the Practical Farmer

Practical Farmers of Iowa Newsletter

Vol. 4, #4
Winter 1990

ACHIEVEMENTS OF 1989, OPPORTUNITIES FOR 1990

In this special issue of *the Practical Farmer*, we review a year's worth of on-farm trials, and we look ahead to opportunities for the coming year. The results of the PFI on-farm demonstrations, now entering their fourth growing season, make a sizeable body of information on profitable, environmentally sound farming practices. Most of the results appearing in this issue were first presented in greater detail at the winter general meeting. Some of the economic estimates have been refined since then, and three-year summaries for nitrogen and weed trials have been included.

(continued)

IN THIS ISSUE

On the opportunity side, there are more chances than ever before for Iowa farmers to find and share information about sustainable agriculture. The list of meetings alone takes up two full pages. The State of Iowa is putting additional resources into conservation and water quality improvement. The REAP program, described inside, offers Iowa farmers new financial support for beneficial practices, and it also gives Iowans the chance to get involved and make decisions about the future of the land.

At the end of January, Practical Farmers of Iowa *Sustainable Projects* proposals will be selected. You need not be a PFI member to apply. If you are an Iowan with an idea about farming and the environment, and you need some money to make your idea a reality, *SUSTAINABLE PROJECTS* IS FOR YOU! The entry form appears on pages 3-4.

BLACKMER RECEIVES AWARD FOR SOIL NITRATE TEST

Dr. Alfred Blackmer, ISU professor of soil fertility is the first recipient of PFI's *Sustainable Agriculture Achievement Award*. The award was bestowed at the winter general meeting of Practical Farmers of Iowa, Dec. 11, in Ames. This special honor is the result of Blackmer's work with the late spring soil nitrate test, which allows farmers to gauge corn fertilizer needs more accurately than ever before (See PFI N trial results in this issue). In presenting the award, Richard Thompson, PFI board member, called Blackmer "a real friend of the farmer" for his work on the test.

Alfred Blackmer (right) received congratulations from Richard Thompson at the annual meeting.

REAP OFFERS OPPORTUNITIES

Have you learned this new word yet? REAP stands for "Resources Enhancement and Protection." The REAP Act was passed in the 1989 session of the Iowa General Assembly. The law promises to bring farming and conservation closer together in the state. The Iowa landscape may never be the same. PFI members have an opportunity to participate in the change: 1) through local committees; and 2) through cost-shared practices on their own farms.

A standing appropriation of $20 million per year for the next nine years has been signed into law. An additional $10 million per year of lottery funds is intended for the program. The allocation includes: conservation education (the first $350,000), state acquisition of lands and waterways (28%), county conservation boards (20%), soil and water conservation practices (20%), city parks (15%), historical projects (5%), and vegetation mgt. (3%).

Iowans have the opportunity to be involved in the decision making at three levels: county, district, and statewide. Every county now has a "Resource Enhancement Committee" composed of elected officials, leaders in business and education, and representatives of designated conservation and farm organizations. Many of the decisions about allocation of resources will be made by these committees. The

(continued on page 5)

As you can see, Practical Farmers of Iowa is not on the list. Not to worry.

SUSTAINABLE PROJECTS PROPOSAL FORM

PRACTICAL FARMERS OF IOWA

WITH SUPPORT FROM THE NORTHWEST AREA FOUNDATION, ST. PAUL, MN

Sustainable Projects is designed to allow citizens of Iowa to carry out activities that focus on agriculture and the environment. Sustainable agriculture has been described as preserving soil and water resources as well as the people involved in agriculture. What could a Sustainable Project be? Maybe you want to undertake an on-farm trial like those used by the farmer cooperators in Practical Farmers of Iowa. Maybe you would like to create a program for the local school or FFA that teaches about the relationship of farming to the environment. Perhaps you need support to have an educational booth at the county fair. Maybe you could use some funding to bring your community leaders together on a related issue. Be creative!

Proposals for up to several hundred dollars will be accepted. (PFI cooperators, for example, receive as much as $350 for an on-farm trial.) It is quite legitimate to include in the proposal payment for your own time. Large equipment purchases will not be funded; however, equipment leasing may be used in proposals to defray equipment costs.

In return for funding your Sustainable Project, we ask that you agree to share both project results and the *process* that you went through carrying out the project. That will help us to build on past experience and share the successes of the program. The "feedback," or reporting plan, is one of the criteria on which proposals will be evaluated.

Projects will be chosen by a committee consisting of PFI members and board representatives, the PFI coordinator, and representatives of ISU, including the Leopold Center for Sustainable Agriculture. Proposals for 1990 are due by Feb. 1. Committee decisions will be announced by March 1.

Please return this proposal form to: Practical Farmers of Iowa, 2104 Agronomy Hall, Iowa State University, Ames, Iowa 50011

Name _____

Address _____

Zip Code _____ Telephone _____

(OVER, PLEASE)

Please describe the problem that this project will address and why there is a need for the project.

Please describe the planned project, itself.

How will you communicate to the public about the project? What kind of reporting to Sustainable Projects do you propose?

What is the amount of money you need to carry out the proposed project? Please itemize.

(REAP, continued from p. 2)

conservation organizations are: the Audubon Society, the Iowa Sportsman Federation, Ducks Unlimited, the Sierra Club, Pheasants Forever, The Nature Conservancy, the Iowa Association of Naturalists, and the Izaak Walton League. The farm organizations are: the Farm Bureau Federation, the Iowa Farmers' Union, The Iowa Grange, the National Farmers' Organization, and the Iowa Farm Unity Coalition.

As you can see, Practical Farmers of Iowa is not on the list. Not to worry. There is language in the law for the seating of representatives from additional farm and conservation groups. To get in on the action, tell your district PFI board representative that you would like to represent PFI on your county REAP committee. Armed with official PFI approval, you may present yourself to your county committee (all meetings are open) and request to be seated as a member of a farm *or* a conservation group. It would help to have a little song and dance about what you and PFI can contribute, and you might consider some backstage politicking ahead of time.

In February and March, there will be 17 district meetings around the state (also open) to present the whole scope of the program, hear reports from the county committees, and to hear comments from the public. The district meetings will also select delegates to the first statewide REAP Congress, scheduled for this summer.

This year $1.8 million has been allocated to encourage beneficial farm practices. One quarter of this will go for establishment and maintenance of woodlands and native grasses. Applications for projects such as the planting of windbreaks and planned grazing systems may be made to local soil and water conservation districts after Jan. 31. The remaining funds, $1.3 million of the funds will go, on a cost-share basis, to farmers who wish to establish filter strips (75%), field borders (75%), waste management systems (50%), drainage well closures or plugs (75%), or who would like to put in more traditional conservation improvements like terraces, grass waterways, diversions, or water and sediment containment basins (all 50%). It is likely that a common debate in county REAP committees will be whether to fund a few expensive practices or a greater number of the cheaper ones. And what about an application for a practice that doesn't fall neatly into one of the above categories?

Several PFI members have already shown interest in the REAP program, and one cooperator is preparing a proposal for a practice demonstration. You can stay up to date with REAP by writing for the free newsletter. Contact Tammra K. Pavlicek, editor, REAP Newsletter, Wallace State Office Building, Des Moines, Iowa 50319-0034. (515)-281-8653.

MEETINGS, MEETINGS

Jan. 30 *Southwest Iowa Tillage Expo*, Shenandoah Elks Club, equipment display from 9:30, program 9:45-3:30, $7 at the door, $5 advance registration through Mills, Montgomery, Page, and Fremont County Extension offices.

Implementing Soil Conservation Plans -- Dennis Pate, assistant state soil conservationist

Farmers' Experience With Reduced Tillage -- David Dukes, Bedford, and Dale Spencer, Villisca

Ridge Tillage at the Treynor Experiment Station -- Gene Alberts, USDA/ARS, Columbia, Mo.

Corn and Soybean Management in Reduced Tillage -- Garren Benson, extension crop production specialist

Weed Control in Reduced-Till Corn and Soybeans -- Robert Hartzler, extension weed science specialist

Cooperative Projects of Iowa State University and Practical Farmers of Iowa -- Rick Exner, Extension/PFI on-farm trials coordinator.

Jan. 30-31 *Eastern Iowa Conservation Tillage Show*, Five Seasons Center, Cedar Rapids, free admission. 10:00-9:30 on the 30th, 9:00-4:30 on the 31st. PFI Vice-President Mark Mays is on the program for 10:00, the morning of the 31st. PFI will have a booth. Stop in and say hi.

Feb. 3 *Iowa Organic Growers and Buyers Association annual meeting*, Iowa Hall, at Kirkwood Community College. Outside speakers include: Dan Cooper and Daryl Frey, from the Ia. Dept. of Ag and Land Stewardship; Cyril Venner, from IOCIA; Melody Nelson, from the Minnesota OGBA; Willie Kosnopfel, president of Purity Foods; and State Representative David Osterberg. Workshops will cover organic production, certification, marketing, and an organic luncheon. Registration is $10, $15 per family of two. Lunch tickets are $10 for adults and $5 for children and must be ordered by Jan. 28. Contact Jennifer Everett, RR 2, Box 72, Winfield, IA 52659, or call Allison York, at (319)-351-0145.

Feb. 6-7 *New Developments in Cropping Systems and Livestock Management Systems*, Scheman Continuing Education Center, ISU, Ames. The program begins at 8:15 a.m. both days. Session topics include: strip intercropping rotations; sustaining wildlife; intensive rotational grazing; and sustainable swine production. The "all-star" lineup of speakers includes Nina Leopold Bradley, Charles Benbrook (who spearheaded the study that produced *Alternative Agriculture*), farmers Richard Thompson (Boone), and John Miller (Cedar Falls), Chuck Francis (UNL), John Pesek (ISU), and Dennis Keeney, director of the Leopold Center.

Several of the seven different discussion sessions also will feature farmer presenters. Discussion topics are: designing sustainable cropping systems, wildlife and cropping systems, pasture improvement, profitable and sustainable hog production, alternative weed management systems, soil testing and analysis and fertilizer recommendations, and agroforestry.

Registration is $10 per day, $15 for both days. Meals are extra. For information, contact the Leopold Center for Sustainable Agriculture, 3203 Agronomy Hall, ISU, Ames, 50011, (515)-294-3711.

Feb. 9 *Fayette Co. Conservation Tillage Club annual winter meeting*, West Union Country Club (1 mile SE of town), 10:00-3:00. Phil Hufferd, Extension Farm Mgt., will discuss the economics of conservation compliance. Vince McFadden, Extension Soil and Water Engineering, will talk about equipment for conservation tillage. Brian Lang, Extension Crop Production, will speak on residue management. In the afternoon, PFI cooperator Tom Frantzen and Extension/PFI Coordinator Rick Exner will make a presentation on Practical Farmers of Iowa work with nitrogen management and weed control. There will be a charge for lunch but no registration fee.

Feb. 12-13 *National Ridge-till Conference*, Holiday Inn Conference Center, 5202 Brady St., off I-80, in Davenport. Speakers from 12 states and Canada, including Extension, SCS, and university personnel. Workshop subjects include: the '85 Farm Bill and ridge-till; fertilizer placement; ridge-till and the new water erosion model WEPP; herbicides; low-input agriculture; and tillage and earthworms. Four PFI cooperators are on the program, and the PFI display will be there. Preregistration through Feb. 3 costs $35, spouse $20 (includes lunch both days). After that the charge is $40 and $25. Contact: P.O Box 848, Dept. NRTC, Columbus, NE, 68602-0848, (402)-564-3244.

Feb. 16, 22 *Rodale Take-Charge Workshops*, The first workshop will take place in Prairie du Chien, Wisconsin. The second is set for Madison, Minnesota. For details, contact Jim Tjepkema at (507)-256-7409.

Feb. 24 *Nebraska Sustainable Ag Society annual meeting*, New World Inn, Columbus, NE, 8:00-5:00. NSAS members $15, others $20, family members ½ price (includes lunch). Featured speakers are Marty Strange, author of *Family Farming*, and Fred Kirschenmann, author of *Switching to a Sustainable System*. Eighteen workshops on farming practices, gardening, lawn care, cooking, health, the farm bill, and agriculture in Central America. Contact NSAS, P.O. Box 736, Hartington, NE, 68739, (402)-254-2289.

Feb. 27 *LISA Informational Meeting*, 1:30-3:30, Clarke Co. Extension office, Osceola. This is a meeting to acquaint producers with concepts and practices associated with low-input sustainable agriculture. An introductory videotape will be viewed. Stan Murdock, Area Crop Production Specialist, will describe ongoing extension demonstration projects and existing sustainable agriculture programs in IPM, nitrogen management, soil testing, and other areas. Rick Exner, Extension/PFI Coordinator, will relate some experiences of PFI farmers.

Feb. 27 *Best Management Practices to Maintain Groundwater Quality*, 9:10-3:30, C.Y. Stephens Auditorium, ISU, Ames. Co-sponsored by the Cooperative Extension Service and Pioneer Hy-Bred Intl. Purposes: 1) Identify the sources of groundwater contamination and discuss practical ways to control contamination and protect groundwater; 2) Discuss the use of best management practices to maintain groundwater quality; 3) Address the public concerns about groundwater contamination and relate what is being done to improve groundwater quality; 4) Explore the 1990 Farm Bill provisions and discuss the economic and farmer obligations to maintain groundwater quality. No registration fee. Box lunch available for $5.

March 1 *Northwest Iowa Conservation Tillage Expo*, Northern Ia. Technical College, in Sheldon, 9:30-3:00. Featured speakers will be Jim Kinsella, a no-till farmer from Illinois who is associated with BASF, and Dick Thompson, PFI cooperator from Boone. Also, local farmers Marlin Oosterhuis, a ridge-tiller from O'Brien County, and Lauren Schuett, a ridge-tiller/no-tiller from Ida County will share their experiences. In addition, Stuart Melvin, extension agricultural engineering specialist, will discuss "Water Quality as Affected by Tillage," and Tim Wragar, extension soils specialist with the University of Minnesota, will give a presentation on fertilizer placement in reduced tillage systems.

March 6 *Franklin County Tillage Fair*, Franklin Co. Convention Ctr., County Fairgrounds, W. edge of Hampton. Program includes PFI cooperator Mike Reicherts, who will describe his narrow strip cropping, manure application system, and on-farm trials. Free admission, free lunch. For additional information, call Franklin Co. SCS, at 456-2157.

March 14-15 *PFI Cooperators' 1990 Planning Meeting*, Starlite Village Inn, Ames. Times to be announced. The first day, which will begin in the afternoon, is an option intended for cooperators who would like to attend training sessions on financial recordkeeping and working with the news media and for cooperators who wish to drive in the day before. Details will follow.

NOTES AND NOTICES

Landlord Seeks Tenant

Central Iowa owner seeks live-on tenant with livestock (especially cows) for crop-share lease beginning March 1, 1991. ±320 acre cropland plus about 200 aces timber pasture. Fully remodeled, insulated, older house; newer machine and grain storage buildings; newer cattle shed plus assorted older buildings.

Hope for long-term tenant not adverse to work and interested in eventual LISA operation.

Cooperator Honored

Paul Mugge, PFI cooperator from Sutherland, was recognized at the 43rd Annual Conference for Soil and Water District Commissioners of Iowa. Paul was selected as the year's outstanding commissioner from his district. Congratulations, Paul!

Minnesota Farmer Directory

The Sustainable Farming Association of Southeast Minnesota has published *The Farmer-to-Farmer Directory*, covering practices used by 78 members of the SFA. The organization of the directory should make it particularly useful. The information appears in tables organized by subject. In the "soil and water conservation" table, for example, there are columns for: contour strips, terraces, grass waterways, reduced tillage, no-till, and crop rotation. Within each of these columns are symbols to show whether a farmer has used the practice and whether that farmer is willing to share information on the topic. This should save a lot of page-flipping and encourage producers to tap each others' experience.

To obtain a copy of the directory, write: SFA, 180 East Main St., P.O. Box 53, Lewiston, Minnesota 55952.

PFI Represented at Wisconsin Conference

In November, cooperators Mark and Rita Mays, farmers near Wilton, spoke at the Tri-State Regional Rural Life Gathering held at the Dominican Education Center at Sinsinawa, Wisconsin. The event was sponsored by the Churches' Center for Land and People, a new organization headquartered at Center.

Mark was quoted by *The Country Today*, a local Wisconsin paper, as saying, "My fields have become my teacher. They must show me the input products are working, paying for themselves and not harming the environment." *The Telegraph Herald*, another local publication, quoted Rita: "If we expect to sustain ourselves from the land, we must first sustain the land."

Cooperators Report

Thank you for the information, pictures, and also the musk thistle weevils. We really appreciate your help! We received 99 points out of 100 on our experiment, which gave us an A grade. Hopefully, we won't have quite as many thistles next year in our pasture. Thanks again!

Sincerely,
Roger and Ross Oien

Ross Oien introduces musk thistle weevils to their new home.

1989 FIELD DAYS IN REVIEW

There were nine field days in August and September on PFI cooperators' farms. These were held to display the various test plots and demonstrations done by each cooperator during the season. Total attendance for the 22 farms visited was over 1,000.

Those cooperators hosting a field day were: Ted and Donna Bauer (Audubon), Ed Broders (Stockton), Hal and Georgia Bumgarner (Hampton), Dordt College (Sioux Center), Tom and Irene Frantzen (New Hampton), Bob and Diane Graaf (Palmer), Harlan and Sharon Grau (Newell), Allyn and Laura Hagensick (Hampton), Tom and Marcia Hanks (Ackworth), Todd and Linda Hartsock (Rolfe), Brian and Michele Houlihan (Harpers Ferry), Steve and Gloria Leazer (Wilton), Vic jr. and Cindy Madsen (Audubon), Mark and Rita Mays (Wilton), Paul and Karen Mugge (Sutherland), Dave and Bonnie Oien (Durant), Mike and Jamie Reicherts (New Hampton), Ron and Maria Rosmann (Harlan), Ray and Marj Stonecypher (Floyd), Dick and Sharon Thompson (Boone), Rod and Wanda Treimer (Durant), and Doyle and Lowell Wilson and their spouses Sheryl and Eunice (Primghar). At these field days cooperators explained the objectives and reasons for each trial, and visitors had an opportunity to inspect the fields. Other PFI cooperators in 1989 were: Donald and Sharon Davidson (Holland), Jerry and Jill Carlson (Cedar Falls), Greg Schmadeke (Calender), and Dick and Maryjane Svoboda (Aurora).

COOPERATIVE RESEARCH IN 1989

Practical Farmers of Iowa was fortunate this year to be involved in a number of research projects and demonstrations in cooperation with universities and industry. The replicated, randomized comparisons in these trials provide a good field laboratory for scientific study.

At the Thompson field day, cooperator Don Davidson was interviewed by Ricardo Salvador, producer of the sustainable agriculture videocourse offered by ISU Extension with funding from the Leopold Center.

PFI cooperators continued to evaluate the late spring soil nitrate test for corn that is being developed at Iowa State University by Dr. Alfred Blackmer.

Cooperators also participated with ISU researcher Antonio Mallarino in the evaluation of a late-season stalk tissue test for corn.

Dr. Richard Cruse, of Iowa State, expanded his observations on the farms of PFI cooperators who drill oats on permanent ridges and who practice narrow-strip cropping.

With support from the Leopold Center for Sustainable Agriculture, ISU botanist Dr. Tom Jurik conducted a detailed study of weed control in ridge-till with and without herbicides on four cooperators' farms.

Scientists with the USDA National Soil Tilth Lab conducted an intensive study of the long-term soil effects of management on the farm of cooperators Richard and Sharon Thompson.

Also, on the Thompson farm, University of Nebraska researcher Dr. John Doran investigated soil microbiological effects of ridge-till and conventional tillage.

ISU Extension Integrated Pest Management Coordinator Dean Grundman assisted several PFI cooperators to carry out projects in biological control of the musk thistle.

On the farm of cooperators Tom and Marcia Hanks, Pioneer Hi-Bred microbiologist Dr. Susan Brown compared a bacterial seed inoculant for phytophthera control against a conventional chemical treatment.

ON-FARM RESEARCH DESIGN

One good reason Practical Farmers of Iowa is involved with so many projects in cooperation with agricultural researchers is the experimental design used in PFI field trials. This is a very simple design, appropriate to the modest goals of the trial. However, a paper published this year, Rzewnicki, *et al.*, in the *American Journal of Alternative Agriculture*, demonstrated that the experimental precision of PFI trials compares favorably with that of experiment station trials.

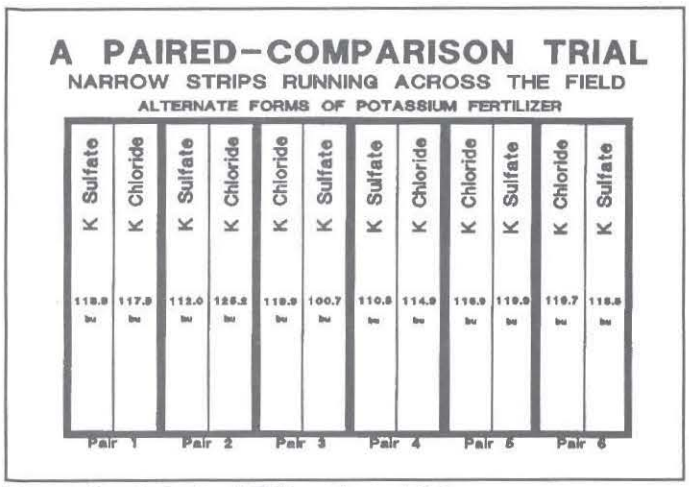


Figure 1. A typical PFI on-farm trial.

PFI demonstration plots, Figure 1, utilize narrow strips (usually eight rows) that run side by side the entire length of the field. Treatment strips are randomized and replicated six to eight times to reduce field variation to a minimum. Customarily only two treatments are used.

A comparison of field research costs and accuracy appears in the paper referred to above. In on-station research trials, four researchers conducted 19 experiments that ranged in cost from $5,700 to $16,000 per trial. On-farm research trials were conducted by six researchers who did a total of 98 experiments. Costs for these ranged from $1,900 to $3,900 per trial. On-farm validation trials done by 52 farmers in 66 experiments ranged in cost from only $500 to $900 per trial. The randomized, replicated, long narrow pairs also had exceptionally low coefficients of variation. Coefficient of variation, "C.V.," is one indication of the degree of precision or reliability of an experiment. The lower the percent, the more reliable the information. For many situations, farmer-managed on-farm trials like those of PFI are most inexpensive and appropriate.

NITROGEN EXPERIMENTS

This year sixteen side-by-side comparisons of nitrogen fertilizer rates were conducted by PFI cooperators. The results are summarized in Table 1. In each trial, the "high rate" was chosen by the cooperator to be more or less the customary rate of N fertilizer for that farm. The "low rate" was determined using the late spring soil nitrate test that is being adapted and developed at Iowa State University. Rates of nitrogen shown include estimates of available nitrogen from any livestock manure applied. These rates do not include N credits from previous crops. Two of the trials were in corn following alfalfa or set-aside, eight trials were in corn following soybeans, and six trials were in corn following corn.

With the late spring test, the farmer samples the soil to a depth of twelve inches when the corn is six to twelve inches tall. A kit allows the results to be derived right on the farm, avoiding the delay involved with sending a sample to a distant lab. The day after taking the sample, the farmer can be back in the field sidedressing the crop.

Table 1. **PFI 1989 NITROGEN RATE COMPARISONS**
16 TRIALS

LOW RATE		
YIELD	134.4	bu/acre
N RATE	69	lbs N/acre
HIGH RATE		
YIELD	136.4	bu/acre
N RATE	126	lbs N/acre
BENEFIT OF LOW RATE	$5.32	per acre
ENERGY SAVINGS (as gal. diesel)	8.2	per acre

The nitrate test proved especially useful in 1989 because of the unusually dry winter and spring and the poor weather in 1988. There was a good deal of nitrogen carryover, especially in second-year corn. The test provided a way to put numbers to this "windfall" N. Cooperator Tom Frantzen says the test saved him several thousand dollars in 1989. Some other cooperators discovered that they required fairly high amounts of nitrogen.

Using the nitrate test kit was a family project for the Svobodas, who farm near Aurora.

The low rate of nitrogen was associated with lower yields in only two trials in 1989. Both rate reductions occurred in "borderline" cases, where the minimum recommendation from the late spring soil nitrate test was somewhat above the actual rate sidedressed. In most trials, the greater financial return was from the low-N strips. Where there was no significant difference in yield, the dollar benefit of the low rate was figured to equal the difference in production costs. Where a significant yield difference was found, the low rate benefit was allowed to include the value of the crop, using a corn price of $2.20/bu.

The last figure in the table indicates the energy savings from using the reduced rates of nitrogen, expressed in equivalent gallons of diesel fuel per acre. Synthetic nitrogen fertilizer is a major energy input in corn farming. If producers across Iowa are able to reduce nitrogen rates, they will not only benefit their pocket books and the groundwater, they will also lessen the energy dependence of Iowa agriculture.

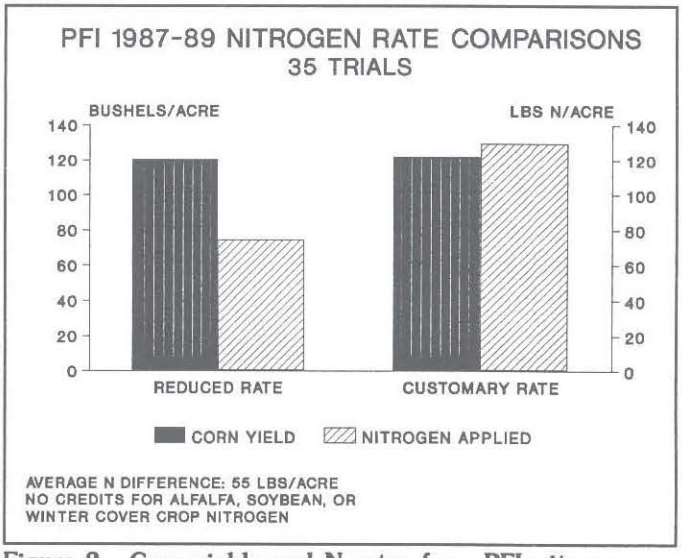


Figure 2. Crop yields and N rates from PFI nitrogen management trials over three years.

Figure 2 summarizes the results of PFI nitrogen trials over the last three years. High and low rates of nitrogen remained quite similar over the years, while yields reflected the weather.

WEED CONTROL TRIALS

There were 17 weed control trials in 1989. Of these, 16 compared herbicide control with some form of cultural/mechanical weed control. The other trial compared chemical weed control with and without a sound generator, described later. Tables 2 and 3 outline the 16 trials and gives crop yields and broadleafed weed counts for the two treatments in the soybean trials. In general, yields were similar in both practices. Cooperator Hartsock's trial was sensitive enough to detect a 0.7 bushel advantage to ridge-till-without-herbicides. Heavy rain washed the herbicide out of the surface soil in Dick Thompson's weed trial, and the resulting weeds depressed soybean yields. In Rod Treimer's trial, on the other hand, the weed pressure after conservation tillage was too great for the corn to withstand without herbicide. The tables present the averages with and without the Thompson and Treimer trials.

Table 2. **PFI 1989 WEED CONTROL TRIALS**
SOYBEANS, 11 TRIALS

LOW RATE			
	YIELD	44.3	bu/acre
	BROADLEAFED	229	count/acre
	WEEDS	211	(10 trial avg.)
HIGH RATE			
	YIELD	43.7	bu/acre
	BROADLEAFED	489	count/acre
	WEEDS	145	(10 trial avg.)
LOW RATE $ BENEFIT		$11.12	per acre

"Low Rate $ Benefit" is the dollar gain from the method using the lower rate of external input. The price of corn was set at $2.20 and soybeans were priced at $5.50. Unless there was yield significance, the benefit for each trial was calculated to reflect only the different costs of field operations, purchased inputs, and labor. A labor rate of $6.00/hour was used.

Table 3. **PFI 1989 WEED CONTROL TRIALS**
CORN, 5 TRIALS

	5 TRIAL AVG.	4 TRIAL AVG.
LOW RATE		
YIELD	134.6 bu/acre	133.4 bu/acre
HIGH RATE		
YIELD	136.6 bu/acre	132.2 bu/acre
LOW RATE		
$ BENEFIT	$0.93 /acre	$7.00 /acre

For each trial, more energy was consumed in herbicides than in any additional tillage operations. In most cases, because of the size of equipment, cooperators rotary hoed their herbicide strips the same as the low/no-chemical strips. This gave unintended weed control benefits to those chemical strips, but it also charged them unnecessarily with the cost of those field operations.

Figure 3 summarizes weed control results in corn and soybeans over the past three years.

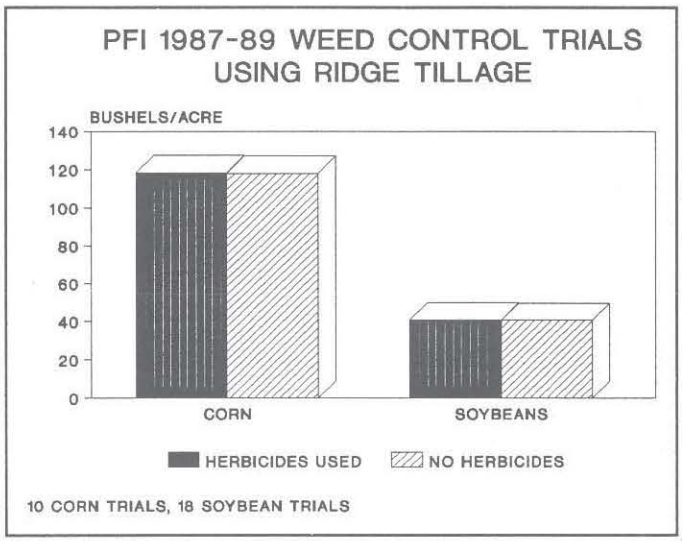


Figure 3. Yield results in the weed control demonstrations over three years.

OTHER FERTILITY DEMONSTRATIONS

In the early part of the 1989 growing season, symptoms of potassium deficiency were evident in many ridge-tillage fields in Iowa. The same phenomenon was reported by extension workers in Minnesota who examined ridge-till fields in that state. By late summer, most crops had grown out of the flamed leaf borders and irregular size that marked the fields in June. Still, there is concern that yields were affected.

Table 4. **OTHER FERTILITY TRIALS**

COOPERATOR	CROP	TREATMENT "A" DESCRIPTION	YIELD	TREATMENT "B" DESCRIPTION	YIELD	DIFFERENCE YIELD	YLD
GRAU	CORN	+20+40+60, FALL DEEP BAND	160.5	NO BAND	153.5	-7.0	*
GRAU	SOYBEAN	+0+0+40, FALL DEEP BAND	46.7	NO BAND	46.1	0.6	N.S.
THOMPSON	CORN	120 LB K_2O & 20 T MANURE	141.2	90 LB K_2O & MANURE	140.8	0.4	N.S.
FRANTZEN	CORN	+10+28+84 STARTER	146.0	+5+14+42 STARTER	145.1	0.9	N.S.
OIEN	SOYBEANS	+2+6+12 STARTER	45.9	NO STARTER	41.7	4.2	N.S.

COOPERATOR, CROP	TREATMENT "A" DESCRIPTION, CROP YIELD	TREATMENT "B" DESCRIPTION, CROP YIELD	TREATMENT "C" DESCRIPTION, CROP YIELD	SIGNIFICANT DIFFERENCES (@ 95% confid.)
DAVIDSON CORN	STARTER (+9+28+9) 146.1 BU/ACRE	STARTER PLUS (+8+24+48) DEEP-BANDED PREPLANT BETWEEN ALTERNATE ROWS 145.5 BU/ACRE	NO STARTER OR DEEP BAND 138.5 BU/ACRE	N.S. (ONLY 4 REPS)
LEAZER CORN	STARTER (+6+18+6) OF 7-21-7 125.2 BU/ACRE	STARTER (+4+8+4) OF 9-18-9 122.3 BU/ACRE	NO STARTER FERTILIZER 129.3 BU/ACRE	* A&C, B&C
MAYS CORN	(+0+0+44) AS KCL DEEP BANDED PREPLANT 6-8" OFF ROW, PLUS STARTER (+6+14+5+2) 94.4 BU/ACRE	(0+0+88) AS KCL DEEP BANDED PREPLANT 6-8" OFF ROW, PLUS STARTER (+6+14+5+2) 94.5 BU/ACRE	ONLY STARTER (+6+14+5+2) (ALL STRIPS RECEIVED N SIDEDRESS) 97.6 BU/ACRE	N.S.

Why does this problem occur, and what can be done about it? Soil scientists around the midwest have offered several partial explanations to the first question. The problem appears to be worse in dry years and in reduced tillage systems. In reduced tillage, potassium leaching from the residue of the previous crop remains close to the soil surface instead of being stirred back into the tilled layer of soil. The same is true for broadcast applications of potassium. In dry conditions, crop roots do not grow well in this surface soil, and potassium ions are also less able to diffuse through the soil to the roots.

Some researchers around the midwest have seen evidence that crops in reduced tillage respond more strongly to band applications of potassium than they do to broadcast treatments. This is corroborated by PFI cooperator Richard Thompson, who ridge-tills. If the goal is to place the nutrient where the plant can get it, then where, exactly, is that? The answers may depend on a number of factors, including the weather. Several cooperators have turned their attention to the problem.

In 1989, a number of cooperators compared rates or placement locations for P and K fertilizers. The trial results appear in Table 4. In one of eight trials there was a significant yield increase from the added fertilizer, and in one there was a decrease. Additional on-farm trials in succeeding years will be needed to refine these practices.

MANURE TRIALS

Three cooperators carried out field trials that directly involved livestock manure. These are shown in Table 5. The table gives the nitrogen applied as estimates of N available in the year of application. An exception is the comparison of manure and compost, conducted by Ron Rosmann, for which total N content of these two materials is estimated. The table also shows leaf nitrogen content (as percent) and crop yield for the two treatments in each trial. "Manure Only $ Benefit" is the financial advantage associated with the manure treatment. The ( ) means that this return was negative, so the manure treatment had a lower return than the alternative. Positive numbers here indicate that the "manure only" treatment made more money than the "additional input" system.

Table 5. **TRIALS USING MANURE**

COOPERATOR	MANURE ONLY				ADDITIONAL INPUT		ADDITIONAL INPUT			YLD.	MANURE ONLY
	PREVIOUS	N RATE	LEAF N	YIELD	BASE N RATE	INPUT TYPE	ADDED N	LEAF N	YIELD	SIG.	$ BENEFIT
DORDT	ALFALFA	42	3.02	134.3	42	STABILIZER	0	3.09	132.3	N.S.	$15.00
ROSMANN	SOYBEANS	§ 15	3.41	141.2	0	COMPOST	§ 16	3.44	133.8	*	$34.20
SVOBODA	SOYBEANS	31	2.28	122.0	0	32% N	60	2.40	133.8	*	($20.92)

§ Total N content of applied material. Other figures are estimates of available N.

The Dordt College Ag Stewardship Center injected dairy manure with and without DCD, a material which stabilizes the nitrogen. Corn yields were good both with the treated manure and the untreated, and leaf nitrogen was uniformly in the range that would be considered adequate. If additional N was made available by the treatment, it may have been unneeded by the crop.

Ron Rosmann grew corn with manure and with compost containing a similar amount of total nitrogen, in the third year of a comparison between those two amendments. In 1989, compost-treated corn yielded significantly less than the manured corn. Leaf nitrogen would appear to have been adequate in both treatments.

Dick Svoboda compared manure and UAN in 1989. The total nitrogen applied in the two treatments was similar, but only a fraction of the nitrogen in the manure was available to the crop. The corn that received the manure yielded significantly less than the corn that was fertilized with synthetic N. Judging from the leaf tissue results, nitrogen may have been limiting in both treatments. Under those conditions, the UAN would have fed the crop in a more timely fashion than the manure.

TILLAGE TRIALS

Three cooperators compared different tillage systems in 1989. Each trial involved ridge tillage in some way. Table 6 shows the data. Todd Hartsock found similar yields in ridge-till and conventional corn. Ron Rosmann obtained significantly higher soybean yields in ridge-till, but stalk chopping and a preplant cultivation pass reduced the relative profitability of the ridge-till crop. Dick Thompson grew corn following meadow in strips that were moldboard plowed in the spring and in strips that had been disked and ridged the previous fall. The spring-plowed strips outyielded the others by a significant margin.

An interesting component of the Rosmann tillage comparison is the effect of the treatments on weeds. The study results are consistent with research which shows that where herbicides are not used, the potential for most weeds is higher in conventional tillage than in ridge-till. The bar graph in Figure 4 compares per-acre rates of different broadleafed weeds in the two systems for the last two years. Ridge-till was effective in controlling late-germinating plants like velvetleaf and pigweed. Ridge-till's problem weeds are the early ones, such as lambsquarter, which are already established by planting time.

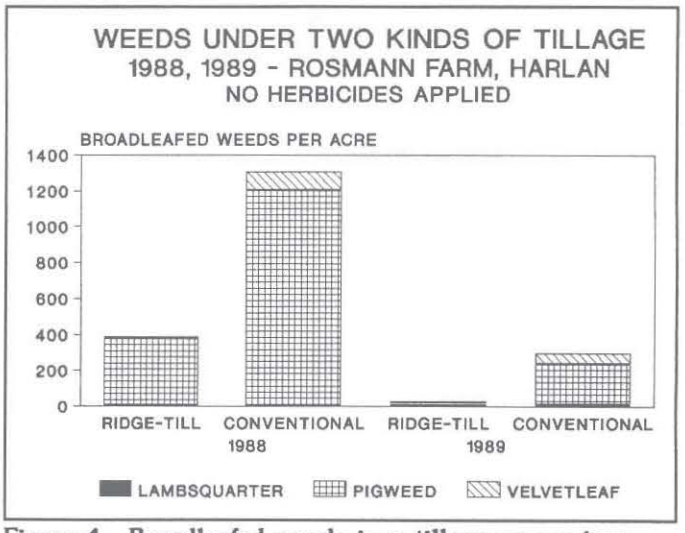


Figure 4. Broadleafed weeds in a tillage comparison without herbicide.

Table 6. **TILLAGE COMPARISONS**

COOPERATOR	CROP	PREVIOUS	RIDGE-TILL YIELD (bu)	CONVENTIONAL YIELD (bu)	YLD. SIG.	RIDGE-TILL $ BENEFIT	GAL DIESEL EQUIVALENT
HARTSOCK	CORN	SOYBEANS	88.2	87.2	N.S.	$7.90	2.0
ROSMANN	SOYBEANS	CORN	45.3	42.9	*	$8.80	0.2
			FALL RIDGES	SPRING PLOW			
THOMPSON	CORN	MEADOW	111.4	115.1	*	($5.96)	0.7

COVER CROP TRIALS

There has been continuing interest among farmers in the use of winter cover crops to protect and improve the soil. PFI cooperators have built an overseeding rig from a used high clearance tractor in order to sow cover crops cheaply. Another important cost cutting measure is the production of cover crop seed right on the farm.

The last several years have seen dry winters and springs. These conditions are hard on cover crops, and they can cause the cover to deplete the scarce soil moisture. In such years it is important to completely eliminate the cover crop at planting time, if not before. This can be done with a ridge-till planter itself, but the shoulder of the ridge is difficult to clear mechanically using available equipment. Several cooperators reported yield losses from cover crops in 1989. Other fields that looked bad early in the year gradually improved. Because of their longer season, soybeans may be better able to follow cover crops than is corn. This year's experience reacquainted several PFI cooperators with the great competitiveness of rye! Table 7 gives data for the cover crop trials.

OTHER PFI TRIALS

There were several trials in 1989 that really belong in categories by themselves. Three of these are reported in Table 8.

Table 7. **COVER CROP TRIALS**

COOPERATOR	TREATMENT A COVER CROP	TREATMENT A CROP YIELD	TREATMENT B COVER CROP	TREATMENT B CROP YIELD	DIFFERENCE SEED COST	DIFFERENCE YIELD (bu)	YLD
(CORN)							
FRANTZEN	VETCH	140.3	RYE	137.6	$10.00	2.7	N.S.
HAGENSICK	OATS, VETCH	137.9	NO COVER	137.4	$9.00	0.5	N.S.
HAGENSICK	RYE, SPRING SEEDED	106.8	NO COVER	116.5	$12.00	-9.7	*
THOMPSON	RYE, OATS, VETCH	143.7	NO COVER	155.7	$15.75	-12.0	*
(SOYBEANS)							
HAGENSICK	RYE, SPRING SEEDED	28.5	NO COVER	39.65	$12.00	-11.1	*
THOMPSON	RYE, OATS, VETCH	47.7	NO COVER	48.9	$15.75	-1.2	N.S.

Table 8. **OTHER TRIALS**

COOPERATOR		TREATMENT "A"		TREATMENT "B"		DIFFERENCE	
	CROP	DESCRIPTION	YIELD	DESCRIPTION	YIELD	YIELD	YLD
LEAZER	CORN AFTER BEANS	BANDED COUNTER	148.5	NO BAND	146.5	2.0	N.S.
CARLSON	CORN	MOLASSES W. N SIDEDRESS	123.0	N SIDEDRESS ONLY	132.2	-9.2	*
CARLSON	% GRASS CONTROL	POAST W. SONIC BLOOM	65.6 %	POAST ONLY	45.3 %	20.3 %	*
FRANTZEN	OATS (BUSHELS)	DRILLED ON RIDGES	108.8	DRILLED ON FLAT	111.2	-2.5	N.S.
FRANTZEN	OATS (BALES)	DRILLED ON RIDGES	44.7	DRILLED ON FLAT	51.5	-6.8	*

Corn Insecticide

Steve Leazer has been told by his neighbors that rootworm insecticides are advisable even in first-year corn if it has been heavily manured. In 1989 he put this story to the test, and for the second year in a row there was no detectable difference in yields.

Molasses and Nitrogen

Jerry Carlson used molasses with his sidedressed nitrogen. Compared to corn that received plain nitrogen only, yields were significantly lower in the molasses treatment.

Sound and Herbicide

Cooperator Carlson also wanted to test a commercially marketed high frequency sound generator in conjunction with the grass herbicide Poast™. The sound is said to increase uptake of foliar sprays. Carlson feared any effect of the sound would carry over into adjacent strips. With the on-farm trials coordinator, a procedure was developed that could give a reasonable test of the method. The "sound" strips were to be sprayed one day and the non-sound strips the next. Numerical grass control ratings by four people were averaged to score the two treatments. By this measure, weed control was significantly better in the treatment that used sound with Poast.

It was recognized that any treatment differences could be confused with differences caused by spraying on different days. However, this method was the best one that could be devised given the resources. If the trial is repeated, strips will be placed in two fields. One field will receive the sound on day #1 and the non-sound on day #2, while the order in the other field will be reversed.

Oats on Ridges

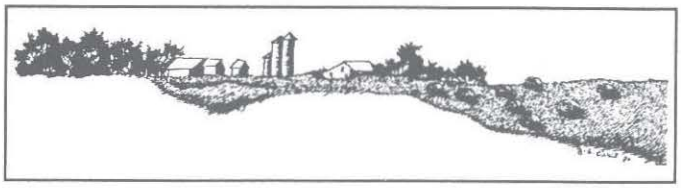
Cooperators Tom and Irene Frantzen grew oats on permanent ridges side-by-side with oats that had been seeded on tilled soil. With funding from the LISA program, Rick Cruse, ISU professor of soil management helped out with some of the measurements on the Frantzen farm and on the farm of Dick and Sharon Thompson, where oats were also grown on ridges. The Frantzen results show that an excellent oat crop can be grown on ridges. These results also illustrate that the typical hay rake is less effective on ridges than it is on flat ground.

One trick to growing small grains on ridges is to vary the tension on the disk openers of the drill according to position on the ridge. Tom also precultivated the valleys to warm them up and incorporate some trash before seeding. On the Thompson farm (data not shown), there was no precultivation. Yields varied from about 42 bushels per acre in the valleys to approximately 189 bushels per acre on the ridge tops, for an overall yield near 120 bushels per acre.

Narrow Strip Cropping

The Frantzen oats trial was part of a larger study on narrow strip cropping. Tom planted 12-foot-wide strips of corn, soybeans, and oats/red clover (see cover photo). The strips provide good erosion control, but Frantzen and Cruse feel they also may offer some yield advantage due to positive effects at the borders between crops. This year there were higher yields (20-40 bu/acre) in corn rows on the south and southeast sides of strips where there was a bordering crop of beans. At the same time, soybeans lost 8-9 bushels/acre in rows next to either corn or oats.

It will take a number of years to work out the interactions among crops, crop locations, and row positions. Moreover, the results will likely vary with the weather. Last year, for example, corn in the row next to oats was rolled from moisture stress in early July. In other years this moisture competition might be less important than the benefit to corn of having the neighboring oats removed in midsummer. The LISA study will continue in 1990.



Weed Population Dynamics in Ridge-tilled Soybeans With and Without Herbicides.

Thomas W. Jurik, Department of Botany, ISU

Editor's note: The Leopold Center for Sustainable Agriculture funded this study, which Dr. Jurik developed in cooperation with PFI. The results are the best-yet documentation of an important method of weed control.

The effect of herbicide on weed populations and soybean yield was tested on three north-central Iowa farms in 1989 (cooperators Graaf, Grau, and Hartsock). On a fourth farm (cooperator Thompson's), heavy rains the day after planting led to extensive washing, and the trial was converted into a test of four rotary hoeings ("4RH") versus one rotary hoeing ("1RH") on the plots that originally had herbicide applied. On all farms, herbicide was banded in the row, at planting in mid-May, in a ridge-tillage system. Corn had been grown the previous year in all plots.

Soybean cultivars, herbicides used, and cultural data are shown in Table 9. Row widths and seeding rates varied among farms. There was little difference in soybean density in July on the Graaf and Grau farms, but the Hartsock plots without herbicide and the Thompson 4RH plots had somewhat fewer plants than their respective comparison treatments. Rainfall was lower on the Grau and Hartsock farms than on the Thompson farm. On all farms, weed seedling emergence was highest in late May, with little seed germination occurring after mid-June (data not shown).

Harlan Grau at the field day.

Herbicide trials: Rotary hoeing and cultivation in May and June were effective in reducing weed numbers in all plots (Table 10); mean densities of broadleaf weeds in mid-July were reduced to less than 0.3% of the maximum observed early in the season on the Graaf and Hartsock farms. The Grau farm had fewer broadleaf weeds initially, but numbers in July were similar to those on the other farms. On the three farms, plots without herbicide averaged 33-65% more weeds than plots with herbicide, although the difference was not statistically significant on the Graaf farm. There were no statistically significant differences in soybean yield (Table 10) for plots with or without herbicide on the Graaf and Grau farms, but there was a statistically significant increase in yield for plots without herbicide on the Hartsock farm.

Rotary hoeing trial: Mean density of broadleaf weeds in May-June was far higher in the 1RH plots than in the 4RH plots on the Thompson farm (Table 10). Two cultivations greatly reduced weed populations, but the 1RH plots still had 10 times as many weeds as the 4RH plots in late July (Table 10). Soybean yield was significantly higher in the 4RH plots than in the 1RH plots (Table 10).

Conclusions: Herbicide banded in the row at planting reduced final broadleaf weed numbers slightly, but weed densities in plots without herbicide were also low. Over the three farms together, herbicide had no consistent effect on yield. The ridge-till system thus appears to do an excellent job of controlling weeds and has no adverse effects on yield. The effectiveness of rotary hoeing in the ridge-till system in reducing weed numbers is emphasized by the results for the Thompson trial; plots with four rotary hoeings had weed numbers similar to those on the other farms, whereas plots without rotary hoeing had ten times more weeds.

Table 9. **Cultural Conditions in 1989**

Farm	Graaf	Grau	Hartsock	Thompson
Cultivar	Pioneer 1981	Hill 2275	Soi 226	Merschman Sauk II
Herbicide	Amiben	Dual+Lexone	Dual	Amiben
Mean row width	30.7"	39.3"	36"	35.4"
Seeding rate (#/acre)	205,000	153,000	160,000	180,000
July plant density (#/acre)				
with herbicide	107,000	115,000	133,000	
without herbicide	106,000	116,000	120,000	
1 rotary hoeing				156,000
4 rotary hoeings				141,000
May-August rainfall	'below normal'	9.3"	6.9"	12.1"

Table 10. **Weed Populations and Soybean Yield in 1989**

Asterisks Indicate statistically significant differences (paired t-test, $p<0.05$) between treatments within a farm.

Farm	Graaf	Grau	Hartsock	Thompson
Maximum number of broadleaf weeds observed In May-June (#/acre)				
with herbicide	41,000	14,000	89,000	
without herbicide	35,000	12,000	89,000	
1 rotary hoeing				251,000 *
4 rotary hoeings				53,000
Broadleaf weeds In late July (#/acre)				
with herbicide	113	293 *	223 *	
without herbicide	172	351	334	
1 rotary hoeing				3,580 *
4 rotary hoeings				386
Soybean yield (bu/acre)				
with herbicide	32.7	45.1	35.5 *	
without herbicide	34.4	44.3	36.2	
1 rotary hoeing				46.7 *
4 rotary hoeings				53.4

CORRESPONDENCE

Correspondence to the PFI directors' addresses is always welcome. Member contributions to *the Practical Farmer* are also welcome and will be reviewed by the PFI board of directors.

District 1 (Northwest): Bob Graaf, RR 1, Palmer, 50571. (712)-359-7787.

District 2 (North Central): Dick Thompson, RR 2, Box 132, Boone, 50036. (515)-432-1560.

Associate board member for District 2: Allyn Hagensick, RR 4, Box 57, Hampton, 50441. (515)-456-2945.

District 3 (Northeast): Tom Frantzen, RR 2, New Hampton, 50659. (515)-364-6426.

District 4 (Southwest): Ron Rosmann, RR 1, Box 177, Harlan, 51537. (712)-627-4653.

District 5 (Southeast): Mark Mays, RR 2, Box 45, Wilton, 52778. (319)-732-2040.

Coordinator: Rick Exner, Room 2104, Agronomy Hall, ISU, Ames, Iowa, 50011. (515)-294-1923.

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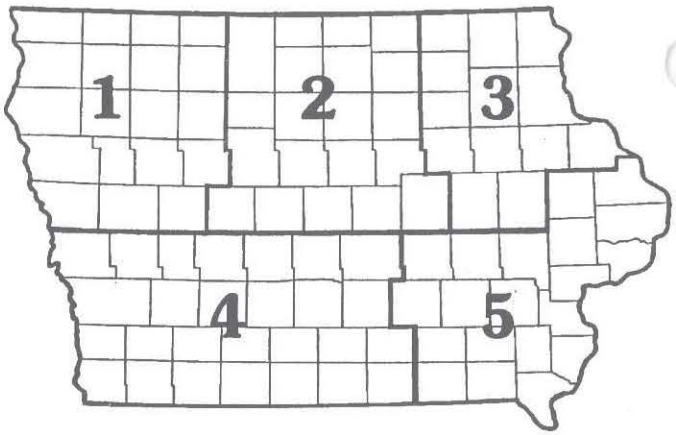

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Practical Farmers of Iowa
Rt. 2, Box 132, Boone, Iowa 50036

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