Nitrogen Trials

In the past two years that PFI cooperators have used the late spring soil nitrate test, nitrogen rate trials in corn have paired a "high," or typical rate of N with a low rate recommended by the test. In the dry springs of 1988 and '89, the soil typically contained a lot of carryover nitrogen from the previous year, and the test allowed farmers to take advantage of that in reducing their fertilizer rates. Everyone was waiting to see what the test would say in a wet year.

The answer came in 1990. Whereas last year PFI soil nitrate readings averaged in the low 20s, in the spring of 1990, they were in the low teens. Farmers using the test sometimes found themselves sidedressing more nitrogen than they had used in years. At the same time, the test allowed a field-by-field determination of what corn needed the high rate and what did not. In showing where a profitable response to additional nitrogen could be obtained, the test made new friends in the farming community this year.

Average N difference: 46lbs/acre
No credits for alfalfa, soybean, or winter cover crop nitrogen.
10 Trials corn after soybeans; 2 trials after corn; 2 after oats.
Fig. 2 Average yields and application rates for PFI 1990 trials.

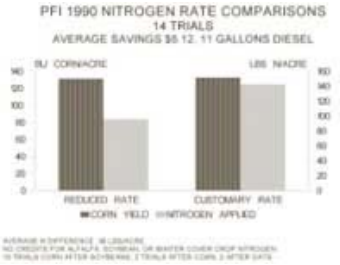


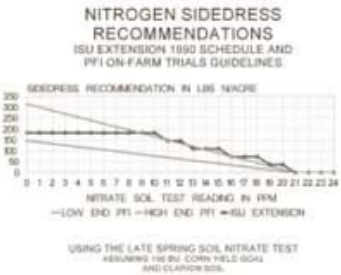
Figure 2 shows the average yields and nitrogen applications for this year's nitrogen rate trials. As in previous years, yields were usually similar between the rates this year. Last year's average low and high rates were 69 and 126 lbs N/acre, a difference of 57 lbs. This year, reflecting the weather, the average low and high were 95 and 141 lbs, a difference of 46 lbs N/acre.

It takes a lot of energy to make a pound of nitrogen fertilizer. The low rate energy savings, figured in gallons of diesel fuel, comes to 11.1 gallons per acre. That is higher than last year's estimate, because PFI adopted Iowa State University's figure for the energy value of nitrogen fertilizer.

The nitrogen rate table shows the results on a trial by trial basis. The "Test PPM" column gives the average value of the late spring soil nitrate test. The following two columns, "Recommended (Low High)" give the "window" or range of sidedress rates suggested by the test. The next column, "Test Rate Sidedress," show which of the two N rates was actually based on the test. This number also appears in one of the next two columns, which specify the low sidedress rate and the high sidedress rate.

This year a number of cooperators chose to "bracket" the recommendation window, making their high rate the high end of the recommendation and their low rate the low end. This is indicated by a "Both" in the Test Rate Sidedress column.

using the late spring soil nitrate test
assuming 150bu. corn yield goal and clarion soil
Fig. 3 ISU extension and PFI sidedress recomendations.



There is one "Neither" in this column as well. Both of Vic Madsen's rates were technically below the window. The yield in the low rate strips was significantly reduced, giving the only loss in the Low Rate $ Benefit category. This is the exception that proves the rule. The nitrate test had recommended higher side dress rates.

The year 1990 saw the nitrate test released to the public. Confusion may arise because there are two sets of recommendation guidelines - PFI's and the guidelines released by Iowa State University. Figure 3 shows sidedress recommendations under the two schemes. The ISU recommendations are based on yield goal, nitrate test results, and soil group. The PFI method is to sidedress 7 to 15 lbs nitrogen for each part-per-million below 21 ppm on the test. Of course, this range was not formulated by PFI. It represents a scientific "guess" of the amount of N needed by the crop.

In 1989, with high test results common, the ISU sidedress recommendations were generally on the high side of the PFI range. PFI, willing to take a risk, could test the 7-15 hypothesis, whereas the recommendations for public consumption were of necessity more conservative. In 1990, however, nitrate readings were sometimes so low that the ISU method led to rates well within the PFI range. As scientific understanding of nitrogen dynamics increases, recommendations will evolve. The future could see guidelines that combine the range in the PFI procedure with the flat plateau of the ISU method.

NITROGEN RATE TRIALS IN CORN

COOPERATOR	LOW RATE TRT YIELD	LOW RATE TRT N RATE	HIGH RATE TRT YIELD	HIGH RATE TRT N RATE	RATE DIFF.	TEST PPM	RECOMMENDED LOW	RECOMMENDED HIGH	TEST RATE SIDEDRESS	LOW RATE SIDEDRESS
(AFTER CORN)										
BAUER §	143.3	111	137.3	159	48	6	105	225	117	69
HOULIHAN	115.3	60	121.2	120	60	17	27	59	60	60
OLSON	130.9	136	128	171	35	11	70	150	BOTH	95
(AFTER SOYBEAN)										
BAUER	130.1	96	128.7	144	48	—	—	—	—	54
DAVIDSON	122.7	120	125	155	35	4	120	256	BOTH	115
FRANTZEN	142.1	91	134.9	141	50	12	63	135	90	40
HAGENSICK	136.9	99	138.7	159	60	11	69	147	BOTH	80
HANKS	100	104	100.3	149	45	20	5	10	50	50
MADSEN	157.7	41	165.1	79	38	13	56	120	NEITHER	0
ROSMANN	127.1	72	129.3	126	54	13	57	123	91	37
SVOBODA	113.7	156	116.4	174	18	8	92	198	BOTH	132
TREIMER	153.9	80	159.1	140	60	12	61	131	80	80
WILSON	126.9	137	130.4	178	41	8	89	190	BOTH	119
(AFTER OATS)										
DORDT	137.9	45	139.1	90	45	8	91	195	90	45
STONECYPHER	143	94	140.4	155	62	13	56	120	62	62
AVG.	131.3		132.6	141	46	12	66	141		69

§ EXCLUDED FROM AVG.

NITROGEN RATE TRIALS IN CORN

COOPERATOR	HIGH RATE SIDEDRESS	YIELD DIFF.	LEAF N SIG.	YLD SIG.	YLD LSD	LOW RATE $ BENEFIT	SAVINGS IN GAL DIESEL EQUIVALENT	COMMENT
(AFTER CORN)								
BAUER §	117	6	N.S.	*	4.4	—	—	3 CULTIVATIONS IN HIGH N STRIPS
HOULIHAN	120	-5.9	N.S.	N.S.	6.2	$10.20	14.3	YIELD REDUCTION NONSIGNIFICANT
OLSON	130	2.8	—	N.S.	5.3	$5.95	8.3	
(AFTER SOYBEAN)								
BAUER	102	1.5	—	N.S.	4	$8.16	11.4	NO NITRATE TEST
DAVIDSON	150	-2.3	—	N.S.	2.5	$5.95	8.3	BOTH N RATES WITHIN TEST WINDOW
FRANTZEN	90	7.2	—	N.S.	10.9	$8.50	11.9	TESTED 6 STRIPS
HAGENSICK	140	-1.8	N.S.	N.S.	3.1	$10.20	14.3	BOTH N RATES WITHIN TEST WINDOW
HANKS	95	-0.3	N.S	N.S.	5	$7.65	10.7	TRIAL FLOODED 48 HRS
MADSEN	38	-7.4	N.S.	*	6.3	($10.38)	9.1	ENERGY SAVINGS TRADED FOR YIELD
ROSMANN	91	-2.2	N.S.	N.S.	6.8	$9.18	12.9	MANURE IN SYSTEM
SVOBODA	150	-2.7	—	N.S.	6.8	$3.06	4.3	
TREIMER	140	-5.2	—	N.S.	7.9	$5.40	14.3	
WILSON	160	-3.4	—	N.S.	6.5	$3.69	9.8	BOTH N RATES WITHIN TEST WINDOW
(AFTER OATS)								
DORDT	90	-1.1	—	N.S.	7.7	$7.65	10.7	UNREPLICATED NITRATE TEST
STONECYPHER	123	2.5	N.S.	N.S.	4.4	$10.47	14.7	
AVG.	116	-1.3			6	$6.12	11.1	GAL/ACRE