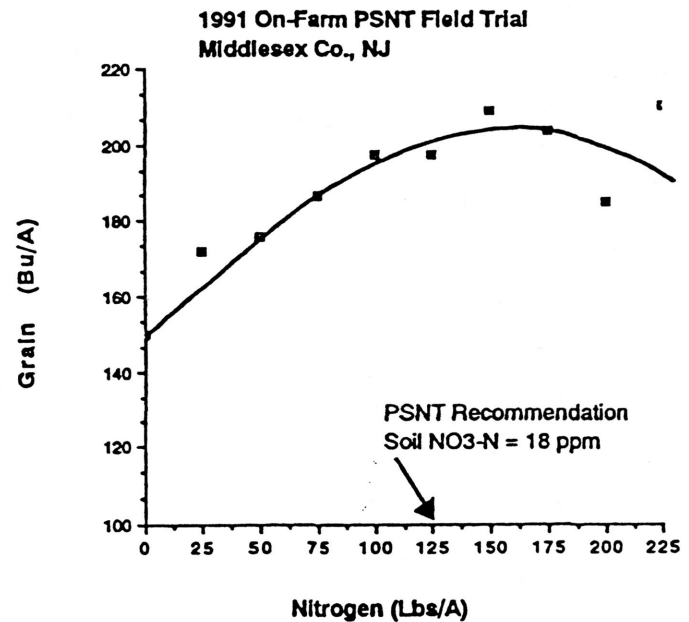


MIDDLESEX COUNTY

This PSNT trial was conducted in a field without manure application. The field has been in continuous no-tillage corn production for 18 years. The soil $\text{NO}_3\text{-N}$ concentration was 18 ppm. The PSNT would recommend 125 lbs N/A for a yield goal of 200 Bu/A. The yield response to sidedress N rates indicates that the PSNT would have provided a recommendation for 98% maximum yield.

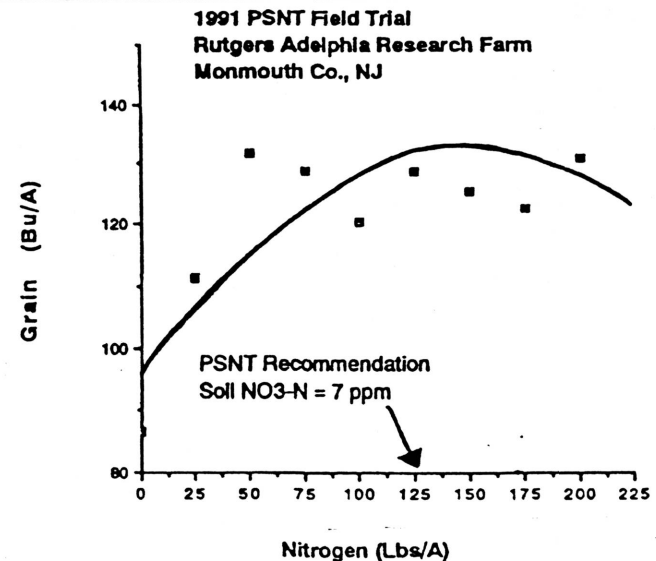
Nitrogen Fertilizer Lost Per Acre

Cost of Applying 1 lb N per bushel: \$58
 Cost of PSNT recommendation: \$36



ADELPHIA

This PSNT trial was conducted in a field that was previously cropped to soybean and received dairy manure with woodchip bedding before corn planting. The soil $\text{NO}_3\text{-N}$ concentration was 7 ppm. The woodchip bedding material immobilized soil N which is reflected in the low soil nitrate concentration. This trial shows that using the PSNT can help to identify soils that are low in N availability. Because the $\text{NO}_3\text{-N}$ concentration is between 0 and 10 ppm, the sidedress N recommendation is based on applying 1 lb N per bushel of expected yield.

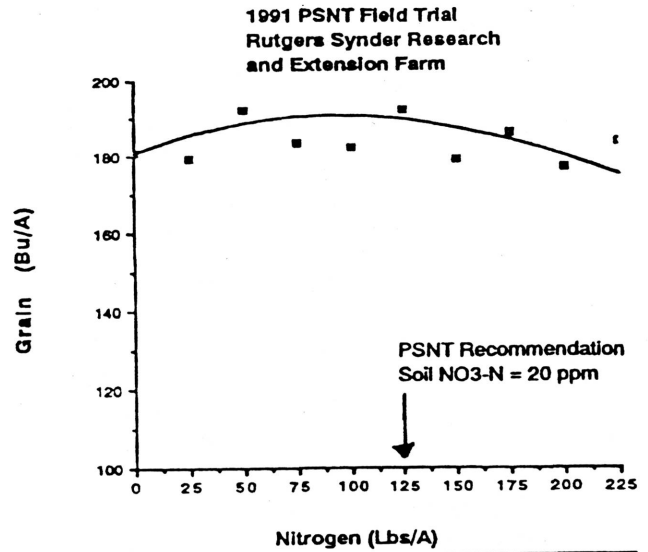


SNYDER FARM

This PSNT trial was conducted in a field that was previously in sod and received dairy manure with straw bedding before corn planting. The soil NO₃-N concentration was 20 ppm. The PSNT would recommend 125 lbs N/A for a yield goal of 180 Bu/A. The lack of a yield response to sidedress N indicates that there was sufficient N available in the soil to achieve the yield goal. The PSNT recommendation was higher than what was needed, but the recommendation is more conservative than applying 1 lb. N per bushel of expected yield.

Nitrogen Fertilizer Cost Per Acre

Cost of applying 1 lb N per bushel: \$52
 Cost of PSNT recommendation: \$36

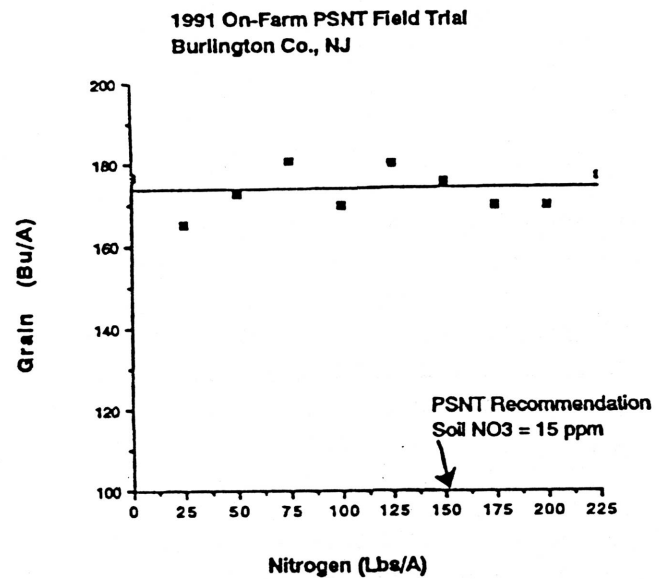


BURLINGTON COUNTY

This PSNT trial was conducted in a field where the previous crop was alfalfa. The soil NO₃-N concentration was 15 ppm. The PSNT would recommend 150 lbs N/A sidedress for a yield goal of 175 Bu/A. The lack of a yield response to sidedress N indicates that there was sufficient N available from the previous alfalfa crop. Over-recommendation of N by the PSNT can occur when corn follows a forage legume because the N apparently mineralizes more slowly from legumes residues than from manure. That the PSNT sometimes does not give proper credit to previous alfalfa stands has also been observed in other states. When corn follows alfalfa, it is advisable to base N credits on percent stand of alfalfa.

Nitrogen Fertilizer Cost Per Acre

Cost of applying 1 lb N per bushel: \$50
 Cost of PSNT recommendation: \$43



Acknowledgements

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*"To simplify information in this newsletter,
 trade names of some products are used.
 No endorsement is intended, nor is criticism
 implied of similar products not named."*