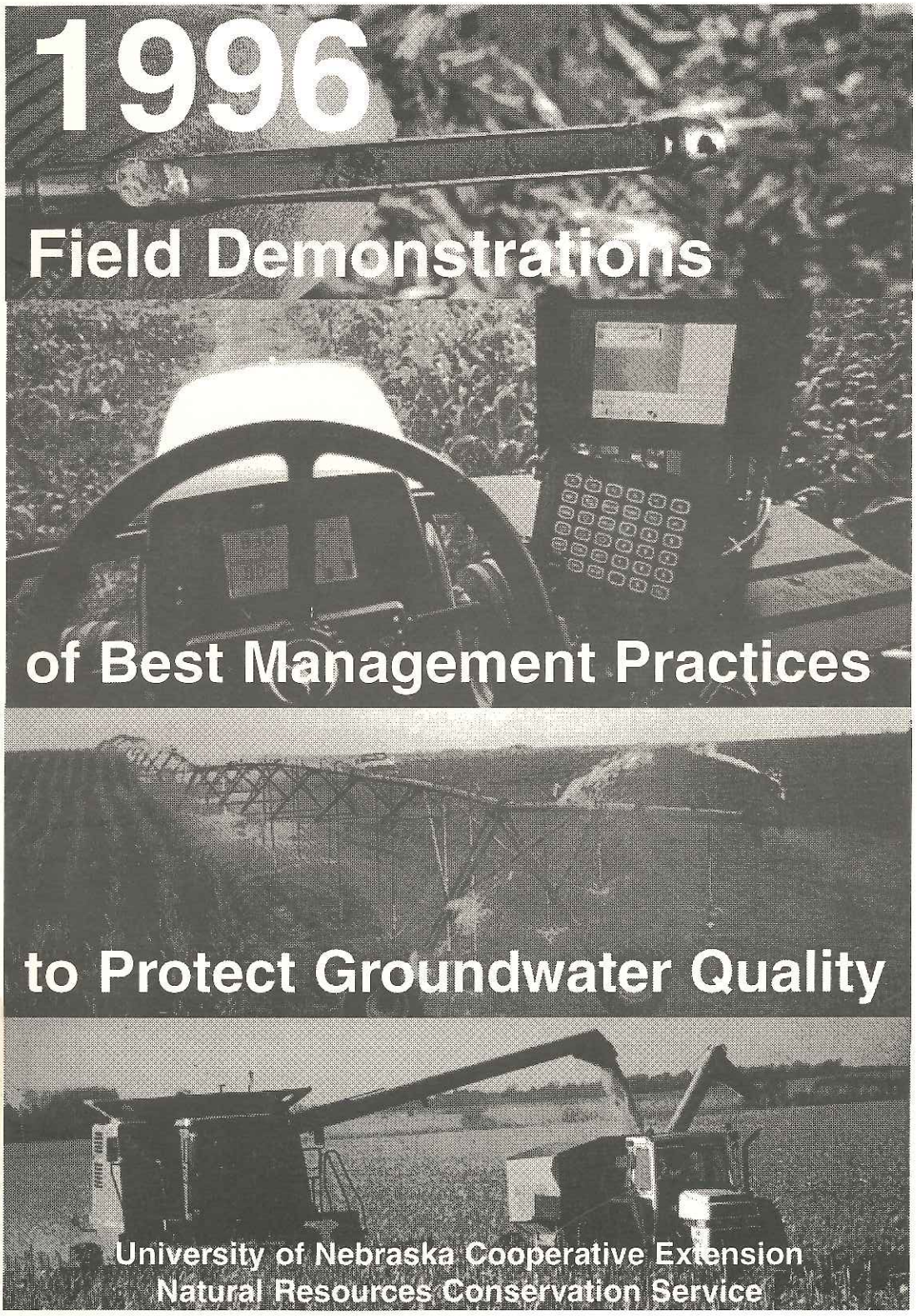
SCREC 97/4

WATER QUALITY

Mid-Nebraska Demonstration Project

1996 Field Demonstrations of Best Management Practices to Protect Groundwater Quality



University of Nebraska Cooperative Extension
Natural Resources Conservation Service

Under the leadership of the Natural Resources Conservation Service and the University of Nebraska Cooperative Extension, the following agencies have provided financial and personnel assistance to make this project possible:

- Upper Big Blue Natural Resources District
- Tri-Basin Natural Resources District
- Little Blue Natural Resources District
- Lower Republican Natural Resources District
- Blue River Association of Groundwater Conservation Districts
- UNL Conservation and Survey Division
- USDA Agricultural Research Service
- USDA Farm Service Agency
- Nebraska Department of Environmental Quality

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Lower Republican Natural Resources District Project Committee

Tri-Basin Natural Resources District Project Committee

Upper Big Blue Natural Resources District Project Committee

Special Thanks to:

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Platte Valley Nitrogen and Irrigation Management Demonstration Project

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Individual Plot Data, Alphabetically

Mid-Nebraska Water Quality Demonstration Project

The Mid-Nebraska Water Quality Demonstration Project (MNWQDP) began in 1990 under the authorization of USDA funds from the 1990 Water Quality Initiative. The project has four objectives:

- Foster adoption of farm management practices that will reduce nutrient and pesticide loading in the soil
- Promote producer adoption of irrigation management practices that provide adequate moisture to grow crops while reducing leaching of agricultural chemicals to groundwater
- Demonstrate that producers can achieve suitable economic returns while utilizing management practices that reduce inputs and chemical leaching to groundwater
- Effectively address critical water quality issues in Nebraska by integrating resources and expertise from agribusinesses, and government and educational institutions.

Project Description

The 17-county area encompassed by the MNWQDP contains over four million acres of cultivated land that has been irrigated for more than 60 years. Continuous corn production is the most common agricultural practice on most of the irrigated acres. Investments made in irrigation capabilities and USDA farm program provisions strongly influence cropping decisions in this area.

The production area includes some of the most productive corn producing acres in Nebraska. While the area accounts for less than 22 percent of the cultivated acres in the state, it produces 35 percent of the total corn acres and it accounts for over 30 percent of the nitrogen fertilizer farmers use.

This production history has left many areas of south central Nebraska with a high nitrate concentration in the vadose zone (the area between the root zone and the water table). As nitrate reaches the groundwater, community and private wells may become contaminated.

A critical widespread nitrate problem in the groundwater underlying the project area does not currently exist, but the intensive irrigated agricultural practices in south central Nebraska create the potential for water quality problems. As the project began in 1990, evidence from local, state, and federal agency studies showed that groundwater levels were on the rise and a nitrate load does exist in the vadose zone. Most of the nitrate is at depths that deep-rooted crops cannot reach, which lead it to eventually leach into the groundwater.

Project Structure

The project area includes four of Nebraska's natural resources districts (NRDs), the Little Blue, the Lower Republican, the Tri-Basin and the Upper Big Blue. In 1995, project personnel developed a stronger working relationship with NRD personnel to match project goals with best management practices emphasized in each NRD.

During 1996, the strengthened relationship between the MNWQDP and the NRDs continues to be positive.

"The intergovernmental relationship to deal with water quality issues has been successful," said Ron Wunibald, general manager of the Lower Republican NRD water quality coordinator. "It is always hard to guage this type of effort in measuring complete success of educational programs, but best management practices are being adopted in the district which could be a result of the project."

Rod DeBuhr, water department manager with the Upper Big Blue NRD said "I feel that the Mid-Nebraska project has really improved the relationship among the agencies involved with the project as well as between the agencies and producers involved in the area."

Best Management Practices

The Mid-Nebraska Project team encourages producers to employ 19 best management practices (BMPs) to slow nutrient and pesticide movement from the crop root zone to groundwater. The project focuses on three areas:

Nitrogen BMPs

Nine practices promoted through the Mid-Nebraska Project help reduce nitrate loss to groundwater.

1. **Select a realistic yield goal**
2. **Credit irrigation water nitrate**
3. **Credit legume nitrate**
4. **Credit soil nitrate**
5. **Credit manure, sludge or compost fertilizer nitrate**
6. **Efficiently apply manures, sludges, and compost**
7. **Use nitrification inhibitors**
8. **Split-apply fertilizer**
9. **Plant a fall cover crop**

Irrigation BMPs

The project team encourages six practices to keep irrigation systems operating efficiently with no more water than necessary.

1. **Level land**
2. **Use reuse pits**
3. **Use a water flow meter to measure the amount of water applied**
4. **Schedule irrigation based on crop water use**
5. **Use surge irrigation**
6. **Rotate crops**

Pesticide BMPs

Pesticides are not a major problem in groundwater in south central Nebraska. Atrazine is the only pesticide occasionally found at low levels in wells. These four practices prevent contamination and tighten economic management.

1. **Rotate crops**
2. **Properly mix chemicals**
3. **Practice integrated pest management (IPM)**
4. **Effectively apply chemicals**

Reference Aids

Several publications and software resources are available through local Cooperative Extension Offices to help producers implement the BMPs recommended under the MNWQDP.

Nitrogen Management

Neb Guides

G74-174A	*Fertilizer suggestions for corn (rev. July 1995)*
G77-361	*Using starter fertilizer for corn, grain sorghum and soybeans*
G93-1171A	*Using a chlorophyll meter to improve N management*
G94-1178A	*Fertilizer nitrogen best management practices*
G91-1000	*Guidelines for soil sampling*

Other Extension Publications/Software

SOIL TEST,	*Version 4.93: fertilizer recommendation software*
EC94-737D	*Calibrating anhydrous ammonia applicators*
EC93-126D	*Procedures for field demonstrations of nitrogen management practices*
EC89-117	*Fertilizing crops with animal manure*

Irrigation Management

Neb Guides

EC89-723	*Irrigation scheduling using soil moisture blocks in silty soils*
NF93-118	*Fine tuning furrow irrigation systems*
NF93-140	*Water management for irrigation in Nebraska*
NF94-176	*Surge irrigation*
NF94-177	*Nebraska surge irrigation trials*
NF94-178	*Surge irrigation field layouts*
NF94-179	*Surge irrigation management*
NF96-290	*Irrigation management practices in Nebraska*
G78-392	*Selecting and using irrigation propeller meters*
G78-393	*Water measurement calculations*
G82-602-A	*Predicting the last irrigation for corn, grain sorghum, and soybeans*
G85-753	*Irrigation scheduling using crop water use data*
G91-1021	*Managing furrow irrigation systems*
G93-1157-A	*Testing irrigation water*

G96-1299-A	*Agricultural management practices to reduce atrazine in surface water*

Other Extension Publications/Software

CP13	*Furrow Irrigation Toolkit (software evaluating and fine-tuning furrow irrigation systems*
EC91-735	*The impact of nitrogen and irrigation management and vadose zone conditions on groundwater contamination by nitrate-nitrogen*
G84-690	*Estimating soil moisture by appearance and feel*

Pest Management

Neb Guides

G75-217	*European corn borer*
G77-382	*Right crop stage for herbicide use*
G79-471	*Choice of corn hybrids*
G81-613	*Ear attacking insects of corn*
G86-774	*Western corn rootworm soil insecticide treatment based on beetle numbers*
G87-839	*Corn rootworm control*
G89-904	*Corn insects - quick reference*
G91-1031	*How to hire a crop consultant*
G92-1108-A	*Evaluating corn rootworm soil insecticide performance*
G93-1182-A	*Best management practices for agricultural pesticides to protect water resources*

Other Extension Publications/Software

EC91-130	*Herbicide use in Nebraska—guide*
EC92-1509	*Insect management guide for Nebraska corn and sorghum*
EC92-1511	*Insect management guide for Nebraska alfalfa, soybeans, wheat, range and pasture*
CP 5	*European corn borer software*
CP 11	*WeedSOFT® -- weed control software developed by University of Nebraska weed scientists*

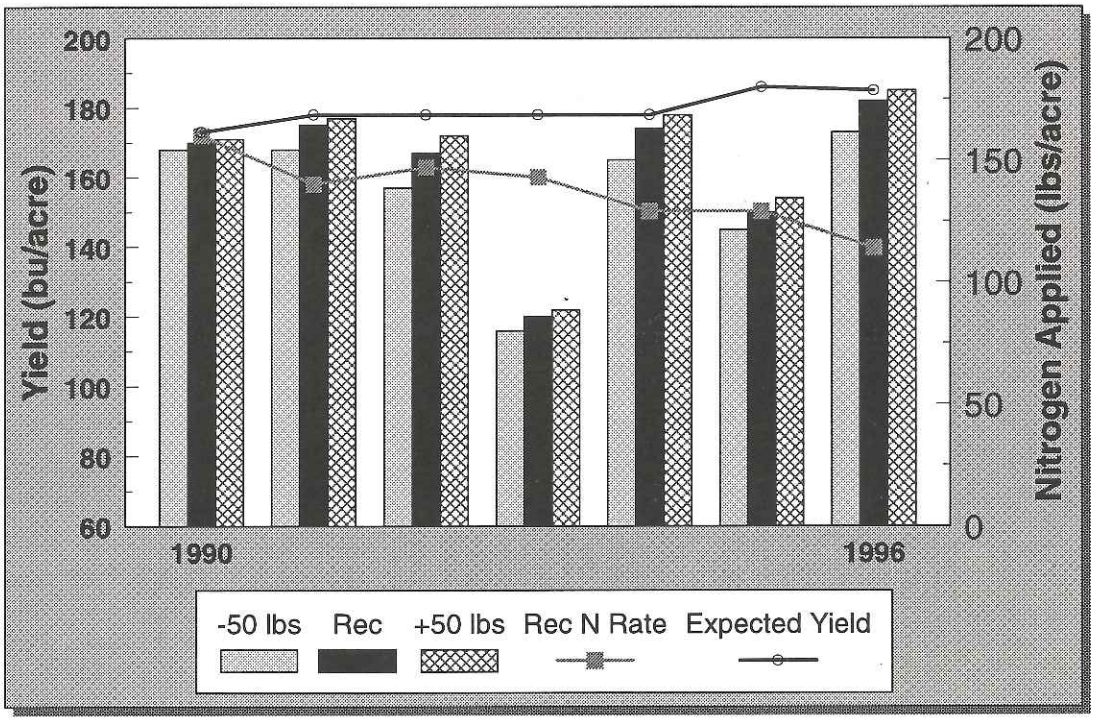
Summary of Results - 1996

Weather, the great equalizer, smiled more favorably on south central Nebraska in 1996 than it had in recent years. Average corn yields for the Mid-Nebraska Demonstration Project were the highest of any years of the project. There are always challenges, but overall, 1996 should have been a satisfying year.

Nitrogen Management

Twenty sites compared University of Nebraska recommended nitrogen rates against higher and lower rates in 1996. The recommended rate was statistically equal to the high rate at 18 sites. While there was no statistical difference, the high rate was numerically greater on 17 sites. The expected yield was exceeded by the recommended treatment on eleven sites.

The average yield of 182.4 bushels per acre on the recommended rate strips was less than three bushels below the average expected yield of 185 bushels per acre.



The above graph shows the effect of weather and the risks associated with strict nitrogen management during the length of this project.

The most obvious weather effect was the wind damage of 1993, which reduced yields by 50 bushels per acre or more. In 1994, 10 of 14 fields fell 10 bushels or more short of

their 1994 expected yield because of wind damage. Extra nitrogen did not help any of the 14 fields shown by 1994's decreased recommended rates to only 129 pounds per acre on average. The opposite occurred after the wet year of 1992; only 48 pounds of nitrate were left in the four-foot soil profile.

Hail and frost were big problems in 1992, as well as excessive rain. Yields on 13 fields were below the expected yield that year by 10 bushels or more. Two suffered hail damage and six showed nitrogen deficiency due to denitrification and nitrogen leaching. Nitrification inhibitors and split application would likely have paid dividends on those fields in 1992. Seven years of field data show the risk from fine-tuning nitrogen management is very small. Using the University of Nebraska approach of crediting soil and water nitrate, manure, legumes, and organic matter results in yields within three bushels of a higher rate of nitrogen. Even deliberately-underfertilized plots have still been within 15 bushels of the high rate after continuous treatment for seven years.

Irrigation Water Management

Seventeen of the 30 cooperators used in-line flow meters in 1996. The meters are an essential tool for water management and troubleshooting irrigation systems. Some sites also used an ultrasonic flow measuring device to verify flow rates. An added advantage of the ultrasonic device is the ability to measure flow losses from leaky gates and gaskets in a gated pipe, gravity-irrigated situation.

The goal of irrigation scheduling is to utilize as much soil water as possible without excessive crop stress, giving the maximum opportunity to hold and use rain water.

In 1996, cooperators scheduled irrigation based on crop water use estimates and soil moisture deficits. In most fields, consultants estimated deficits using the hand-feel method.

Individual site reports show the water status of the root zone. The irrigation graph from Deon Goertzen's site (page 33) is a reasonably good example of scheduling for a 50 percent soil moisture deficit. Deon's first irrigation occurred right at the minimum depletion line. The second irrigation was a little premature. However, the third and fourth applications were both near the mimimum depletion threshold, allowing the crop sufficient moisture to mature and deplete the soil moisture level to the 60 percent depletion mark at crop maturity.

WATER QUALITY

Mid-Nebraska Demonstration Project

The project staff would like to thank the following cooperators for providing demonstration sites in 1996:

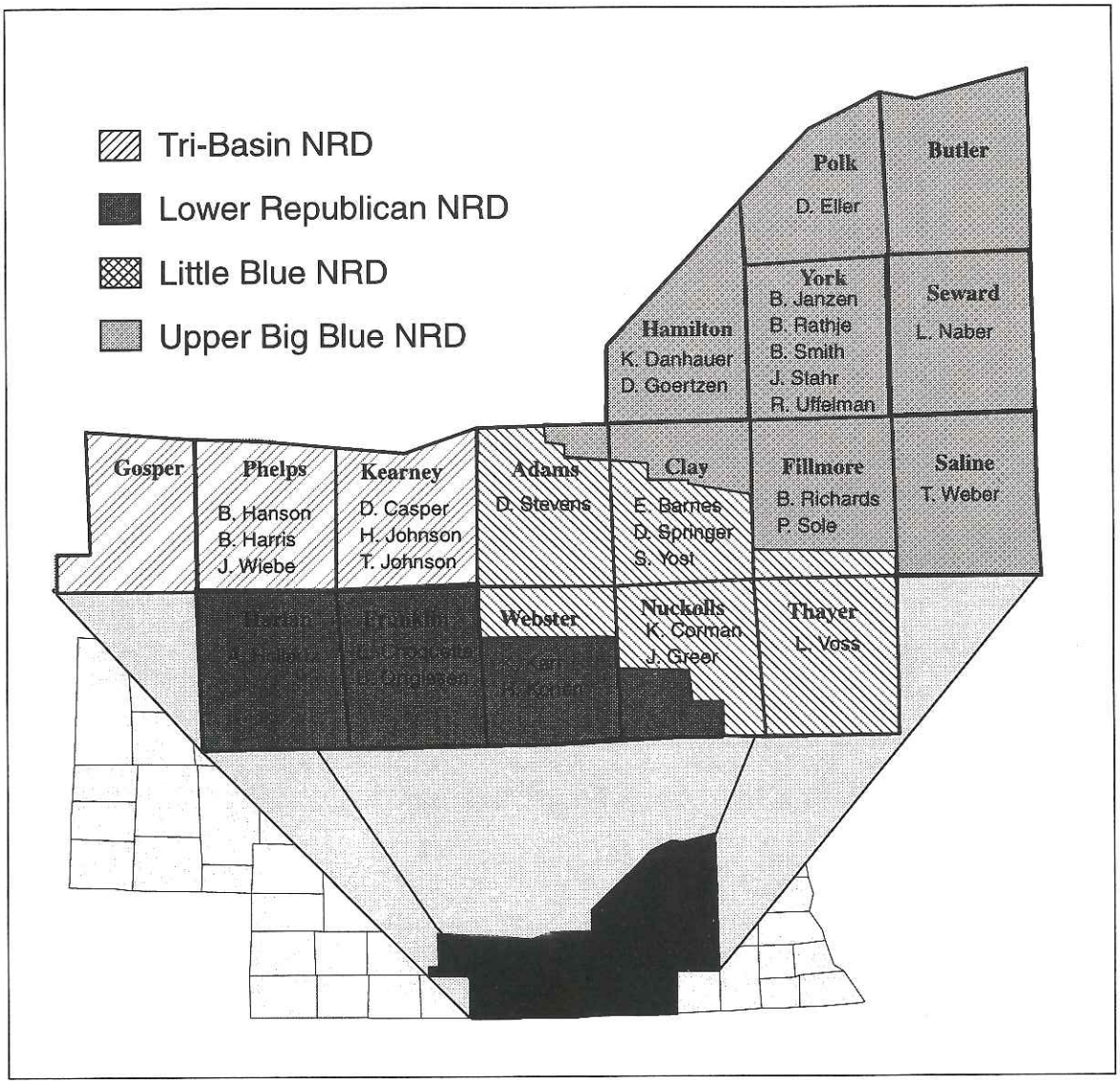


Table 1. Summary of practices and results from 1996 demonstration sites with nitrogen strips.

Site	--Used in N rate		--Measured during season--				Nitrogen Rate	Yield
	Expected Yield	Residual Soil NO_3-N	Gross Rainfall	Gross Irrigation	Water NO_3-N Content	Gross Water N Applied		
	bu/acre	lb/acre-3 ft	inches	inches/acre	ppm	lb/acre	lb/acre	bu/acre
Konen, Rich (pg 57)	180	141	16.30	NA	NA	NA	55 105R 155	165.9 a 167.3 a 169.6 a
Naber, Larry (pg 52)	190	85	13.15	15.30	3.20	11.02	100 150R 160	161.5 a 163.0 a 152.5 a
Rathje, Brad (pg 60)	200	108	17.35	12.40	<1.0	0.00	60 110R 160	138.0 a 150.7 a 151.0 a
Smith, Boyd (pg 62)	200	205	11.10	NA	NA	NA	0 50R 100	159.4 b 179.1 a 184.7 a
Stahr, Jerry (pg 64)	185	156	16.90	6.44	7.00	10.14	0 55R 105	163.6 c 191.9 b 202.8 a
Stevens, Dan (pg 16)	185	46	15.95	13.73	1.50	4.63	125 175R 225	183.4 a 175.6 a 180.5 a
Uffelman, Ron (pg 66)	200	117	13.50	13.82	NA	NA	65 115R 165	193.2 b 204.3 a 205.7 a
Weber, Tom (pg 51)	180	81	NA	NA	NA	NA	70 120R 170	164.3 a 182.0 a 172.9 a
Wiebe, John (pg 48)	190	115	18.20	3.84	NA	NA	115R 55R* 105*	166.7 c 173.0 b 179.4 a
Yost, Steve (pg 22)	180	52	15.1	3.46	2.00	1.56	60 110R 160	188.7 b 197.1 a 196.4 a

† Indicates that the recommended amount plus N-Serve was applied.
‡ Indicates 230 lbs/acre was applied to the first 200 feet of row, then 180 lbs/acre on the remainder of the row.
* In addition to the applied nitrogen there was a 60-pound N credit from a manure application.

[1]Yields with the same letter are not significantly different at the 5% level of significance using Duncan's Multiple Range Test

R=Recommended Rate

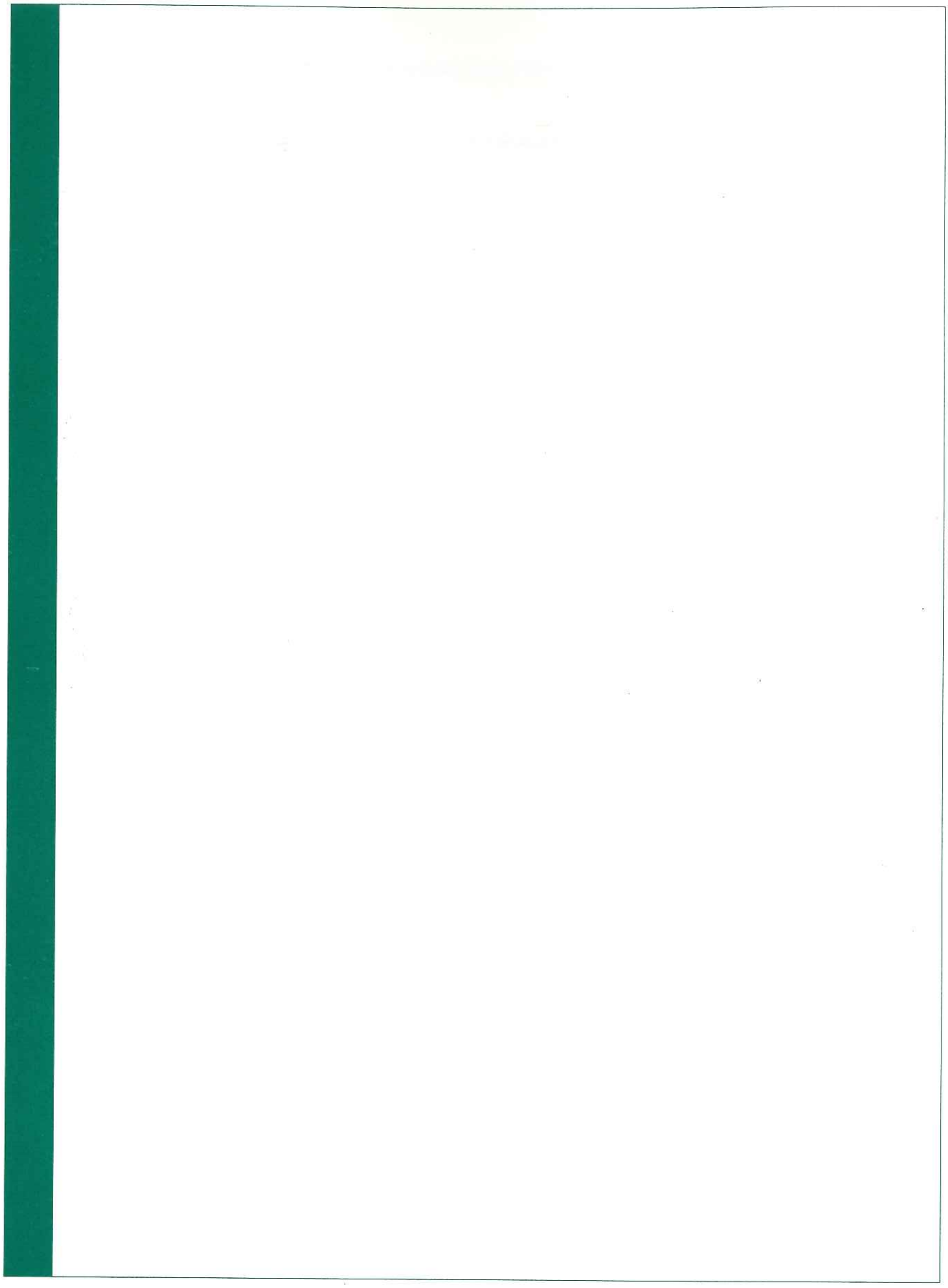
NA=Not Applicable

Site	--Used in N rate		--Measured during season--				Nitrogen Rate	Yield
	Expected Yield	Residual Soil NO_3-N	Gross Rainfall	Gross Irrigation	Water NO_3-N Content	Gross Water N Applied		
	bu/acre	lb/acre-3 ft	inches	inches/acre	ppm	lb/acre	lb/acre	bu/acre
Casper, Dean (pg 36)	175	48	21.30	11.78	<1.0	0.00	155R 205 255	193.9 b 202.3 ab 204.8 a
Choquette, Edwin (pg 26)	200	49	15.25	10.32	6.20	14.40	100 150R 200	221.1 a 207.7 a 220.7 a
Danhauer, Ken (pg 30)	180	193	NA	NA	NA	NA	50 100R 185	194.0 b 203.5 a 208.3 a
Eller, Dick (pg 50)	180	217	NA	4.50	NA	NA	0 50R 200	137.9 b 153.8 a 160.6 a
Greer, John (pg 43)	170	66	NA	NA	NA	NA	50 100R 150	147.6 b 155.8 a 157.6 a
Goertzen, Deon (pg 32)	190	69	18.95	7.68	6.60	11.40	80 130R 180	183.6 b 192.1 a 196.2 a
Hanson, Bill (pg 44)	180	52	25.40	5.40	2.00	2.43	100 150R 200	176.8 b 191.3 a 191.8 a
Harris, Bill (pg 46)	180	95	30.10	17.88	<1.0	0.00	70 120R 170	167.4 b 170.0 ab 170.5 a
Hollertz, Al (pg 34)	175	73	26.00	2.92	6.80	4.47	30 80R 130	206.3 a 204.2 a 208.0 a
Janzen, Brian (pg 58)	170	55	15.25	9.01	3.30	6.69	75 125R 175	156.2 c 169.1 b 174.9 a
Johnson, Harold (pg 38)	150	26	21.60	NA	NA	NA	180R 180 N† 230 230&180‡	91.3 c 111.3 a 102.9 b 96.5 c
Johnson, Tim (pg 40)	190	49	21.10	12.32	<1.0	0.00	120 170R 220	182.3 b 195.4 a 195.8 a

[1]Yields with the same letter are not significantly different at the 5% level of significance using Duncan's Multiple Range Test

R=Recommended Rate

NA=Not Applicable



Individual Demonstration Plot Data Summaries

Dan Stevens, Adams County

Ed Barnes, Clay County

Darrel Springer, Clay County (rotated to soybeans in 1996)

Steve Yost, Clay County

Blaine Richards, Fillmore County (pivot nozzle demonstration)

Pete Sole, Fillmore County

Butch Ortgiesen, Franklin County (four crops under one pivot)

Edwin Choquette, Franklin County

Ken Danhauer, Hamilton County

Deon Goertzen, Hamilton County

Al Hollertz, Harlan County

Dean Casper, Kearney County

Harold Johnson, Kearney County

Tim Johnson, Kearney County

Kerry Corman, Nuckolls County

John Greer, Nuckolls County

Bill Hanson, Phelps County

Bill Harris, Phelps County

John Wiebe, Phelps County (manure application)

Dick Eller, Polk County

Tom Weber, Saline County

Larry Naber, Seward County

Leroy Voss, Thayer County

Kevin Karr, Webster County

Rich Konen, Webster County

Brian Janzen, York County

Brad Rathje, York County

Boyd Smith, York County

Jerry Stahr, York County

Ron Uffelman, York County

Dan Stevens, Adams County

- Location: 5 miles south of Holstein
- Soil Type: Hord silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Deep-ripped; disked
- Planting Date: April 23, 1996
- Hybrid: Fontanelle 6162
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1.2 qts/acre Bicep II, banded at planting
- Insecticide: 2 pts/acre Penncap-m, aerially applied, August 1, 1996
- Harvest Date: October 30, 1996

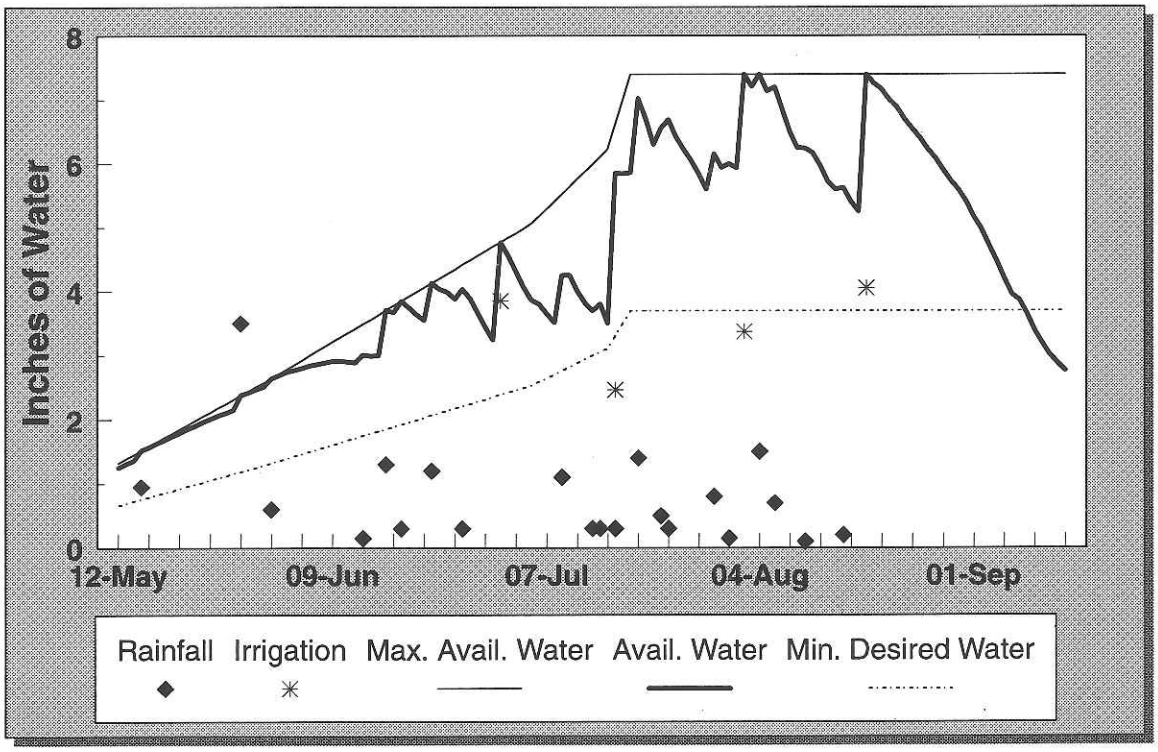
General Fertility	
pH	6.4
OM	1.7%
P	15 ppm
K	358 ppm
Zn	1.4 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	6-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				125	183	35	130	165
1996	Rec	5	46	185	175	176	61	180	168
	+50				225	181	57	230	170

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Ed Barnes, Clay County

- Location: ½ mile south of Clay Center
- Soil Type: Butler silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Ridge-till
- Planting Date: April 27, 1996
- Hybrid: Northrup King 7590
- Starter: 5 gal/acre of 10-34-0
- N Application Type: 165 lbs/acre of 28-0-0 pre-emergence
- Herbicide: 1 qt/acre Aatrex, banded; 1 oz/acre Exceed, broadcast
- Insecticide: 6.7 lbs/acre of Counter 20CR
- Harvest Date: October 30, 1996

Special project—agrotain urease inhibitor demonstration

Introduction

Volatile loss of nitrogen (N) to the atmosphere as ammonia (NH_3) is a concern when urea-based nitrogen fertilizers are surface-applied, particularly when there is substantial residue cover. With reduced or no-tillage systems becoming more common, broadcast applications of urea or UAN solution have also increased as a means of providing adequate N without the time and expense of injection or incorporation. With ideal climatic conditions for ammonia loss from urea (warm, moist soil; substantial residue; little or no rain following application), N losses can be 10% to 20% or even greater.

Agrotain® is a recently available additive to urea or UAN fertilizers which can reduce their potential for ammonia loss. The active ingredient in Agrotain, N-(n-butyl)thiophosphoric triamide (NBPT), temporarily blocks the function of the urease enzyme which converts urea to ammoniacal forms of N. This temporary blockage (2-6 weeks, depending on temperature and moisture) allows additional time for urea to move into the soil with rain or incorporation. Once urea has moved into the soil even a couple of inches, the ammoniacal N released when urea breaks down will be retained in the soil instead of volatilized to the atmosphere.

A primary use of Agrotain is in no-till or reduced till situations, where urea-based fertilizer will be broadcast onto moist soil with substantial residue. A number of research and demonstration trials in several states have shown that the use of NBPT (Agrotain) can protect against yield reduction if conditions favor NH_3 loss, but will have little or no effect if rain incorporates the fertilizer soon after application.

Procedures

A demonstration of the use of Agrotain on ridge-tilled, furrow-irrigated corn was placed on the Ed Barnes farm south of Clay Center. The field contains primarily Butler silt loam soil, with a small section of Crete silt loam soil. The previous crop was corn. Randomized, field length strips with five replications of UAN with and UAN without Agrotain were used. The N rate was 165 pounds per acre for both treatments.

The field was ridge-planted on April 27, 1996 (NK 7590 hybrid) and fertilized with a commercial applicator on May 2, 1996 (Figure 1). Treatment strips were 25 feet (10 rows) wide.

Treatments were harvested with the cooperator's combine and yield measured with a weigh wagon on October 30, 1996.

Figure 1. Applicator used to apply UAN solution with Agrotain.

Results

There were no statistically significant differences in grain yield between treatments with and without Agrotain. Grain yield was 172 bushel per acre with Agrotain, 168 bushel per acre without. The primary factor influencing yield response to Agrotain use was rainfall after fertilization. Figure 2 illustrates the pattern and frequency of rain after fertilization. From May 7-9, the site received 2.35 inches of rain, which effectively moved the UAN solution into the soil and eliminated potential for NH_3 loss. The trend at this site towards increased yield with Agrotain application may be indicative of some N loss occurring between May 2 and May 7. The 0.1 inch of rain on May 3 is not likely to have been adequate to move the fertilizer far enough into the soil to protect against N loss.

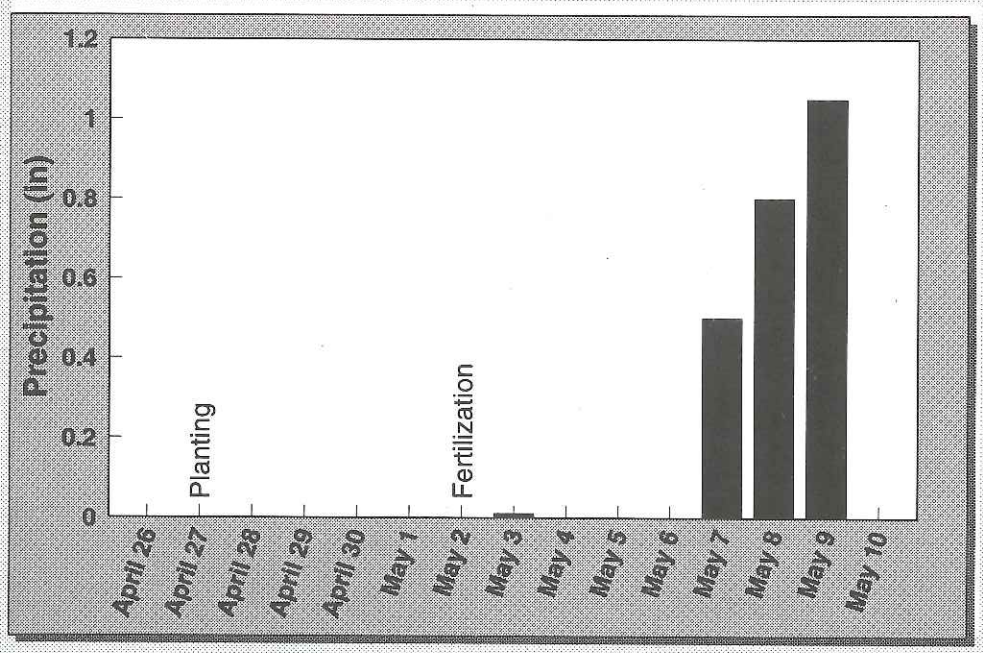


Figure 2. Pattern and frequency of rain after fertilization.

Summary

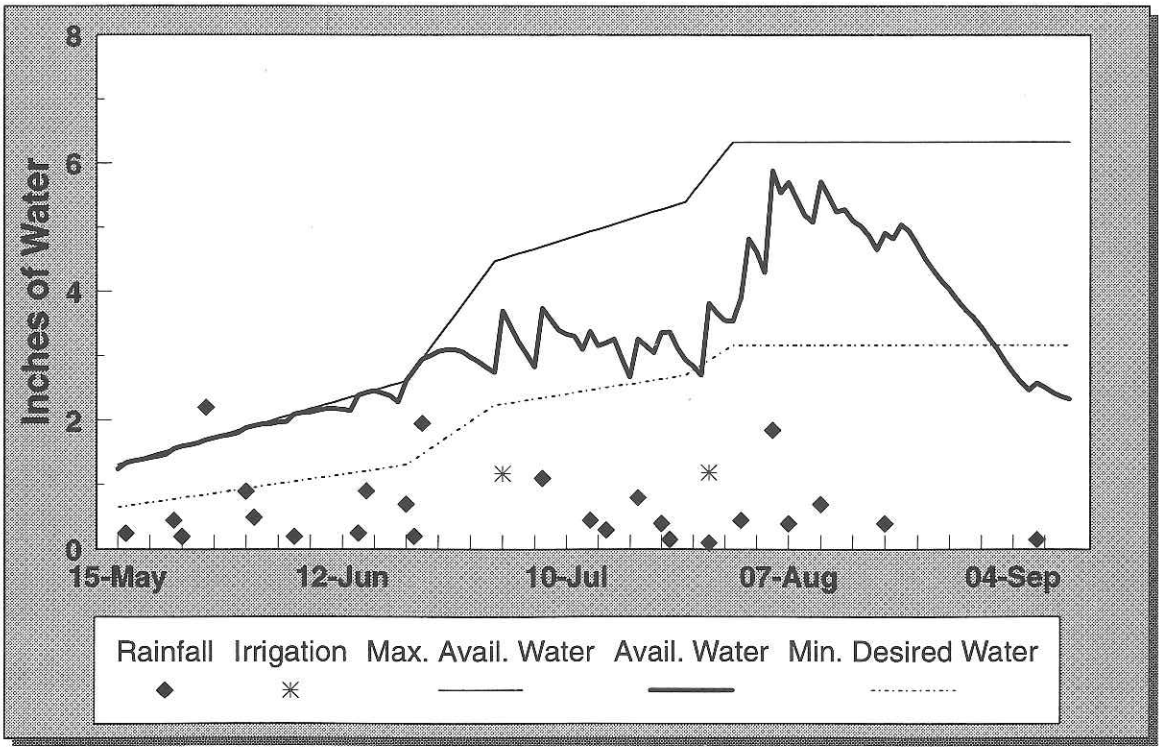
These results are consistent with many other studies which have shown no benefit to practices which protect against environmental losses of N if the climate is not conducive to such loss. The use of a urease inhibitor, or nitrification inhibitors, for that matter, should be considered as insurance which can protect against substantial yield reduction in some years, but which will show little or no benefit in many or perhaps even the majority of years.

Darrel Springer, Clay County

- Location: ½ mile east of Edgar
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Disked twice
- Planting Date: May 2, 1996
- Hybrid: NC+ 3A44, Dekalb 377 (soybeans)
- N Application Type: 90 lbs/acre of 11-52-0 dry; 36 lbs/acre of 46-0-0 urea with floater
- Herbicide: ¼ oz/acre Pinnacle and ¼ oz/acre Classic, broadcast June 4, 1996; 9 ozs/acre Assure, broadcast June 13, 1996; 6 oz/acre Cobra, broadcast June 15, 1996
- Insecticide: None

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Steve Yost, Clay County

- Location: 4 miles north, 2 miles west of Clay Center
- Soil Type: Crete silt loam with a 0-1% slope
- Preceding Crop: Soybeans
- Preplant Soil Prep: Shred stalks
- Planting Date: April 24, 1996
- Hybrid: Golden Harvest 2564
- Starter: 5 gal/acre of 10-34-0
- N Application Type: 115 lbs/acre of 28-0-0, split-applied at planting and June 20, 1996
- Herbicide: 2.2 lbs/acre Extrazine, broadcast May 6, 1996
- Insecticide: None
- Harvest Date: October 16, 1996

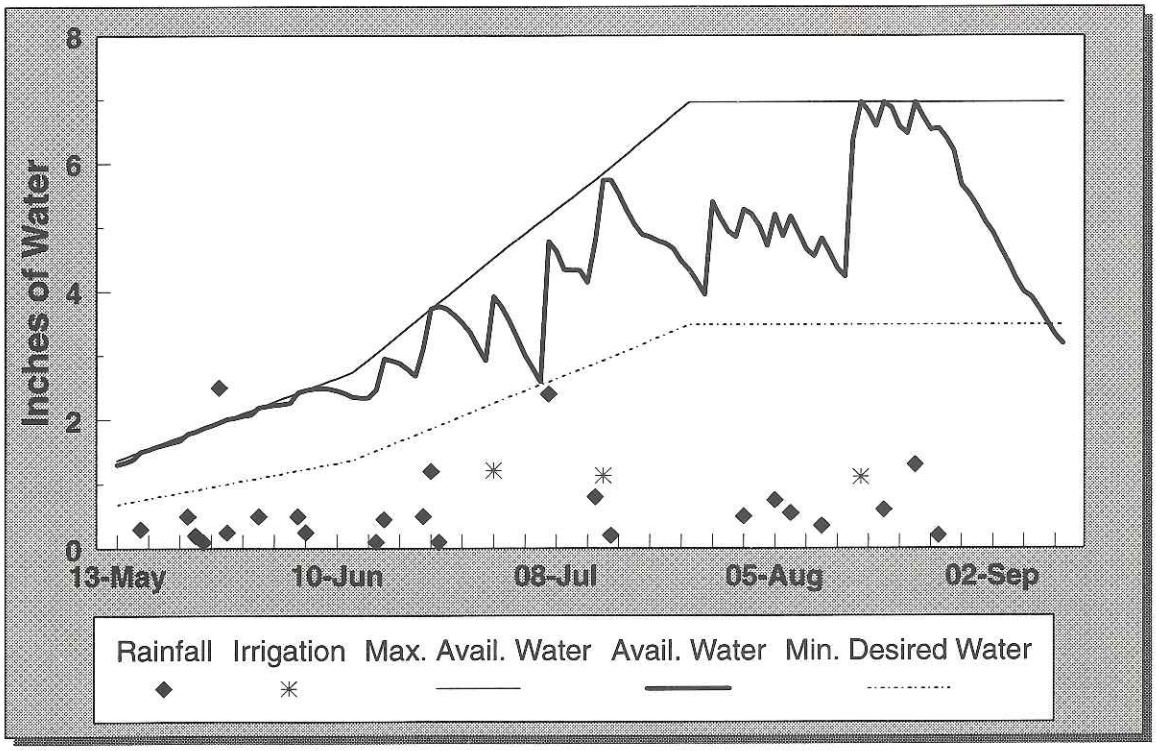
General Fertility	
pH	6.2
OM	2.4%
P	10 ppm
K	395 ppm
Zn	1.9 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
1991 to 1994	Rec	6	42	180	156	143			
	-30				123	144			
	-60				90	138			
	-90				56	126			
1996	-50				60	189		60	189
	Rec	2	52	180	110	197	52	110	197
	+50				160	196		160	196

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.

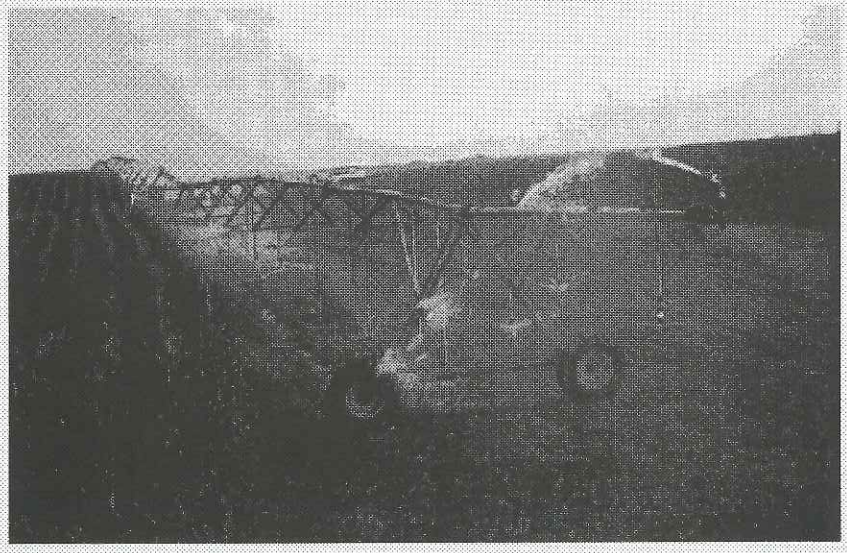


Blaine Richards, Fillmore County

- Location: 4 miles west, 4 miles south of Geneva
- Soil Type: Crete silt loam with a 0-1% slope

Special project—pivot nozzle demonstration

Blaine Richards demonstrated the use of a variety of pivot nozzles. All of the nozzles on the last span of Blaine's pivot were changed to a variety of low-energy drop nozzles. A field tour was held in August, where the participants had the opportunity to view this menagerie of nozzles in operation for themselves. Spray nozzles on drop tubes should be placed at or just barely into the crop canopy (when at full crop height). According to Kelly Wertz, Extension Educator with the Management Systems Evaluation Area program at Shelton, Nebraska, irrigators going to low-pressure drop nozzles face a bewildering array of nozzle types, drop tube lengths, and outlet spacings in trying to select the best system components. The following three goals should be considered.



1. Minimizing wind and evaporation losses by lowering nozzles close to the crop canopy and reducing pressure of the nozzles to maintain adequate droplet size (large enough to reduce drift and evaporation).
2. Maintaining adequate wetted diameter from each nozzle to prevent runoff from the point of application.
3. Maintaining proper nozzle spacing to maintain pattern overlap of one to one and one-half nozzle paterns to achieve application uniformity.

These three goals are interrelated. The goal is to select the nozzle type, size, height, and spacing that comes closest to achieving those goals for your system.

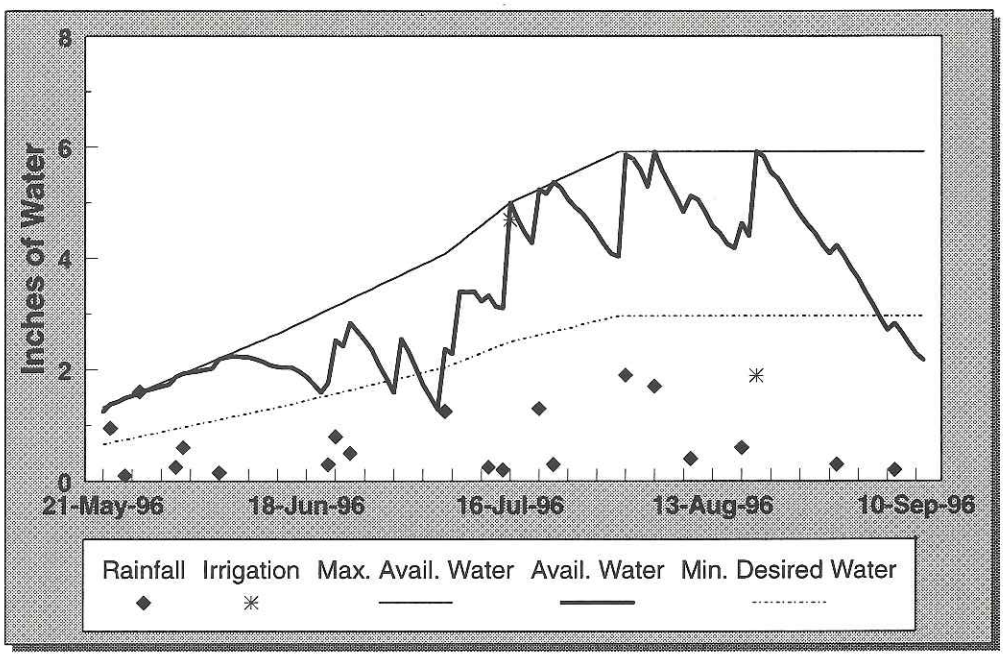
Pete Sole, Fillmore County

- Location: 2½ miles east, ½ mile north of Shickley
- Soil Type: Crete silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Ridge-till
- Planting Date: May 4, 1996
- Hybrid: Cargill 7777
- Starter: 5 gal/acre of 10-34-0
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1.6 qts/acre Harness Extra, banded at planting and 1 oz/acre Exceed, broadcast June 11, 1996
- Insecticide: None

General Fertility	
pH	5.9
OM	1.9%
P	9 ppm
K	340 ppm
Zn	14 ppm

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Edwin Choquette, Franklin County

- Location: 2 miles east, 4 miles south of Upland corner, Highway 4
- Soil Type: Holdrege silt loam with a 0-3% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Chopped stalks
- Planting Date: May 2, 1996
- Hybrid: Pioneer 3162
- N Application Type: Preplant 11-0-0, broadcast
- Herbicide: 2.4 qts/acre Bicep II, broadcast
- Insecticide: 5.4 lbs/acre Force, T-banded at planting
- Harvest Date: October 25, 1996

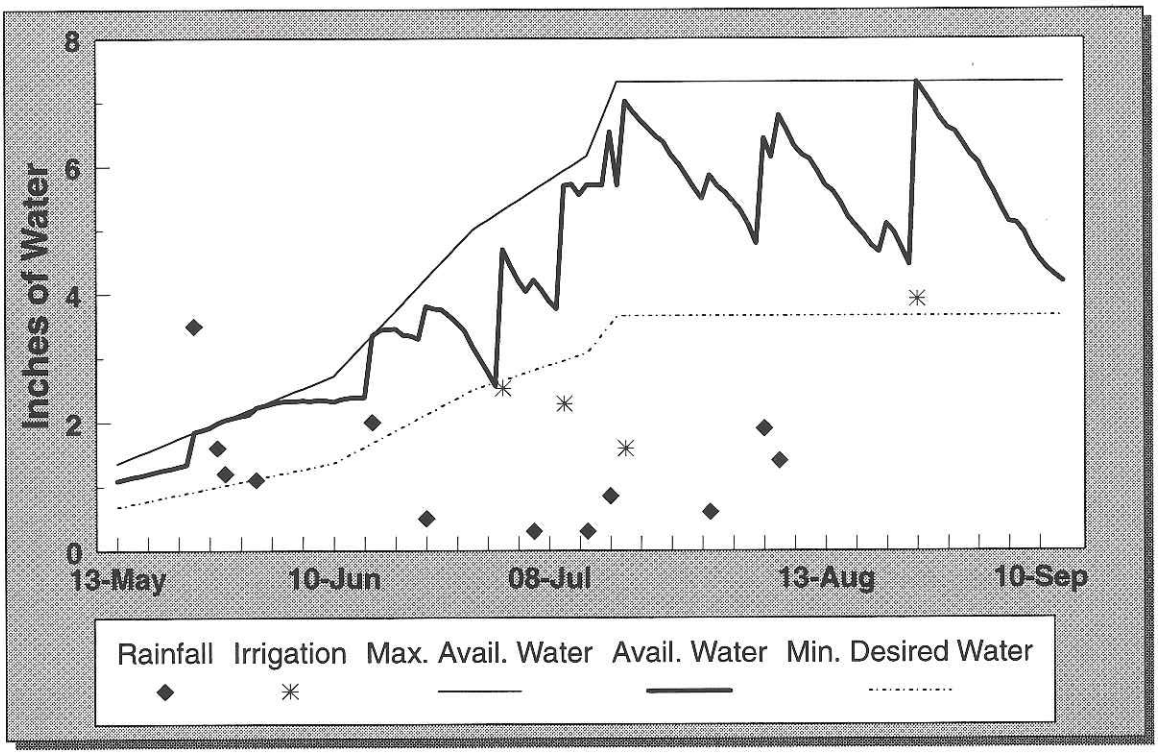
General Fertility	
pH	6.9
OM	2.8%
P	50 ppm
K	565 ppm
Zn	3.2 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	2-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				100	221		50	194
1996	Rec	14	49	200	150	208	51	100	183
	+50				200	221		150	193

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Butch Ortgiesen, Franklin County

- Location: 1 mile south, 1½ miles west of Hildreth turnoff on Highway 4
- Soil Type: Holdrege silt loam with a 0-3% slope

Special project—four crops under one pivot

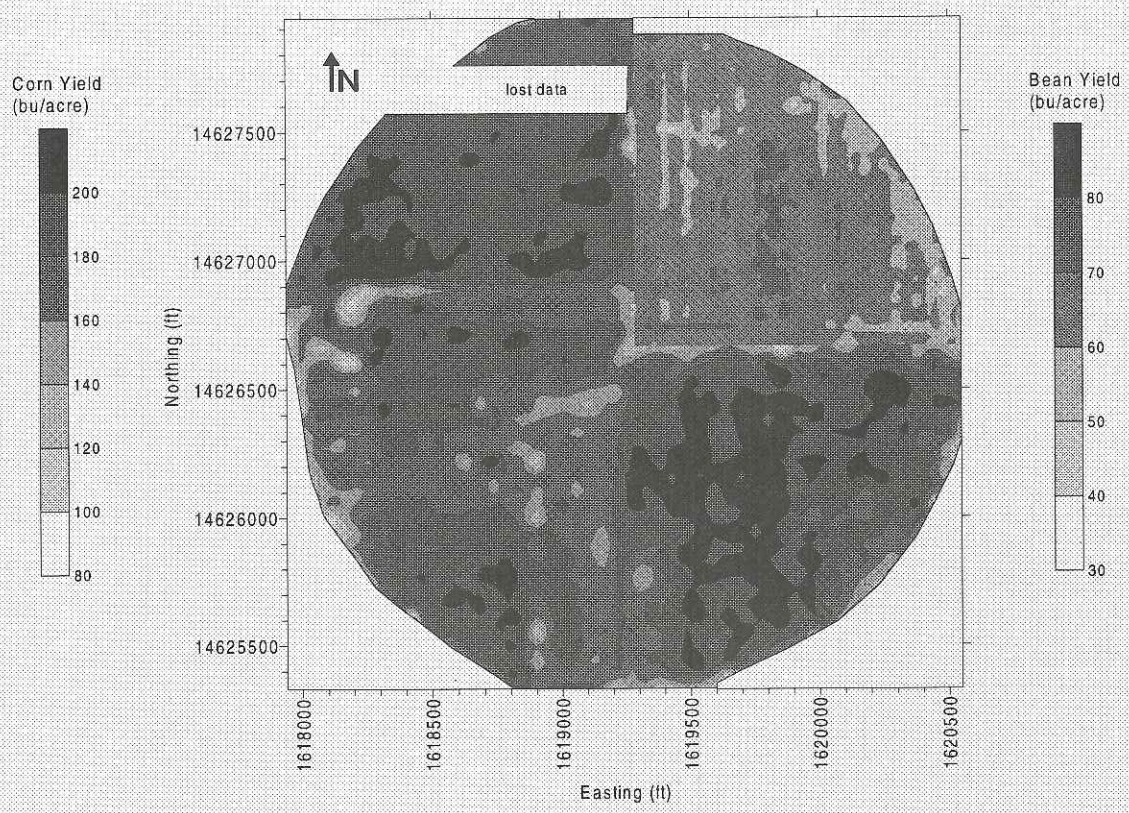
Butch Ortgiesen demonstrated a unique varied-crop, four-year rotation on a field with a low-pressure pivot which pumps 350 gallons per minute. The pivot, divided into four quarters, held soybeans, wheat, ecofallow corn, and no-till corn. For 1996, the quarter of wheat was torn up and replaced with corn due to excessive winter-kill of the wheat. For 1997, wheat is once again included in the rotational plan.

Because of the limited amount of water available for irrigation, a RAMS (Reinke Automated Management System) was installed on the pivot. Funding for this unit was provided by the Lower Republican NRD, in addition to a unit discount from Reinke Manufacturing Company, Inc. The RAMS unit will enable Butch to manage and apply the limited amount of water with greater precision.

To enable economic comparisons to be made, a yield monitor was purchased with cooperation from Minden Terminal, an implement dealer in Minden, Nebraska. The yield monitor was mounted on Butch's combine. This unit, along with grid sampling that was done on the site, will help in utilizing and measuring the effects of inputs used by the various crops in the rotation plan.

This site offered a good opportunity to demonstrate the advantages of crop rotation, irrigation management, fertilizer management, and integrated pest management. Butch will continue learning about and fine-tuning this cropping system to fully use management techniques that limit crop inputs and efficiently use resources.

The cooperation of the Lower Republican NRD, Reinke Manufacturing Company, Inc., Minden Terminal, Cooperative Extension specialists, and local businesses is greatly appreciated in helping gather data on this site.



Yield map of study site in 1996. The northeast quarter of this field was soybeans, the rest was corn.

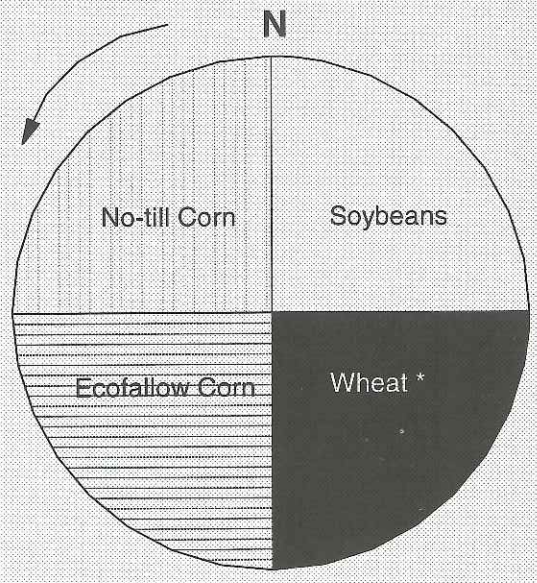


Diagram of crop rotation schedule for 1996. Note that the wheat rotation was actually corn this year but next year will include wheat again. The direction of the

Ken Danhauer, Hamilton County

- Location: 1 mile east of the Marquette intersection on Highway 14
- Soil Type: Holder silt loam with a 1-3% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Ridge-till
- Planting Date: May 8, 1996
- Hybrid: Stauffer S2207
- Starter: 5 gal/acre of 10-34-0 plus 1 qt/acre zinc at planting
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1 qt/acre Aatrex 90, banded at planting
- Insecticide: None
- Harvest Date: October 28, 1996

General Fertility	
pH	5.5
OM	2.9%
P	23 ppm
K	440 ppm
Zn	1.3 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				50	194		50	194
1996	Rec	0	193	180	100 *	203	193	100	203
	+50				185	208		185	208

** The original recommended rate for Ken's plot was 50 pounds N per acre. Due to in-season observances, soil samples were taken before sidedress. After analysis, it was determined to apply an additional 50 pounds per acre N on the 50-minus and recommended strips, bringing total application rates up to 50 and 100 pounds per acre, respectively.*

Deon Goertzen, Hamilton County

- Location: 1½ miles south of the I-80 Hampton exit
- Soil Type: Crete silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Disked
- Planting Date: April 26, 1996
- Hybrid: Pioneer 3225
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1¼ qts/acre Harness Extra, banded at planting
- Insecticide: 5 lbs/acre Dipel, applied June 19, 1996
- Harvest Date: October 28, 1996

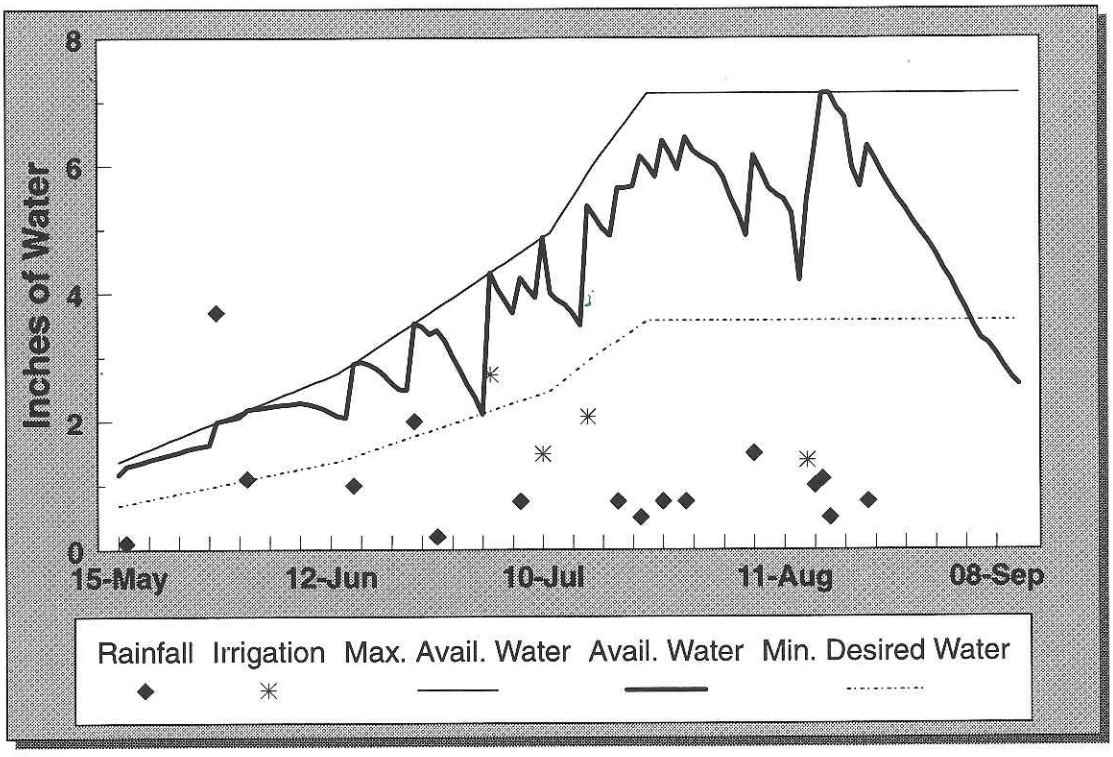
General Fertility	
pH	5.7
OM	2.6%
P	13 ppm
K	460 ppm
Zn	0.6 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	6-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				80	184	53	86	151
1996	Rec	11	69	190	130	192	86	136	154
	+50				180	196	120	186	164

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Al Hollertz, Harlan County

- Location: 7 miles south, 2 miles east of Holdrege
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Soybeans
- Preplant Soil Prep: Disked lightly
- Planting Date: April 20, 1996
- Hybrid: Golden Harvest 2493
- Starter: 60 lbs/acre phosphate and 4 lbs/acre zinc, dry broadcast
- N Application Type: Sidedress anhydrous ammonia
- Herbicide: 2 qts/acre Bicep, broadcast April 22, 1996
- Insecticide: None
- Harvest Date: October 11, 1996

General Fertility	
pH	6.4
OM	2.2%
P	11 ppm
K	399 ppm
Zn	1.8 ppm

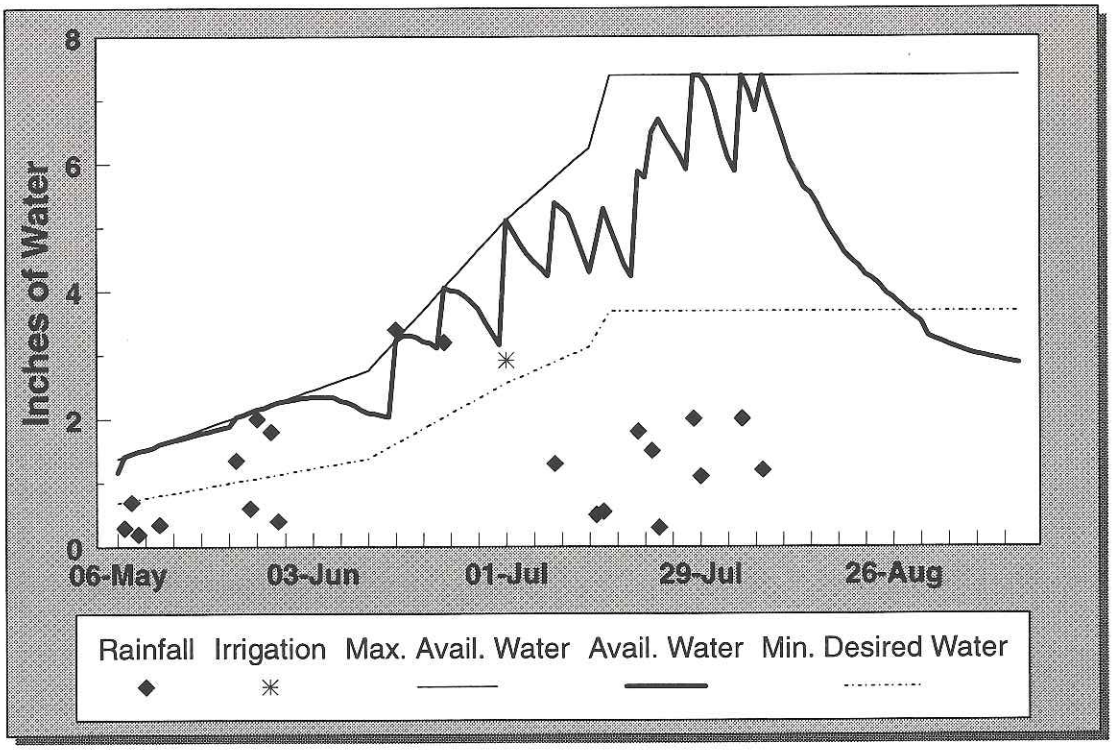
Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N * applied	Yield	5-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				30	206	103	22	167
1996	Rec	5	73	175	80	204	99	119	169
	+50				130	208	113	122	170

** Please note there was a 45-pound nitrogen credit given from soybeans in 1995.*

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Dean Casper, Kearney County

- Location: 5 miles south, 3 miles west, ¾ mile south of Minden
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: April 25, 1996
- Hybrid: Pioneer 3225
- Starter: 5 gal/acre of 10-34-0 in furrow at planting
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1 qt/acre Bicep II, banded at planting; ½ oz/acre Exceed, banded on April 8, 1996
- Insecticide: 1 qt/acre Furadan, aerially applied on July 25, 1996
- Harvest Date: November 13, 1996

General Fertility	
pH	6.5
OM	2.3%
P	17 ppm
K	462 ppm
Zn	1.0 ppm

Nitrogen Management

Dean Casper's field has had significant differences in yield between the recommended rate and the plus 50-pound rates in four of the years between 1990 and 1996. The average difference in yield has been almost ten bushels per acre between the two rates. In the other three years, the yield was not significantly different; the average yield difference was seven bushels per acre between the two rates.

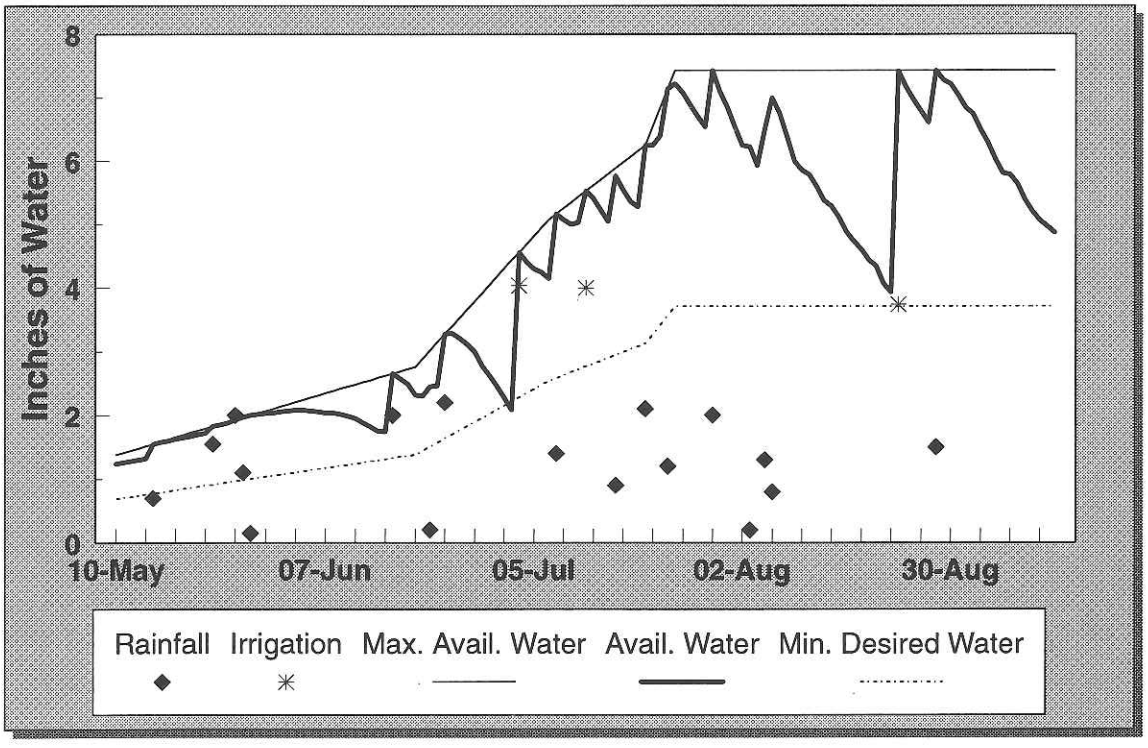
The University of Nebraska algorithm used to determine nitrogen rates works on most fields, but some fields do not produce the usual yield result. In an effort to fine-tune the algorithm on Dean's field, he applied a recommended rate of 155 pounds of nitrogen, a plus 50-pound rate, and a plus 100-pound rate. The difference between the recommended rate and the plus 50-pound rate, although not significant, was 8.4 bushels per acre. The difference between the plus 50-pound rate and the plus 100-pound rate was 2.5 bushels per acre. More data may allow a better understanding of what rate is needed on this field.

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	7-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	Residual N	N applied	Yield
1996	Rec	0	48	175	155	194			
	+50				205	202			
	+100				255	205			
1995	Rec	1	32	175	150	147			
	+25				175	147			
	+50				225	158			
1990 to 1994	-50	3	38	175	126	134	38	126	136
	Rec				176	147		169	154
	+50				226	156		219	163

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Harold Johnson, Kearney County

- Location: ½ mile east, 1½ miles north, ½ mile east of Norman
- Soil Type: Inavale loamy fine sand with a 0-3% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Disked twice
- Planting Date: May 2, 1996
- Hybrid: Crows 435
- Starter: 40 lbs/acre of 28-0-0 with 20 lbs/acre sulfur, broadcast
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1¾ qts/acre Harness Extra, broadcast at planting and 0.67 oz/acre Accent, broadcast on June 20, 1996
- Insecticide: None
- Harvest Date: October 9, 1996

General Fertility	
pH	6.2
OM	0.7%
P	26 ppm
K	196 ppm
Zn	2.8 ppm

Nitrogen Management

Harold Johnson is experiencing yield reductions at his site in Kearney County. In order to help determine the cause of the yield reductions, different rates and treatments of nitrogen were applied to the field. In addition to a recommended rate of 180 pounds of N, a plus 50-pound rate was used along with a 180-pound rate with N-Serve, and a combination rate of 230 pounds for the first 200 feet of row then dropping back to a 180-pound rate. The 230-pound rate was to address the possibility of leaching of nitrogen from the head of the field due to any over-application of irrigation water from the gated pipe system. Results of the treatments are shown in the yield table.

A nematode analysis was conducted to determine if nematodes could possibly be causing excessive yield reductions. Results of the analyses found only background levels of nematodes which did not cause a problem. Tissue samples were collected which included whole plants that were exhibiting both stress and stunting as well as specimens which exhibited no signs of stress or stunting. Results of these analyses showed no significant disease levels. Nutrient deficiency was ruled out based on soil test results and plant specimens.

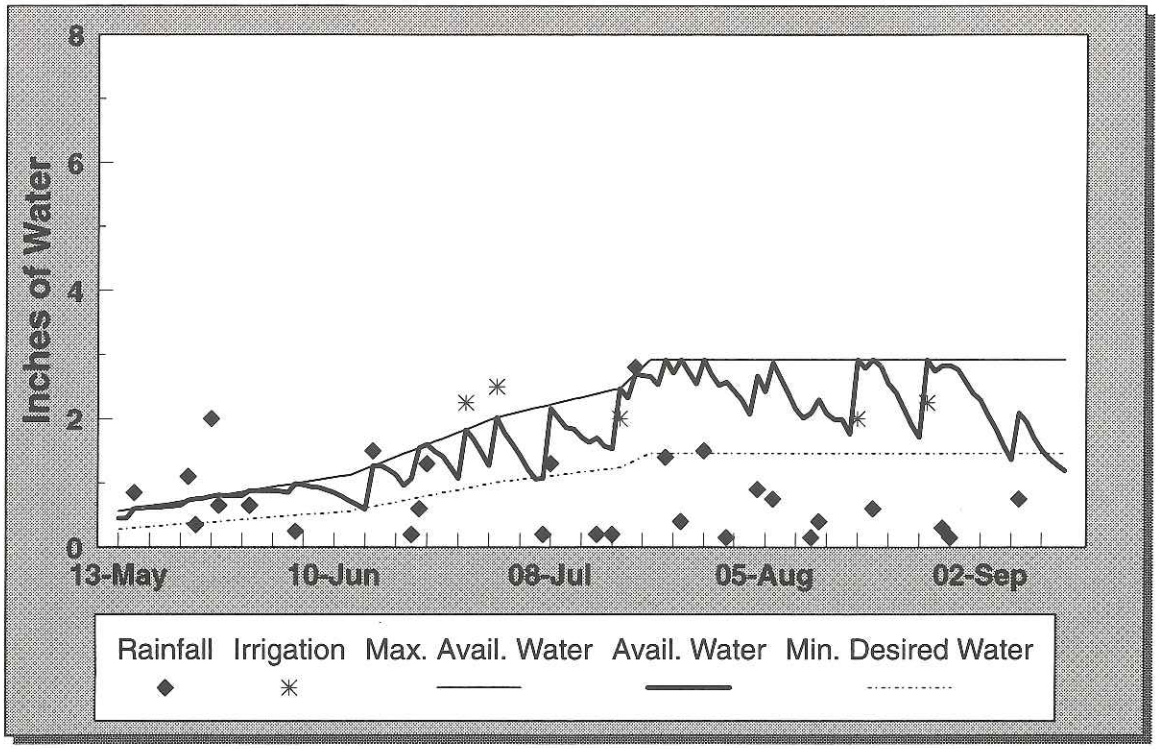
In order to address this problem, a crop rotation using soybeans is currently being planned. Along with the rotation, "smart sampling" will be employed based on aerial color and infrared photos of the field which were taken during the 1996 growing season. In order to determine the cause(s) for the yield reduction more study and data collection will be necessary.

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	6-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
1996	Rec	0	26	150	180	91	26	180	91
	Rec +N *				180+N	111		180+N	111
	+50				230	103		230	103
	+50 **				230/180	97		230/180	97

** Indicates that the recommended amount plus N-Serve was applied.*
*** 230 lbs/acre was applied to first 200 feet of row, then 180 lbs/acre for the rest of the row.*

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Tim Johnson, Kearney County

- Location: 9 miles south, 6 miles east of Minden
- Soil Type: Detroit silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Rolling stalk cutter, twice
- Planting Date: April 24, 1996
- Hybrid: Pioneer 3162
- Starter: 9 gal/acre of 10-34-0, banded preplant
- N Application Type: Preplant anhydrous ammonia; 9.6 gal/acre of 20-0-3-4 banded on April 25, 1996
- Herbicide: 1 pt/acre Dual II, banded at planting; 3 pts/acre Marksman, broadcast on May 15, 1996; 0.66 oz/acre Accent, broadcast on April 2, 1996
- Insecticide: 1½ pts/acre Penncap-m, aerially applied, July 28, 1996
- Harvest Date: November 9, 1996

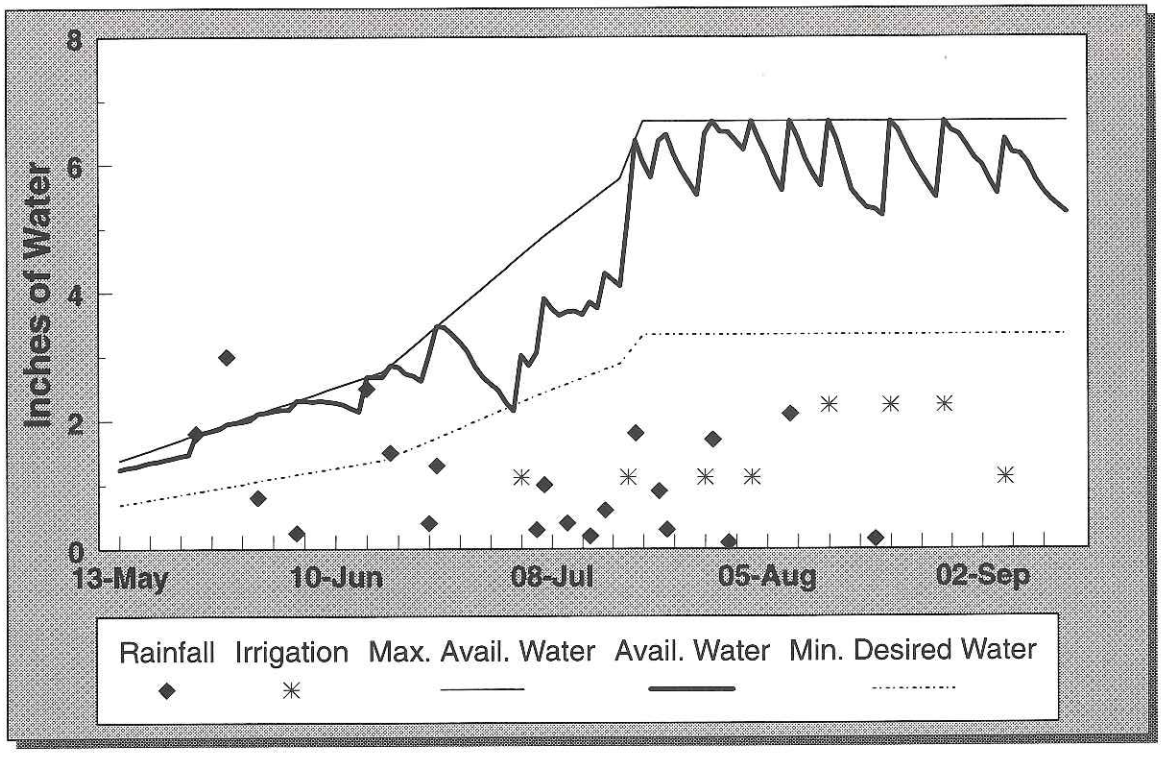
General Fertility	
pH	6.5
OM	2.2%
P	30 ppm
K	504 ppm
Zn	2.0 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	2-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				120	182		118	162
1996	Rec	0	49	190	170	195	48	168	171
	+50				220	196		218	174

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



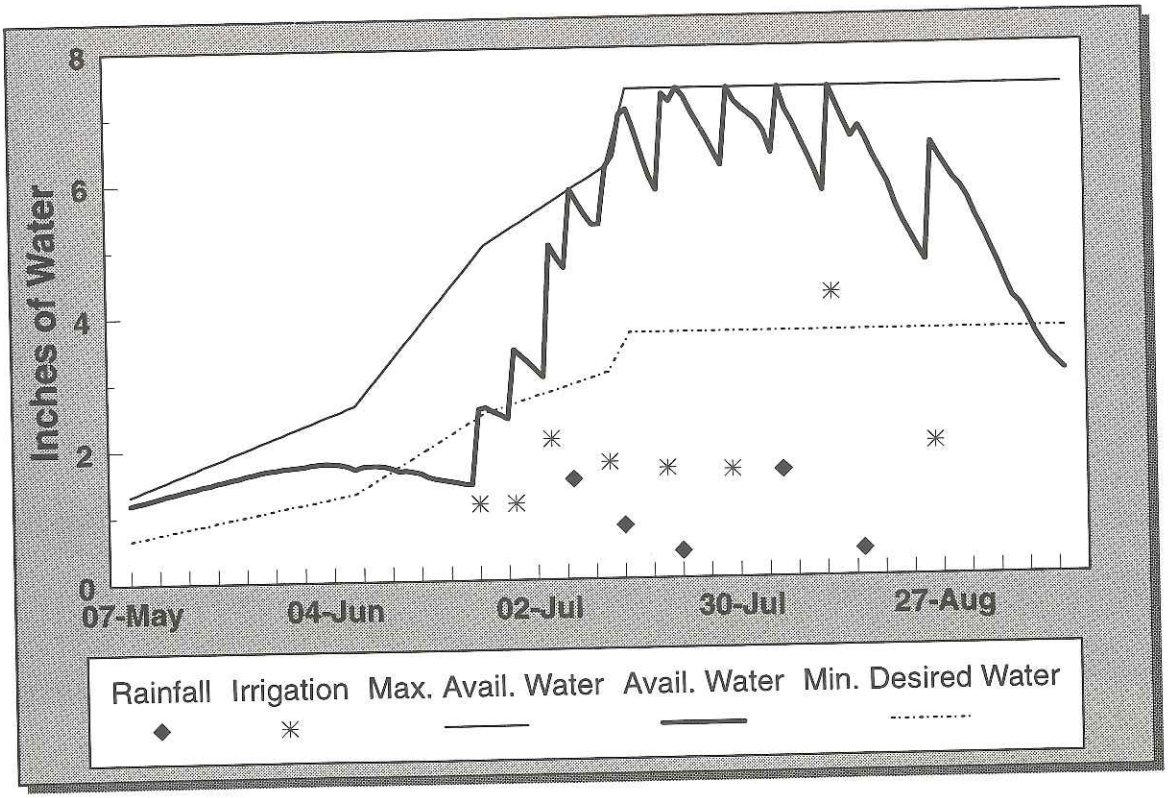
Kerry Corman, Nuckolls County

- Location: 5 miles east of Superior on Highway 8
- Soil Type: Hord silt loam with a 0-1% slope
- Preceding Crop: Corn

Irrigation Management

Kerry wanted to minimize irrigation costs and avoid unnecessary runoff and deep percolation at the site. In order to optimize the allotted canal water, he chose to install a surge valve to help increase his irrigation efficiency. With the use of a flow meter, Kerry was able to measure his applications and experiment with the settings on the surge valve to optimize his application rates.

As the irrigation graph shows, rainfall did not occur from crop emergence on May 7 until July 7. Kerry applied his first irrigation as soon as the crop was tall enough to complete the ridging cultivation. Small water amounts were applied to get over the field quickly and the applications were repeated frequently to meet the crop's needs. Only one irrigation application was heavier due to high crop water use and experimentation with optimizing the surge valve settings. Overall, Kerry met the crop water needs while minimizing the amount of water that was applied. For more information on surge irrigation refer to the Irrigation Management section on page 7 for a list of available NebGuides.



John Greer, Nuckolls County

- Location: 6½ miles east of the junction of Highways 4 and 14
- Soil Type: Fillmore silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks, chopped stalks
- Planting Date: May 6, 1996
- Hybrid: Pioneer 3162
- Starter: 5 gal/acre of 10-34-0, applied in furrow at planting
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1 qt/acre Harness Extra, banded at planting; 1 oz/acre Sencor, banded at planting
- Insecticide: 4 lbs/acre Aztec, placed in furrow at planting
- Harvest Date: November 21, 1996

General Fertility	
pH	6.8
OM	3.0%
P	47 ppm
K	483 ppm
Zn	2.0 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				50	148		50	148
1996	Rec	0	66	170	100	156	66	100	156
	+50				150	158		150	158

Bill Hanson, Phelps County

- Location: 6 miles north, 2 miles west, 1 mile north of Holdrege
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: April 19, 1996
- Hybrid: Cargill 7777
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 2 qts/acre Bicep II, banded at planting
- Insecticide: 1½ pts/acre Penncap-m, aerially applied, July 25, 1996
- Harvest Date: October 25, 1996

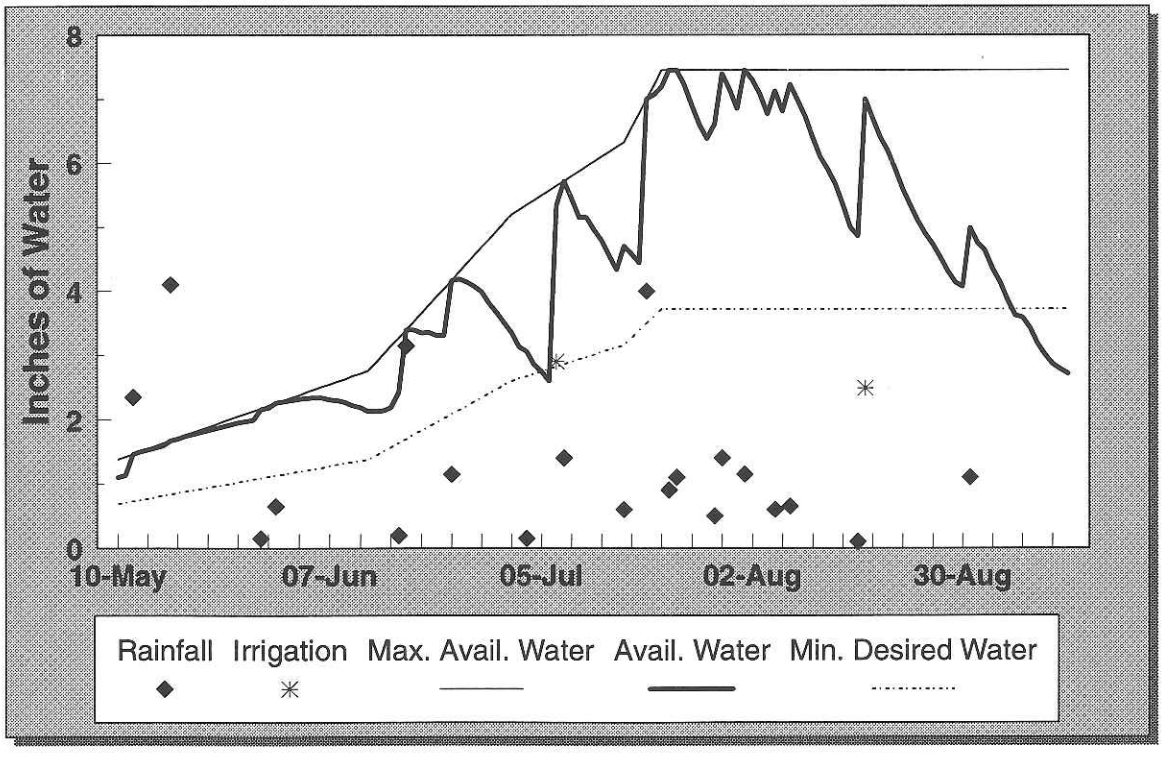
General Fertility	
pH	5.6
OM	2.4%
P	42 ppm
K	427 ppm
Zn	7.4 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	2-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				100	177		108	168
1996	Rec	2	52	180	150	191	42	158	179
	+50				200	192		208	178

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Bill Harris, Phelps County

- Location: 6 miles north, 4½ miles west of Holdrege
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Disked and deep-ripped in November, 1995
- Planting Date: April 19, 1996
- Hybrid: Pioneer 3287W
- Starter: Broadcast 0-40-0-8S-2Z in December, 1995
- N Application Type: 10 lbs/acre of 32-0-0 disked in on April 18, 1996; sidedressed remainder as 32-0-0 in June, 1996
- Herbicide: 2 qts/acre Bicep II, broadcast ppi on April 18; ½ oz/acre Exceed spiked with Banvel, banded on June 10, 1996
- Insecticide: One 1.8-ounce packet Kernel Guard per bag of seed corn at planting; 1 pt/acre Penncap-m, aerially applied on August 10, 1996
- Harvest Date: October 25, 1996

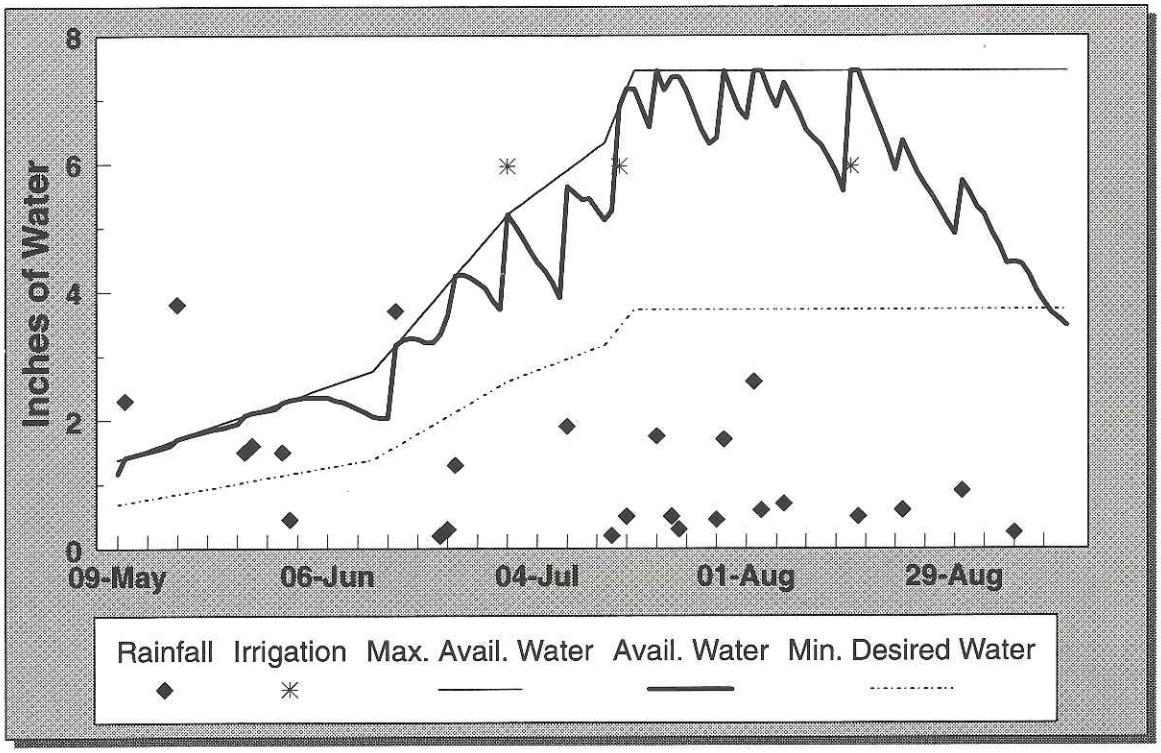
General Fertility	
pH	6.0
OM	2.5%
P	30 ppm
K	412 ppm
Zn	3.6 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	2-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				70	167		55	147
1996	Rec	0	95	180	120	170	116	98	149
	+50				170	171		140	154

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



John Wiebe, Phelps County

- Location: 5 miles north, ¾ mile east of Loomis
- Soil Type: Holdrege silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks; rolling stalk chopper
- Planting Date: April 27, 1996
- Hybrid: Golden Harvest 2493
- N Application Type: Manure and liquid fertilizer
- Manure Applied: 29 tons/acre
- Herbicide: None
- Insecticide: None
- Harvest Date: October 19, 1996

General Fertility	
pH	6.2
OM	2.3%
P	23 ppm
K	485 ppm
Zn	3.0 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
							Residual N	*N applied*	*Yield*
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)			
1996	Rec	0	115	190	115	167	115	115	167
	Rec (m)				55 *	173		55 *	173
	+50 (m)				105 *	179		105 *	179

** These amounts are only the amount of commercial N applied. They also had 60 pounds of N credit from a manure application.*

Special project—manure application

John Wiebe wanted to demonstrate the advantages of utilizing manure as a source of nutrients. A recommendation was made taking into account both residual soil nitrate and the available nitrogen in the manure which was measured through sampling the manure.

Results:

Manure was applied at 29 tons/acre. The equipment operator made every reasonable effort to apply manure uniformly. However, the characteristics of feedlot manure as well as the limitations of the manure application equipment contributed to considerable variability in application rate. Measurement at 11 locations along the length of travel revealed application rates ranging from 10 to 45 tons per acre (see Figure 1). Considerable variation was also observed across the spread pattern (perpendicular to direction of travel). This variability along with lack of any tillage following manure application was a source of concern.

However, yield response of manure (60 pounds of crop available N) plus commercial fertilizer (55 pounds of N) was statistically better than a comparable application of commercial nitrogen (115 pounds of N). Either the benefits of other manure components (P, K, micronutrients, or organic matter) or the ability of the crop to "level out" the uneven application offset the variation in manure nutrient application.

The manure application contributed approximately 60 pounds of crop available nitrogen and 230 pounds of crop available phosphorus per acre. It was estimated at the beginning of the season that 20 percent of the organic nitrogen in manure would be crop available (0.20 x 9.8 pounds N/ton x 29 tons/acre). All ammonium nitrogen (4 pounds N/ton) was assumed lost since no tillage incorporation or rain occurred during the week following application. Some additional residual organic-nitrogen credit should be available next year (about 50 percent of this year's credits). The high rate of manure phosphorus application should meet crop phosphorus needs for two additional years' corn crop beyond this years crop. A spreading of manure at this site every three years would likely produce the greatest savings in commercial fertilizer purchase.

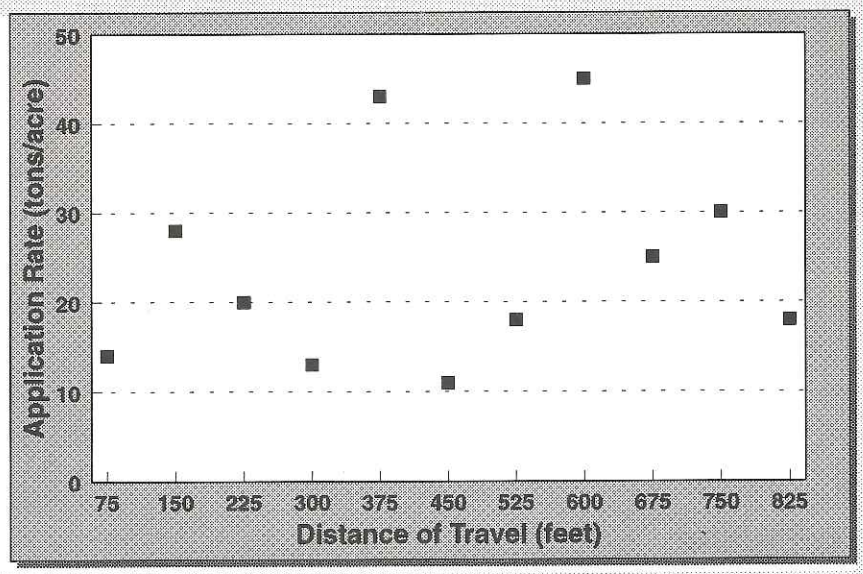


Figure 1. Manure application rate (tons per acre) at eleven locations along the length of travel of the manure spreader. Manure was collected from 22 ft² area to determine rate.

Dick Eller, Polk County

- Location: 3 miles east, 5½ miles north of Shelby
- Soil Type: Holder silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: May 17, 1996
- Hybrid: Golden Harvest 2502
- Starter: 100 lbs/acre of 11-52-0 (11 lbs N)
- N Application Type: 33 lbs/acre N (28-0-0 solution) at planting; 155 lbs/acre sidedress anhydrous ammonia
- Herbicide: 2.85 pts/acre Landmaster as a burndown; 1.15 qts/acre Harness, banded at planting
- Insecticide: 6.5 lbs/acre Counter CR at planting; 4 lbs/acre Dipel at cultivation for 1st generation corn borer
- Harvest Date: November 5, 1996

General Fertility	
pH	6.1
OM	2.7%
P	45 ppm
K	378 ppm
Zn	2.2 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
1996	-50	0	217	180	0	138	217	0	138
	Rec				50	154		50	154
	+150				200	161		200	161

Tom Weber, Saline County

- Location: 1 mile east, ½ mile north of Dorchester
- Soil Type: Crete silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Chiseled and one-pass tillage tool
- Planting Date: April 27, 1996
- Hybrid: Pioneer 3489
- Starter: 10 lbs/acre N and 10 lbs/acre P_2O_5 at planting
- N Application Type: 70 lbs/acre of 28-0-0, broadcast with herbicide preplant; 50 lbs/acre of 28-0-0, sidedressed at cultivation
- Herbicide: 2.3 qts/acre Harness Extra, broadcast preplant with fertilizer; 0.67 oz/acre Accent, broadcast post-applied
- Insecticide: 7.2 ozs Aztec per 1000 feet of row
- Harvest Date: October 15, 1996

General Fertility	
pH	7.0
OM	2.8%
P	25 ppm
K	346 ppm
Zn	5.4 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				70	164		70	164
1996	Rec	0	81	180	120	182	81	120	182
	+50				170	173		170	173

Larry Naber, Seward County

- Location: 1¾ miles north of Utica
- Soil Type: Fillmore silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Disked
- Planting Date: April 24, 1996
- Hybrid: Asgrow 899
- N Application Type: 110 lbs/acre preplant anhydrous ammonia; 40 lbs/acre N sidedressed at cultivation
- Herbicide: 1.6 qts/acre Harness Extra, banded May 18; 1 oz/acre Exceed, broadcast May 15
- Insecticide: 5 lbs/acre Dipel at cultivation
- Harvest Date: November 6, 1996

General Fertility	
pH	5.9
OM	2.7%
P	81 ppm
K	457 ppm
Zn	2.2 ppm

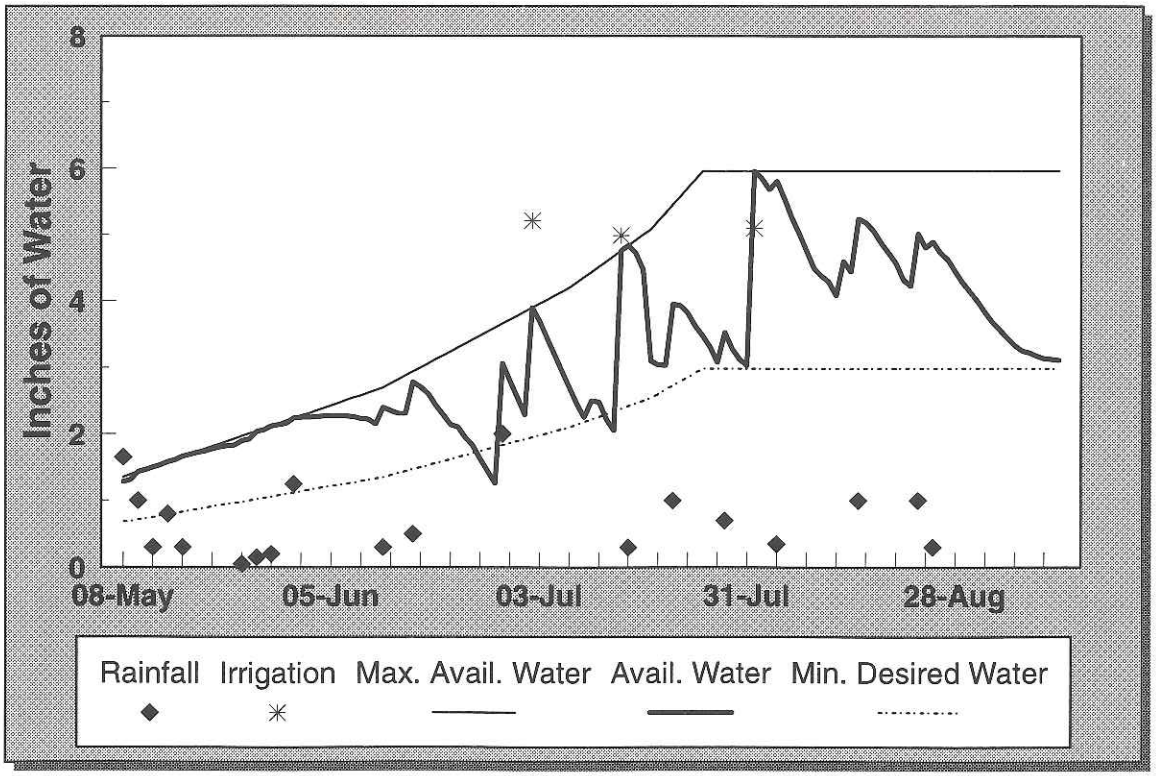
Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	2-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				100	162		80	156
1996	Rec	11	85	190	150 *	163	78	130	154
	+50				160	153		160	150

** The original recommended rate for Larry's plot was 110 pounds N per acre. Due to in-season observances, soil samples were taken before sidedress. After analysis, it was determined to apply an additional 40 pounds per acre N on the 50-minus and recommended strips, bringing total application rates up to 100 and 150 pounds per acre, respectively.*

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Leroy Voss, Thayer County

- Location: 2½ miles west of Bruning
- Soil Type: Crete silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: April 20, 1996
- Hybrid: Pioneer 3489
- Starter: Amounts varied from 0-12 gal/acre 28-0-0 and 10-34-0
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 2.2 qts/acre Surpass 100, broadcast at planting; 0.8 oz/acre Exceed, broadcast on June 10, 1996
- Insecticide: 1.5 pts/acre Penncap-m, aerially applied on July 28, 1996; repeated application August 6, 1996
- Harvest Date: October 9, 1996

General Fertility	
pH	6.3
OM	3.1%
P	32 ppm
K	385 ppm
Zn	4.5 ppm

Special project — effect of different starter programs

Nitrogen Management

Leroy Voss was interested in seeing the effect of different starter fertilizer treatments when adequate levels of nutrients were already in the soil. Leroy applied 185 pounds per acre of anhydrous ammonia preplant. Soil samples taken from the field showed that the field required no other nutrients to achieve the 170-bushel expected yield based on University of Nebraska recommendations.

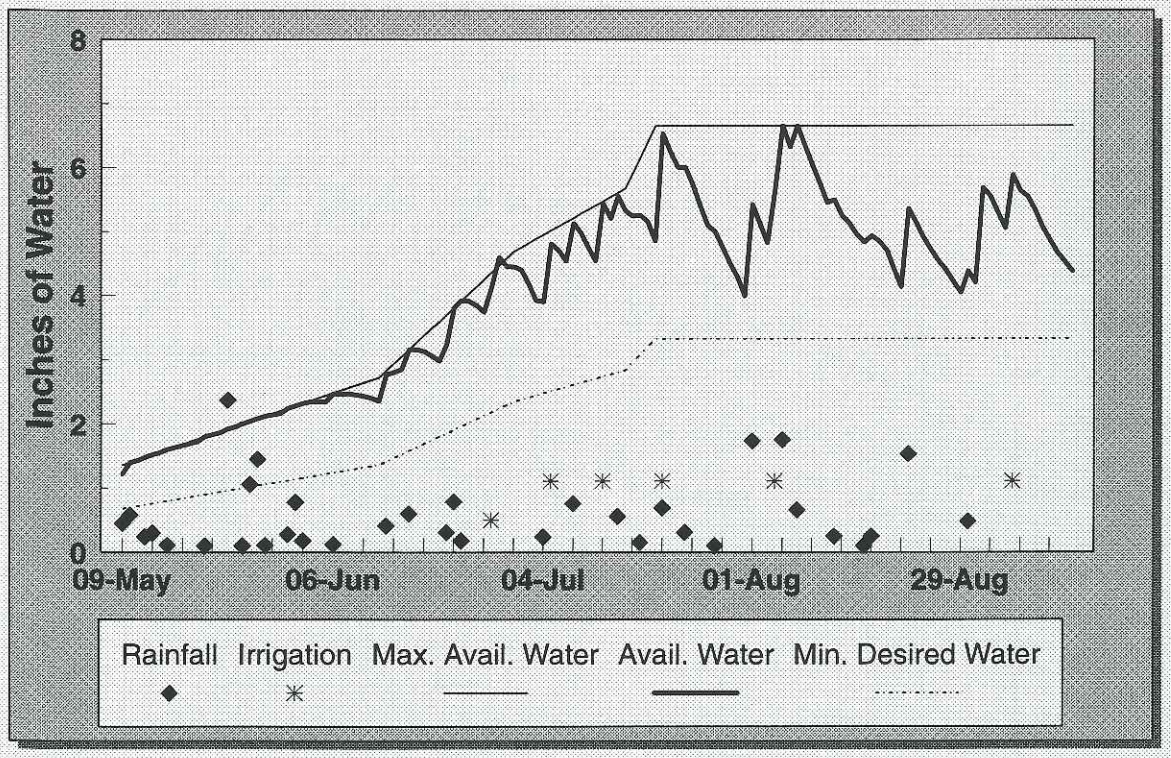
As in the first year of the trial, the demonstration consisted of four treatments, replicated three times. The treatments were 12 gallons per acre of 28-0-0, 12 gallons per acre of 10-34-0, a combination of 6 gallons per acre each of 28-0-0 and 10-34-0, and no starter fertilizer. All treatments were placed in a two-by-two band at planting. There was no significant difference in yield between treatments. The harvest results are shown in the table at the top of page 55. Leroy plans to continue with a similar plot in 1997.

Nitrogen Management

Treatment	% Moisture	Adjusted Yield (15.5%) -- bu/acre --	2-Year Average -- bu/acre --
12 gal/acre 28-0-0	17.8	165	157
12 gal/acre 10-34-0	17.9	166	158
6 gal/acre 28-0-0 6 gal/acre 10-34-0	18.3	169	163
No starter	17.9	168	159

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.

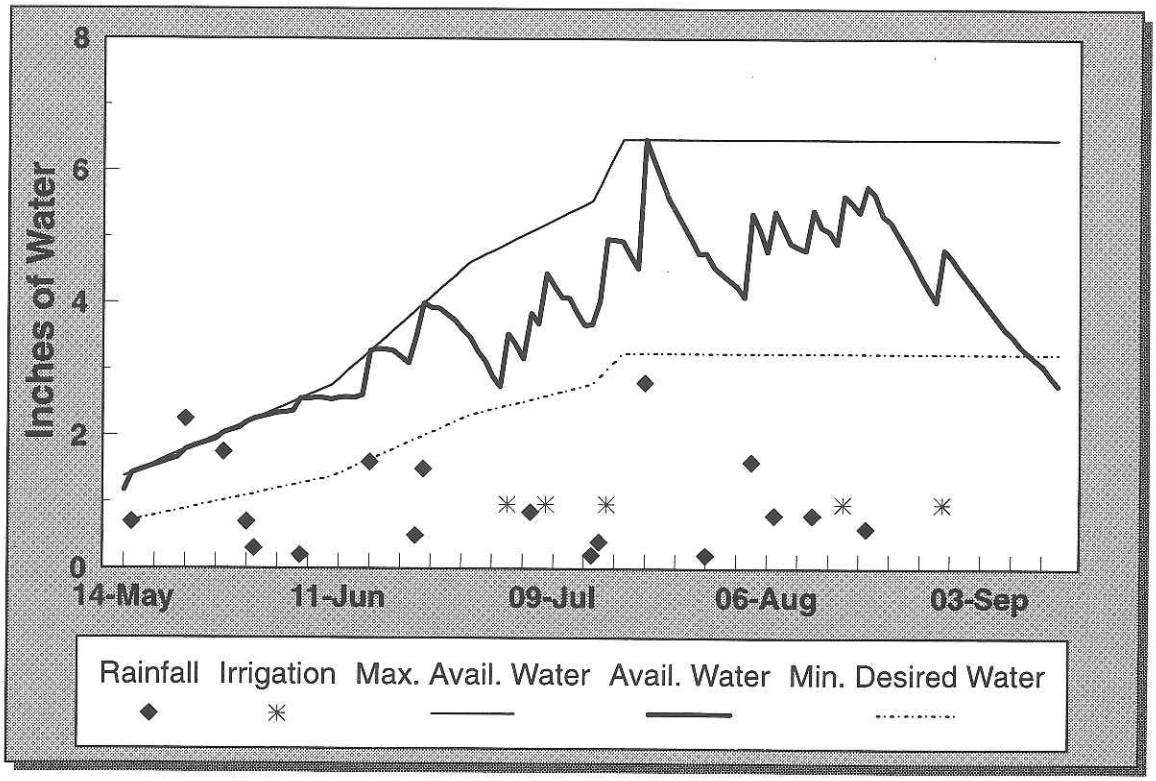


Kevin Karr, Webster County

- Location: ½ mile north of Bladen
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Rich Konen, Webster County

- Location: 1½ miles south, 2¼ miles west of Guide Rock
- Soil Type: Roxbury silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Conventional tillage
- Planting Date: May 11, 1996
- Hybrid: Keltgen 2689
- Starter: 100 lbs/acre of 11-52-0 broadcast on May 1, 1996
- N Application Type: 10 gal/acre of 28-0-0, banded at planting; remainder sidedressed on June 12, 1996
- Herbicide: 1 qt/acre Bicep, banded at planting
- Insecticide: None
- Harvest Date: November 5, 1996

General Fertility	
pH	7.8
OM	1.7%
P	21 ppm
K	486 ppm
Zn	1.1 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				55	166		55	166
1996	Rec	0	141	180	105	167	141	105	167
	+50				155	170		155	170

Brian Janzen, York County

- Location: 3 miles south, 3½ miles east of Henderson
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Rolling stalk chopper
- Planting Date: April 25, 1996
- Hybrid: Pioneer 3325
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1.1 qts/acre Bicep II, banded at planting and 1 pt/acre Atrazine at planting
- Insecticide: 5 lbs/acre Lorsban, T-banded at planting
- Harvest Date: October 28, 1996

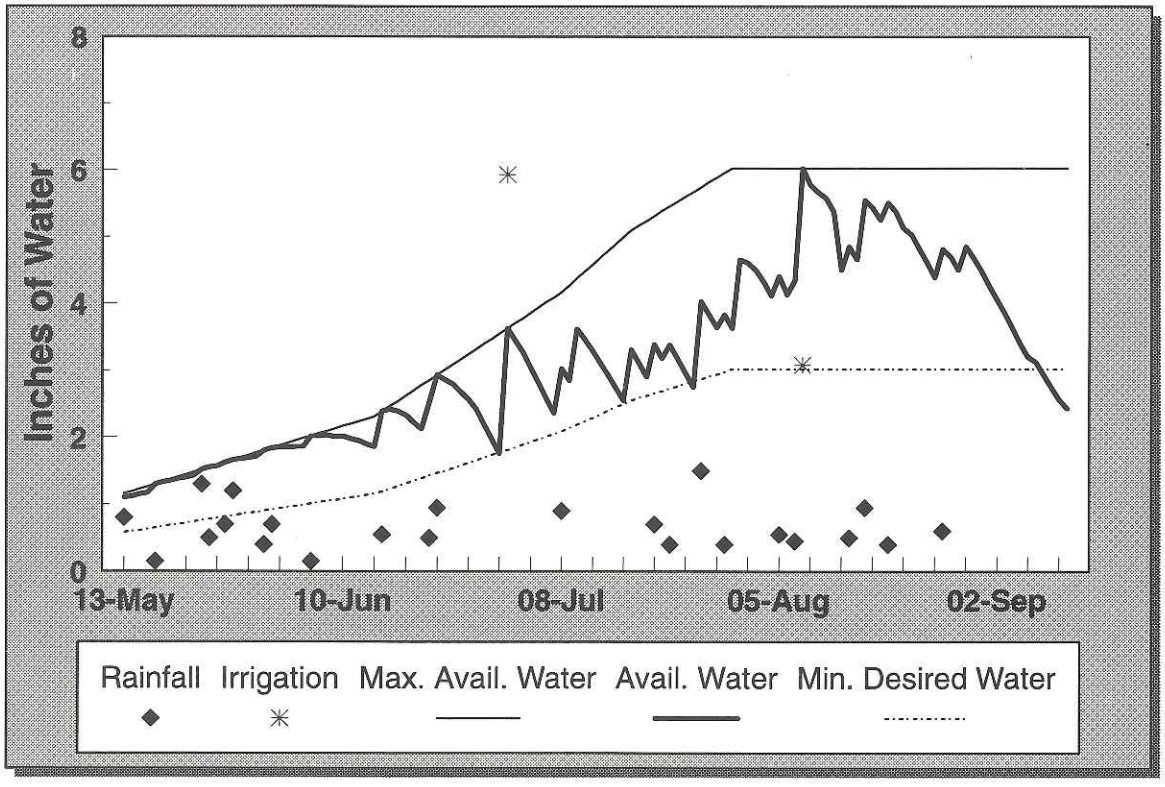
General Fertility	
pH	6.1
OM	2.9%
P	18 ppm
K	320 ppm
Zn	0.8 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	5-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				75	156	52	99	146
1996	Rec	7	55	170	125	169	55	149	152
	+50				175	175	88	199	154

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Brad Rathje, York County

- Location: 1 mile west of Waco
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks
- Planting Date: April 28, 1996
- Hybrid: Ciba Max 454
- Starter: 5 gal/acre of 10-34-0
- N Application Type: 10 gal/acre of 28-0-0 at first cultivation and 25 gal/acre of 28-0-0 at second cultivation
- Herbicide: 1 pt/acre Atrazine 4L and 1¼ pts/acre Dual, banded at planting
- Insecticide: 8¾ lbs/acre Force at planting
- Harvest Date: November 6, 1996

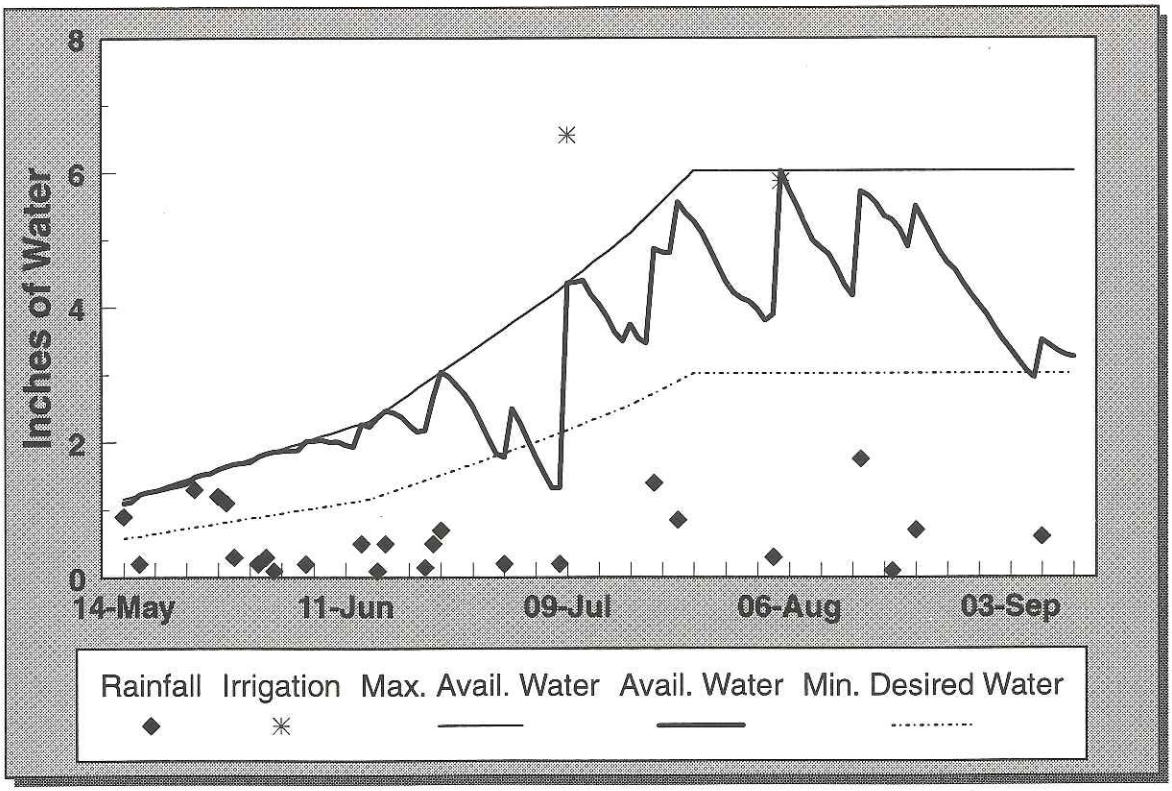
General Fertility	
pH	5.4
OM	2.9%
P	13 ppm
K	301 ppm
Zn	0.8 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	7-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				60	138	35	105	158
1996	Rec	0	108	200	110	151	63	155	161
	+50				160	151	51	205	163

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Boyd Smith, York County

- Location: 4 miles west, 1 mile south, ½ mile west of York on Highway 34
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Disked and field cultivated
- Planting Date: April 26, 1996
- Hybrid: Pioneer 3375
- Starter: 5 gal/acre of 10-34-0+0.5Zn
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 0.6 qt/acre Bicep II, banded at planting; 1 oz/acre Exceed, broadcast on June 3, 1996
- Insecticide: 5 lbs/acre Dyfonate, aerially applied on June 30, 1996
- Harvest Date: October 23, 1996

General Fertility	
pH	5.9
OM	2.6%
P	19 ppm
K	423 ppm
Zn	1.0 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	1-year average		
							Residual N	*N applied*	*Yield*
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)			
	-50				0	159		0	159
1996	Rec	0	205	200	50	179	205	50	179
	+50				100	185		100	185

Jerry Stahr, York County

- Location: 1½ miles east of York at the junction of Highway 81 and Highway 34
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Rotary stalk chopper
- Planting Date: April 28, 1996
- Hybrid: Golden Harvest 2547
- Starter: 5 gal/acre of 10-34-0
- N Application Type: Preplant anhydrous ammonia
- Herbicide: 1¼ qts/acre Bicep II, banded at planting
- Insecticide: 2 pts/acre Penncap-m, aerially applied July 31, 1996 and 1½ pts/acre Penncap-m, aerially applied August 28, 1996
- Harvest Date: October 24, 1996

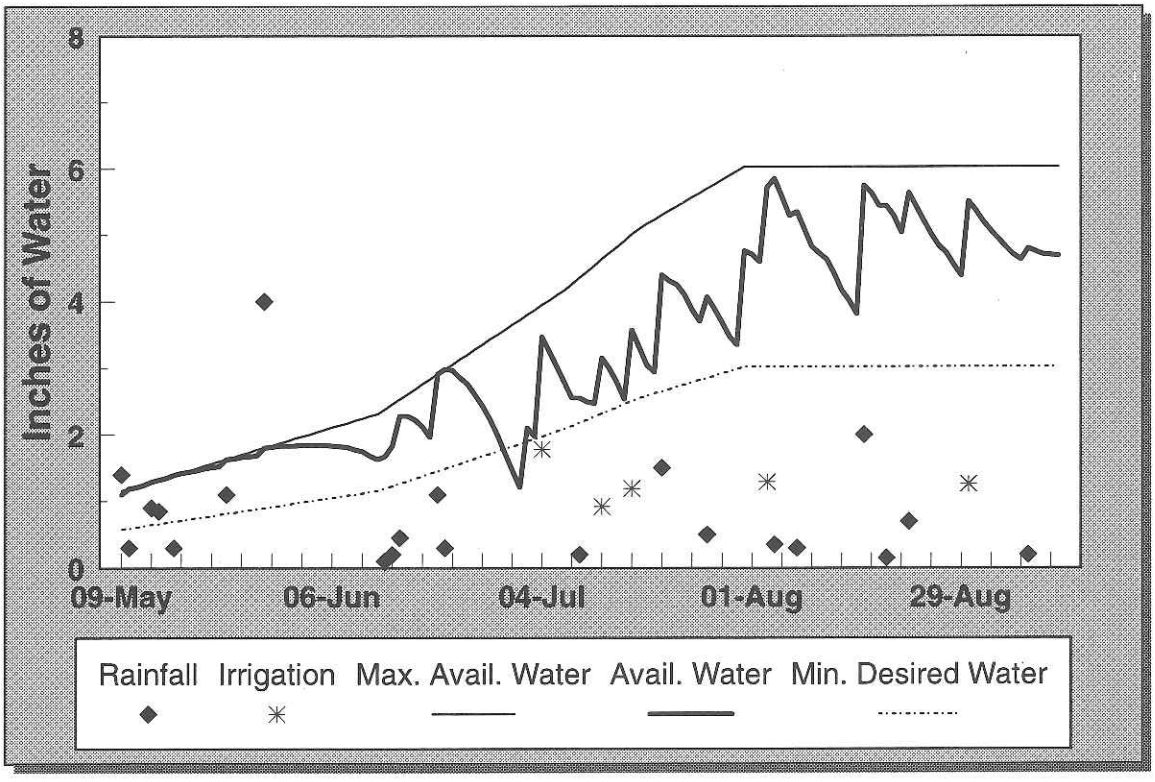
General Fertility	
pH	5.7
OM	2.8%
P	23 ppm
K	407 ppm
Zn	0.9 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	6-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				0	164	42	87	161
1996	Rec	10	156	185	55	192	74	138	172
	+50				105	203	54	188	174

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Ron Uffelman, York County

- Location: 3 miles east, 2¼ miles south of Waco
- Soil Type: Hastings silt loam with a 0-1% slope
- Preceding Crop: Corn
- Preplant Soil Prep: Shredded stalks, roto tiller at planting
- Planting Date: May 1, 1996
- Hybrid: Golden Harvest 2547
- N Application Type: Preplant anhydrous ammonia; 10 gal/acre of 32-0-0 on June 12, 1996; 9 gal/acre of 32-0-0 on June 25, 1996
- Herbicide: 3 pts/acre Lariat, banded at planting; and 0.66 oz/acre Permit, broadcast on June 5, 1996
- Insecticide: 6.5 lbs/acre Aztec at planting; 5 lbs/acre Pounce on June 25, 1996
- Harvest Date: October 18, 1996

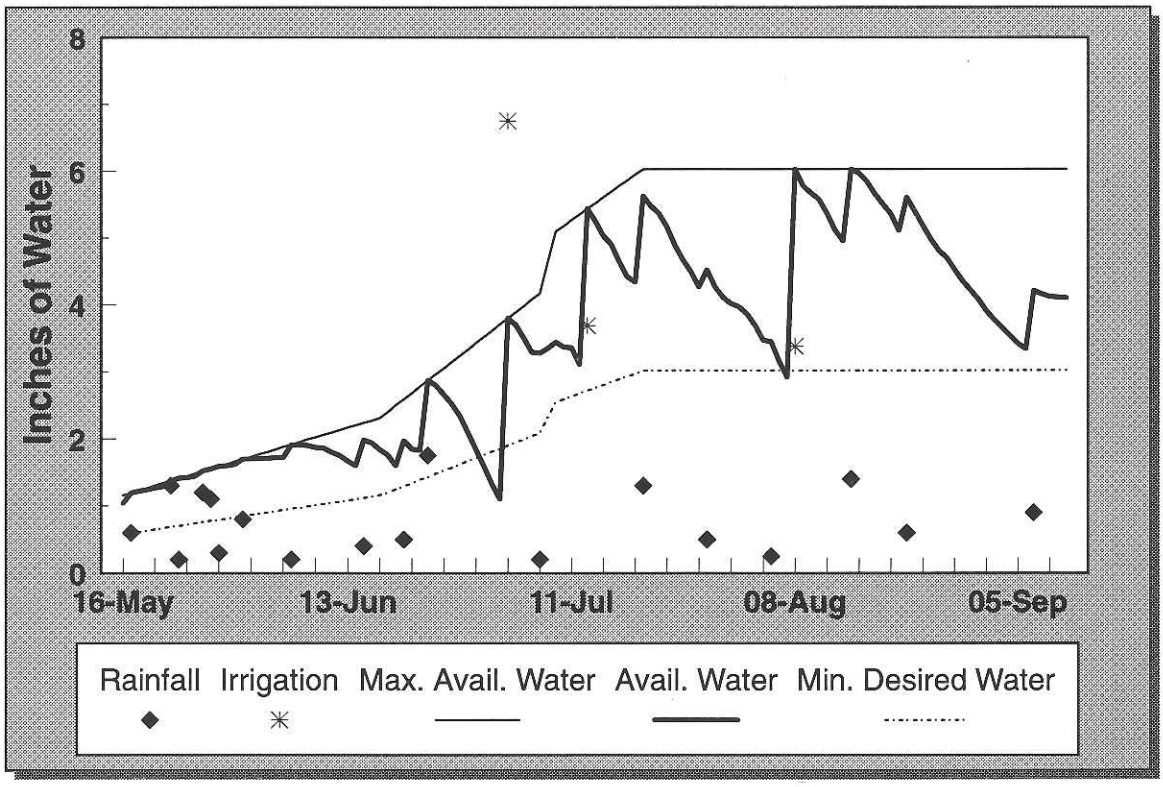
General Fertility	
pH	5.2
OM	2.6%
P	84 ppm
K	430 ppm
Zn	2.6 ppm

Nitrogen Management

Year	Treatment	Water N	Soil Residual N	Expected Yield	N applied	Yield	3-year average		
		(lb/acre)	(lb/acre)	(bu/acre)	(lb/acre)	(bu/acre)	*Residual N*	*N applied*	*Yield*
	-50				65	193		85	180
1996	Rec	0	117	200	115	204	100	90	207
	+50				165	206		140	208

Irrigation Management

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. The middle line indicates soil moisture status. When the middle line reaches the upper line, runoff and/or deep percolation has occurred.



Special project — demonstration of sticky traps for monitoring corn rootworm beetles

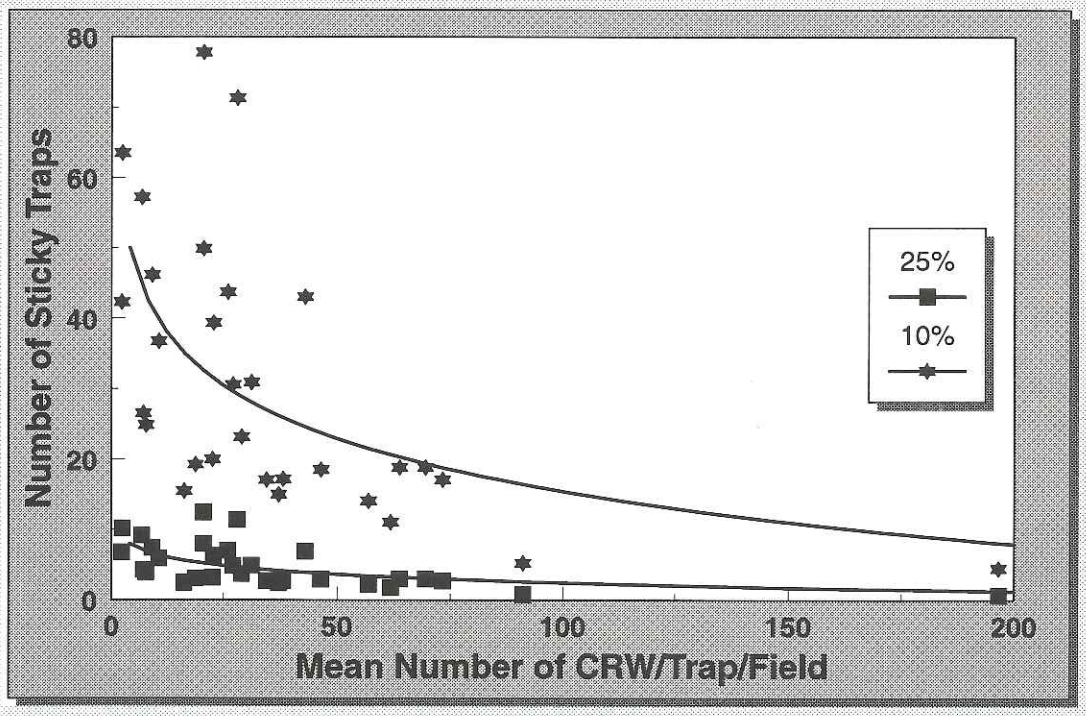
The four Natural Resources Districts involved with the Mid-Nebraska Water Quality Demonstration Project funded a study of the effective use of sticky traps for monitoring corn rootworm beetles. The study consisted of nine fields located throughout the Project area. Six of the sites were pivot-irrigated while the remaining three sites were furrow-irrigated. Field sizes ranged from about 30 to 160 acres. The following is a summary of the data collected from these sites.

Research in Iowa established that yellow sticky traps were an effective monitoring method for corn rootworm adults. Some potential advantages of sticky traps are that they monitor beetle activity over several days, and average out some of the hourly and daily fluctuation in beetle activity in the field. Also, some people lack confidence in their ability to see and count all beetles present on corn plants as they move through a field.

Iowa research suggested that 12 traps per field will estimate beetle density at the 10% precision level. Traps should be placed at ear height and monitored weekly for beetle numbers. If trap counts equal six or more beetles/day/trap, then it is likely that there will be an economic problem with rootworms if that field is planted back to corn. Control options include crop rotation or use of an insecticide at planting or cultivation time.

The studies in Iowa were done in commercial fields ranging from 10-40 acres in area. One question is whether more traps would be needed in the larger fields common in Nebraska. Nine commercial corn fields in Phelps, Hamilton, Franklin, Fillmore, Nuckolls, Polk, Seward, and Webster Counties were selected for this demonstration. Sticky traps (12 per field) were placed in each field and monitored weekly (in a few cases every two weeks) from ~mid-July to mid-August.

Data from these fields (weekly trap catches) were analyzed statistically. The average coefficient of variation (c.v.) across all sample dates and locations was 53%, compared to 35% found in Iowa studies. This suggests that there was more variability within fields compared to what was seen in Iowa. The number of traps needed to estimate beetle density at 10% and 25% precision levels based on the average c.v. varied with the beetle density level (see graph). A 10% precision level is often suggested to be adequate for research studies, while a 25% precision level is suggested to be adequate for pest management scouting. At the 25% level an average of 5 traps per field would be needed and at the 10% precision level an average of 30 traps per field would be needed.



Relationship between beetle density (trap count per week) and number of sticky traps needed to estimate mean at 10% or 25% precision level.

Who to contact in your area for more information...

Adams County

Ken Franzen, NRCS, 2727 W. 2nd, Suite 102, Hastings, NE 68901, 402/462-5412
Paul Swanson, CE, P.O. Box 30, Hastings, NE 68902, 402/461-7209
Douglas Carter, FSA, 2727 W. 2nd, Hastings, NE 68901, 402/463-6771
Greg Craig, Little Blue NRD, P.O. Box 100, Davenport, NE 68335, 402/364-2145
Cooperators:
Dan Stevens, RR 1 Box 13, Campbell, NE 68932, 402/756-5363

Butler County

Scott Willet, NRCS P.O. Box 4H, David City, NE 68632, 402/367-4877
Ed Siffring, CE, 451 5th St., David City, NE 68632, 402/367-7410
Mike Eller, FSA, P.O. Box 151, David City, NE 68632, 402/367-3074
Rod DeBuhr, Upper Big Blue NRD, 105 Lincoln Ave., York, NE 68467, 402/362-6601

Clay County

Richard Hayes, NRCS, 209 W. Fairfield, Clay Center, NE 68933, 402/762-3569
Chuck Burr, CE, Clay Center, NE 68933, 402/762-3644
David Studnicka, FSA, 100 S. Alexander, Clay Center, NE 68933, 402/762-3521
Greg Craig, Little Blue NRD, P.O. Box 100, Davenport, NE 68335, 402/364-2145
Cooperators:
Ed Barnes, RR 1 Box 1A, Clay Center, NE 68933, 402/762-4441
Darrel Springer, RR 1, Edgar, NE 68935,402/762-5162
Steve Yost, 500 Center Crest Drive, Clay Center, NE 68933, 402/762-3845

Fillmore County

Kent Norquest, NRCS, 120 S. 12th St., Rm 2, Geneva, NE 68361, 402/759-4017
Tom Dorn, CE, 972 G St., Geneva, NE 68361, 402/759-3712
Bryan Dohrman, FSA, Box 426, Geneva, NE 68361, 402/759-4463
Rod DeBuhr, Upper Big Blue NRD, 105 Lincoln Ave., York, NE 68467, 402/362-6601
Cooperators:
Blaine Richards, RR 1, Grafton, NE 68365, 402/759-4653
Pete Sole, 221 N. 1st, Geneva, NE 68361, 402/759-3901

Franklin County

E. Joe Vavricka, NRCS, 713-15th Ave., Franklin, NE 68939, 308/425-6276
Alan Corr, CE, P.O. Box 306, Franklin, NE 68939, 308/425-6277
James Shelton, FSA, Box 126, Franklin, NE 68939, 308/425-6234
Ron Wunibald, Lower Republican NRD, P.O. Box 618, Alma, NE 68920, 308/928-2182
Cooperators:
Edwin Choquette, RR 1 Box 55, Upland, NE 68981, 402/756-0164
Butch Ortgiesen, RR 1 Box 44, Wilcox, NE 68982, 308/478-5270

Gosper County

Curtis Scheele, NRCS, P.O. Box 41, Elwood, NE 68937, 308/785-2360
Gary Hall, CE, P.O. Box 146, Elwood, NE 68937, 308/785-2390
Loren Vancura, FSA, P.O. Box 137, Elwood, NE 68937, 308/785-3307
Rick Anderbery, Tri-Basin NRD, P.O. Box 528, Holdrege, NE 68949, 308/995-6688

Hamilton County

Dennis Schroeder, NRCS, 1611 10th St., Aurora, NE 68818, 402/694-3500
Andy Christiansen, CE, P.O. Box 308, Aurora, NE 68818, 402/694-6174
Kelly Grossnicklaus, FSA, Box 148, Aurora, NE 68818, 402/694-3122
Rod DeBuhr, Upper Big Blue NRD, 105 Lincoln Ave., York, NE 68467, 402/362-6601
Cooperators:
Ken Danhauer, 2106 N. Hwy 14, Marquette, NE 68854, 402/854-2528
Deon Goertzen, Rural Route, Hampton, NE 68843, 402/723-4654

Harlan County

James D. Miller, NRCS, P.O. Box 320, Alma, NE 68920, 308/928-2626
Tony Anderson, CE, Box 258, Alma, NE 68920, 308/928-2119
Lee Christenson, FSA, Box 410, Alma, NE 68920, 308/928-2172
Ron Wunibald, Lower Republican NRD, P.O. Box 618, Alma, NE 68920, 308/928-2182
Cooperators:
Al Hollertz, Rural Route 2, Box 206A, Holdrege, NE 68949, 308/567-2243

Kearney County

Buddy Steinshouer, NRCS, 640 N. Minden Ave., Minden, NE 68959, 308/832-1895
Alan Corr, CE, Box 31, Minden, NE 68959, 308/832-0645 OR 308/832-2715
Richard Booker, FSA, Box 240, Minden, NE 68959, 308/832-2280
Rick Anderbery, Tri-Basin NRD, P.O. Box 528, Holdrege, NE 68949, 308/995-6688
Cooperators:
Dean Casper, RR 3 Box 114D, Minden, NE 68959, 308/832-1653
Harold Johnson, 1156 41st Road, Minden, NE 68959, 402/756-0686
Tim Johnson, RR 1 Box 20, Upland NE 68982, 402/756-0670

Nuckolls County

Larry Waneking, NRCS, P.O. Box 307, Nelson, NE 68961, 402/225-2311
Steve Melvin, CE, Box 386, Nelson, NE 68961, 402/225-2381
Dale Kovanda, FSA, Box 367, Nelson, NE 68961, 402/225-3401
Greg Craig, Little Blue NRD, P.O. Box 100, Davenport, NE 68335, 402/364-2145
Cooperators:
Kerry Corman, RR 1 Box 114, Hardy, NE 68943, 402/279-3305
John Greer, RR 1, Edgar NE 68935, 402/224-4175

Phelps County

Buddy Steinshouer, NRCS,1609 Burlington St., Holdrege, NE 68949, 308/995-6141
Gary Hall, CE, 1308 2nd St., Holdrege, NE 68949, 308/995-4222
Kevin Pesek, FSA, Box 201, Holdrege, NE 68949, 308/995-6121
Rick Anderbery, Tri-Basin NRD, P.O. Box 528, Holdrege, NE 68949, 308/995-6688
Cooperators:
Bill Hanson, RR 3 Box 90, Holdrege, NE 68949, 308/995-8348
Bill Harris, RR 1 Box 130, Loomis, NE 68958, 308/876-2189
John Wiebe, RR 1 Box 117, Loomis, NE 68958, 308/876-2261

Polk County

Kristi Schleif, NRCS, P.O. Box 526, Osceola, NE 68651, 402/747-2461
Coleen Pallas, CE, Box 215, Osceola, NE 68651, 402/747-2321
Ilene Anderson, FSA, Box 547, Osceola, NE 68651, 402/747-2111
Rod DeBuhr, Upper Big Blue NRD, 105 Lincoln Ave., York, NE 68467, 402/362-6601
Cooperators:
Dick Eller, RR 1 Box 97A, Shelby, NE 68662, 402/527-5698

Saline County

Jerry Bucy, NRCS, PO Box 741, Wilbur, NE 68465, 402/821-2031
Randy Pryor, CE, Box 978, Wilbur, NE 68465, 402/821-2151
Wendee Wate, PO Box 686, Wilbur, NE 68465, 402/821-2251
Ron Fleeces, Lower Big Blue NRD, PO Box 826, Beatrice, NE 68310, 402/228-3402
Cooperators:
Tom Weber, RR 1, Dorchester, NE 68343, 402/576-3736

Seward County

Connie Tvrdy, NRCS, 322 South 14th St., Seward, NE 68434, 402/643-6231
Dennis Kahl, CE, 216 South 9th St., Seward, NE 68434, 402/643-2981
Bruce Thompson, FSA, Box 389, Seward, NE 68434, 402/643-4586
Rod DeBuhr, Upper Big Blue NRD, 105 Lincoln Ave., York, NE 68467, 402/362-6601
Cooperators:
Larry Naber, RR 1, Utica, NE 68456, 402/534-2198

Thayer County

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Steve Melvin, CE, Hebron, NE 68370, 402/768-7212
Michael Bantam, FSA, Box 8, Hebron, NE 68370, 402/768-6520
Greg Craig, Little Blue NRD, P.O. Box 100, Davenport, NE 68335, 402/364-2145
Cooperators:
Leroy Voss, RR 1 Box 75, Bruning, NE 68322, 402/353-3805

Webster County

Merle L. Illian, NRCS, 20 N. Webster St., Red Cloud, NE 68970, 402/746-2268
Chuck Burr, CE, 621 N. Cedar, Red Cloud, NE 68970, 402/746-3417
Robert Bohrer, FSA, Box 487, Red Cloud, NE 68970, 402/746-2204
Ron Wunibald, Lower Republican NRD, P.O. Box 618, Alma, NE 68920, 308/928-2182
Cooperators:
Kevin Karr, RR 1 Box 126, Bladen, NE 68928, 402/756-1176
Rich Konen, RR 1, Guide Rock, NE 68942, 402/257-4035

York County

Bill Gilliam, NRCS, 212 W. 6th St., York, NE 68467, 402/362-4906
Gary Zoubek, CE, RFD 4, Box 46, York, NE 68467, 402/362-5508
Maxine Knauss, FSA, Box 485, York, NE 68467, 402/362-7751
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Cooperators:
Brian Janzen, RR 1 Box 594A, Henderson, NE 68371, 402/723-4966
Brad Rathje, RR 1 Box 124A, Waco, NE 68460, 402/728-5378
Boyd Smith, 941 Woodcrest Court, York, NE 68467, 402/362-7707
Jerry Stahr, RR 2 Box 75, York, NE 68467, 402/362-2574
Ron Uffelman, RR 2 Box 175, Waco, NE 68460, 402/728-5424