

Northeast Iowa Water Quality Demonstrations Summary of Results - 1999 Demonstration Sites

This is only field demonstration information. These demonstrations were not managed as research plots (example: planting excess seed and thinning the small plants to the same populations for each treatment), however all treatments except large machine-harvested tillage treatments are replicated three or more times so trends in the response of crops to various fertility or tillage practices may be observed. Harvest populations on corn plots were 22,000 to 34,000 plants per acre. Excess moisture in 1993 affected crop performance.

Nitrogen Management

The "profit" calculations for nitrogen demonstrations compare the amount of nitrogen used and crop response to the zero nitrogen check. For these calculations the value of nitrogen fertilizer is \$0.20/lb and the value of corn is \$2.40/bu. Other variables are not included. The end-of-season cornstalk nitrate nitrogen test is an indicator of whether or not the nitrogen supply was adequate for corn development. At levels less than 250 parts per million (ppm) the lack of nitrogen limits corn yield. It's marginal at levels between 250-700 ppm, and available nitrogen is optimal between 700-2,000 ppm. Above 2,000 ppm nitrate in the stalk, nitrogen rates are excessive.

Nitrogen Demonstration - 1. First year corn following a two-year alfalfa stand on Downs soil, with the final alfalfa year stand count at one plant per square foot, spring moldboard plow.

Treatment	1992 Yield	1993 Yield	1994 Yield	1995 Yield	1996 Yield	1997 Yield	1998 Yield	1995-98 Stalk NO ₃	7 sites, 1992-98 Yield	Profit
lb/A N	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A	bu/A	ppm	bu/A	\$/A
0	141	109	167	161	157	171	156	1,194	152	0
30	144	107	159	153	166	170	150	—	150	-11
60	138	112	166	163	172	165	150	2,230	152	-12
90	141	109	172	162	163	171	157	—	154	-13
120	134	110	178	163	164	173	154	2,827	154	-19
150	142	111	171	157	164	166	160	—	153	-28

Nitrogen Demonstration - 2. Corn following soybeans, replicated at planting ammonium nitrate nitrogen treatments located in adjacent plots. Corn in 1999 following 50 bu/A soybeans; corn 1998 following 57, 56 and 40 bu/A soybeans; corn 1997 following 72, and 62 bu/A soybeans; corn 1996 following 68 bu/A soybeans; corn 1995 following 52 bu/A soybeans; corn 1994 following 41 bu/A soybeans; corn 1993 following 40 bu/A soybeans. Fayette County, 1999; Clayton and Allamakee counties, 1998; Clayton County, 1997 and 1996; Winneshiek County, 1995; Allamakee County, 1994; and Clayton County, 1993.

Treatment	1993-98 Ave. Yield	1999 Yield	1999 Stalk NO ₃	1997-99 Stalk NO ₃	1997-99 Yield	10 sites 1993-99 Profit
lb/A N	bu/A	bu/A	ppm	ppm	bu/A	\$/A
0	150	—	—	—	148	0
30	159	137	—	—	157	16
60	167	159	42	1,176	166	31
90	169	163	164	2,422	168	30
120	172	172	—	—	172	34
150	172	174	484	4,261	172	28

Nitrogen Demonstration - 3. Third-year N management demonstration on Fayette soil for continuous corn. Nitrogen treatments applied at planting with four replications.

Treatment	1996		1997		1998		Profit
	Yield	Stalk NO ₃	Yield	Stalk NO ₃	Yield	Stalk NO ₃	
lb/A N	bu/A	ppm	bu/A	ppm	bu/A	ppm	\$/A
0	132	230	88	139	120	164	0
60	148	—	119	—	164	—	94
90	143	964	124	340	197	1,092	167
120	159	637	127	1,708	193	1,902	151
150	144	1,254	119	1,728	192	1,932	143
180	139	1,444	120	4,708	196	4,702	146

Nitrogen Demonstration - 4. Corn yields, planted into a ten-year CRP field May 1. Four nitrogen rates were demonstrated. The CRP brome grass cover was spring disk chisel plowed with fall-applied herbicide. Nitrogen treatments were replicated three times.

Nitrogen Treatments	Corn Yield, bu/A						Ave. Cornstalk NO ₃ , ppm	Profit, \$/A
	1994	1995	1996	1997	1998	1994-98	1995-98	1994-98
lb/A N								
12 (starter)	174	113	100	112	177	135	74	—
80	174	144	130	147	202	159	128	42
130	172	146	152	153	204	165	1,194	46
180	174	152	149	150	211	167	2,059	41

Nitrogen Demonstration - 5. Second-year corn following alfalfa that received no nitrogen on the first-year corn crop. Clayton and Allamakee counties.

Treatment	Second-year corn 1997		Second-year corn 1998		Averages 1997-98		
	Yield	Stalk NO ₃	Yield	Stalk NO ₃	Yield	Stalk NO ₃	Profit
lb/A N	bu/A	ppm	bu/A	ppm	bu/A	ppm	\$/A
0	125	21	127	109	126	65	0
30	136	36	145	133	140	84	28
60	153	139	166	181	160	160	70
90	165	—	173	—	169	—	85
120	163	982	180	2,782	172	1,882	86
150	164	—	174	—	169	—	73

Nitrogen Demonstration - 6. This continuous corn site had 150 pounds per acre of anhydrous ammonia applied in the fall vs. spring on two tillage systems: no-till, zone planted also fall chisel, spring disk and plant. Gilbertson Conservation Center, Fayette County.

Treatments	No-till, Zone Planted		Fall Chisel, Spring Disk
	Yield, bu/A	Stalk NO ₃ , ppm	Yield, bu/A
Fall anhydrous ammonia	135	36	140
Spring anhydrous ammonia	168	796	164

Manure Management

Manure Demonstration - 1. Eight first-year manure demonstrations were established on project area fields in 1999. Plot treatments included no manure and manure-treated plots with application of 0, 50 and 100 pounds of nitrogen. The corn-following-corn yield and cornstalk NO₃ results from the producers using different manure sources is indicated for 1999. The average corn yields and end-of-season cornstalk NO₃ from 24 demonstrations during crop seasons 1994 through 1998 are also reported in the table below.

Manure Source and Season of Application	First Year Manure N Credit lbs/A	Corn following corn yield, bu/A			
		No Manure No N	Manure No N	Manure + 50 lbs N/A	Manure + 100 lbs N/A
Ave. yield, 8 demonstrations, 1999 (bu/A)	131 (160 bu/A)	134	152	153	160
Ave. yield, 24 demonstrations, 1994-1998 (bu/A)		132	144	149	149
Ave. yield, 32 demonstrations, 1994-1999 (bu/A)		133	146	150	152
Ave. cornstalk NO ₃ , 8 demonstrations, 1999 (ppm)	(1,471)	553	1,340	1,245	2,354
Ave. cornstalk NO ₃ , 24 demonstrations, 1994-1998 (ppm)		590	2,037	2,883	4,228
Ave. cornstalk NO ₃ , 32 demonstrations, 1994-1999 (ppm)		581	1,863	2,474	3,760

Manure Demonstration - 2. The second-year impact of swine finishing manure was evaluated. Manure supplied all the nitrogen for the prior year's corn crop. The demonstration results are three separate trials. Clayton County.

Treatment	1996		1997		1998	
	Yield	Stalk NO ₃	Yield	Stalk NO ₃	Yield	Stalk NO ₃
lbs N/A	bu/A	ppm	bu/A	ppm	bu/A	ppm
0	152	1,112	152	485	156	140
50	156	3,572	174	1,788	185	101
100	158	5,112	177	1,558	188	921
150	168	6,902	177	5,168	188	2,707

Manure Demonstration - 3. Manure was fall surface-applied (3,000 gal/ A liquid swine finishing) on soybean stubble resulting in a first-year crop-available nitrogen rate of 96 pounds per acre, followed by no-till corn in 1994, '95 and '96. Dairy freestall manure was fall-applied at a first-year crop-available N rate of 65 pounds per acre for the 1998 corn-following-soybean site. Fayette and Clayton counties.

Treatment	Yield, bu/A				4 site average		
	1994	1995	1996	1998	Yield, bu/A	Stalk NO ₃	Profit, \$/A
0 manure + 0 N	145	137	143	140	141	504	—
Manure only	159	156	159	157	158	970	0
Manure + 50 lbs N/A	164	164	163	165	164	3,291	4
Manure + 100 lbs N/A	172	167	168	162	167	5,499	2

Tillage

Tillage Demonstration - 1. This 3-replication, 0.23-acre experimental unit research on continuous corn was treated with a zone-builder in the fall of 1997 and was no-till planted vs. no-till planting with no zone-builder. Gilbertson Conservation Center, Fayette County.

Treatment	Yield, bu/A
Zone-builder	159
No zone-builder	142

Tillage Demonstration - 2. Tillage systems were compared on corn planted following corn in 1997 and both corn-following-corn and corn-following-alfalfa grass sod in 1998. Clayton County.

Treatment	1997 Corn Following Corn		1998 Corn Following Corn		1998 Corn Following Sod Yield, bu/A
	Residue, cover percent	Yield bu/A	Residue, cover percent	Yield bu/A	
Moldboard plow (spring 1997 - fall '98)	12	116	4	153	187
Deep tillage 15"	–	–	57	139	178
No-till	75	121	60	127	179
Wide-sweep cultivator	61	127	54	141	168
Disk harrow	45	124	33	145	168
Dyna-Drive (spring)	–	–	36	159	163

Tillage Demonstration - 3. Drill vs. 30-inch row planted soybeans, replicated treatments.

Treatment	Yield, bu/A			
	1992	1994	1998	Average 3 sites
Drill	45.4	51.6	54.6	50.5
30" row planter	47.5	54.0	58.8	53.4

Potassium Management

Potassium Rate Demonstration - 1. Potassium was applied at four treatment rates on 3X replicated plots in a field with Downs soil testing K – 350 ppm and a long manure history in 1996. The same treatments were applied in 1998 on Fayette soil testing K– 195 ppm on a corn-bean rotation field. Clayton County.

Potassium treatment, lbs/A	1996 and 1998 Corn Following Corn Yield, bu/A			
	0	60	90	120
1996, swine finishing manure (10,000 gal. fall 1994)	172	164	182	172
1998 corn following soybeans (1997 – 57 bu/A)	227	220	222	223

Pest Management

Pest Management Demonstration - 1. Potato leafhopper pressure was moderate in 1998. An alfalfa field near Postville was monitored for leafhopper throughout the growing season. First cut was completed on June 16. Leafhopper populations did not exceed treatment threshold levels between first and second cut on July 14. Populations exceeded treatment threshold on July 31. An insecticide was applied at the lowest labeled rate, resulting in immediate control of the leafhopper. An unsprayed check area was left for comparison. Third cut was made on August 13. Yield and forage analysis for third crop harvest were as follows. A similar demonstration was conducted near Decorah under extreme leafhopper pressure in 1997, with yields from second crop harvest shown in the table.

	1997		1998	
	Treated Alfalfa	Non-Sprayed Check	Treated Alfalfa	Non-Sprayed Check
Yield, tons per acre	1.44	1.23	1.43	1.28
Crude protein, percent	20.6	16.4	25.5	20.4
Relative feed value	–	–	183	133
Net return to treatment, \$/A (hay at \$105/T)	15.10		10.84	