

the Practical Farmer

Practical Farmers of Iowa Newsletter

Vol. 5, #1
Spring 1990

PFI COOPERATORS PLAN TRIALS AND FARM FIELD DAYS

On March 14 and 15, the on-farm cooperators met in Ames to plan for the 1990 season. Besides making decisions on trials and field days, they absorbed a lot of information and talked about how best to use it in their work.

The meeting was expanded to a day-and-a-half this year, in order to cover all the necessary subject matter. The stay-over at the Starlite Motel gave cooperators a rare opportunity to socialize together. An especially valuable aspect of the two-day event was that the majority of cooperators were represented by *both* spouses.

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Cooperators met in March to plan on-farm trials and field days.



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The meeting began with introductions. PFI has three new cooperators this year: Jason Klinge, of Farmersburg; Jeff and Gayle Olson, of Winfield; and John and Pam Cowles, of Bloomfield. David and Bonnie Owen, of Wilton, graciously agreed to step down as cooperators this year in order to allow the southeast district better geographical distribution of cooperators.

One of the highlights of the meeting was Maria Rosmann's workshop on using the news media. Maria, who has a background in journalism, presented practical instructions for working with local newspapers and broadcasters to publicize field days. She directs PFI news releases and makes some of the initial contacts with the media. Individual cooperators are then in the best position to follow up on those contacts and to suggest others to Maria.

One important emphasis of the meeting was documenting the economics of farming practices and farming systems. John Creswell, extension crop production specialist, described the Crop Enterprise Record system that he and other extension personnel are using around the state. Board member Dick Thompson and coordinator Rick Exner explained methods of record keeping based on the extension bulletin *Estimated Costs of Crop Production*.

Exner also led a session on "analyzing your own trial." With a little training and a pocket calculator, anyone can actually perform the statistical "t-test" on replicated trials done on the farm. A new workbook published by Rodale Press makes this even easier.

One of the most anticipated talks at the meeting was by ISU agronomist Fred Blackmer. PFI cooperators were among the first farmers to use the late spring soil nitrate test, which Blackmer is adapting for Iowa use. That test is now growing in popularity. This year, PFI cooperators will work with Blackmer on an experimental *early* spring soil nitrate test. The early test will be explained at a number of PFI field days this summer.

There were additional sessions at the meeting, as well. Tom Jurik (ISU Botany Dept.) reviewed his weed management study, which has been approved for a second year of funding by the Leopold Center. Antonio Mallarino, a postdoctoral research associate with Blackmer, described his plans for P and K plots on cooperators' farms this year. Dave Hovde, of the Acu-Grain Company, conducted a trouble-shooting session for the combine monitor used by many cooperators to measure yields.

Last item on the agenda was scheduling of field days. There will be 13 regular PFI field days in August and September. These will involve several new cooperators as well as others who have not previously held a field day. A number of field days will take place in cooperation with other organizations or local businesses. Details will appear in the summer newsletter and a field day brochure. Below are the dates, names and places.

- Aug. 2 Grau, Newell
 Graaf, Palmer
 Hartsock, Rolfe
- Aug. 8 Hagensick, Hampton
 Bumgarner, Hampton
- Aug. 9 Rosmann, Harlan
- Aug. 15 Stonecypher, Floyd
 Reichert, New Hampton
 Frantzen, New Hampton
- Aug. 16 Houlihan, Harpers Ferry
 Klinge, Farmersburg
- Aug. 18 Davidson, Holland
 Carlson, Cedar Falls
 Svoboda, Aurora
- Aug. 27 Cowles, Pulaski (cooperating with SCS)

- Aug. 28 Broders, Stockton
Leazer, Wilton
Treimer, Durant
Mays, Wilton
- Aug. 29 Madsen, Audubon
Bauer, Audubon
- Aug. 31 Mugge, Sutherland
Wilson, Primghar
Dordt College, Sioux Center
- Sept. 4 Olson, Winfield
(cooperating with Henry Co. Extension)
- Sept. 6-7 Thompson, Boone
- Sept. 12 Hanks, Ackworth

ENVIRONMENTAL ACHIEVEMENT AWARD TO THOMPSONS

Richard and Sharon Thompson are among two dozen recipients of the *National Environmental Achievement Award* for 1990. Renew America, the organization bestowing the awards, describes itself as a non-profit organization "working toward a sustainable future by promoting a safe and healthy environment." Other programs selected for the award include: surface water protection projects, a municipal recycling program in New Jersey, alternative energy efforts, acid rain monitoring, a citizens' group opposed to stripmining in sensitive areas of Tennessee, a land use planning program in the state of Oregon, forest management, range conservation, environmental education, and Maine's truth-in-produce-labeling laws.

Richard and Sharon received the award in Washington, D.C., at a luncheon of the National Press Club that coincided with *Earth Day 1990* activities. The day before that, representatives of the winning projects attended a White House reception along with participants in the Bush administration's international conference on the environment. When he shook the president's hand, Richard Thompson reportedly took

the opportunity to present George Bush with a card containing Sharon Thompson's recipe for "Iowa ham and broccoli soup."



SUSTAINABLE PROJECTS RECIPIENTS ANNOUNCED

Winners of 1990 PFI *Sustainable Projects* grants were announced in a press release this April. Seven of 11 proposals submitted were funded for activities relating to the connection between agriculture and the environment. Grants this year totaled \$2,245. The project is supported through a three-year study of sustainable agriculture in Iowa that is funded by the Northwest Area Foundation.

A wide variety of projects were selected for funding this year. They represent initiatives in both row cropping and horticulture, by both rural people and city folks. A major goal of the program is to encourage grassroots efforts like these around the state. Selected projects are the following:

City of Fort Madison - \$300 for establishment of historical herb, vegetable and rose gardens around the old Fort Madison. The site, next to the

Mississippi, is visited by thousands of tourists annually.

David Lubben, Monticello - \$60 for the second year of a three-year study of two nonconventional crop inputs, molasses and GroZyme®. Each material is being tested in a separate trial for its effect on yield, grain quality, and soil fertility. The standard PFI field trial design is being used, and Lubben is receiving assistance from Jones County Extension Agriculturalist Jim Lummus.

Richard Thompson, Boone - \$850 for evaluation and demonstration of a cash-grain, seven-year crop rotation and part of the cost of a spring field day. This study will track the production and economics of the seven-year rotation, which will be compared to a typical corn-soybean rotation. The project also utilizes 8-row-wide crop strips.

Richard Godke, Henry County Extension - \$350 for a study of the agricultural application of municipal yard waste (leaves and grass). As of July 1, it will be unlawful for towns to dispose of the materials in landfills. It is not known whether the application of these wastes will have a net negative or a positive effect on a crop of corn. A field day for the demonstration will be combined with the PFI field day of cooperators Jeff and Gayle Olson.

Mike Reicherts, New Hampton - \$350 for evaluation of barley-soybean "relay cropping" in northeast Iowa. The goal is to improve soil conservation and productivity by drilling the beans into a standing crop of spring barley. Barley matures earlier than other small grains, which would give the soybeans more time to develop. The practice has worked in Pennsylvania, but it is not known whether it will be successful in Iowa.

Tom Frantzen, New Hampton - \$60 for development of audiovisual materials in support of educational meetings on sustainable agriculture. Tom has made himself available to schools, FFA, and other groups to lead teaching sessions on sustainable agriculture. The support is to assist that effort by allowing him to produce teaching materials.

Jim Schaefer, Fairfield - \$275 for demonstration of high-value vegetable crops and sustainable production methods. The educational component of the project will be aimed particularly at students,

and some young people will also gain first-hand experience by working on the project.

SUSTAINABLE AG CONFERENCES HELD

The winter of 1989/90 has seen a number of conferences devoted to sustainability in agriculture. Two conferences in February and March included PFI cooperators on the program.

Leopold Center Conference

On February 6-7, the Leopold Center for Sustainable Agriculture hosted a meeting in Ames entitled, "New Developments in Cropping Systems and Livestock Management Systems." Featured topics included strip intercropping, sustainable swine production, farming with wildlife, and intensive rotational grazing. More than 200 people attended.

The sessions offered a nice mix of lectures, workshops, and posters, with contributors coming from all over the country. Speaker Charles Francis, of the University of Nebraska, handed out a "quiz" to encourage the involvement of his audience. Nina Leopold Bradley, daughter of Aldo Leopold, brought sustainable agriculture into perspective with her reflections on the life and work of her father, the renowned conservationist.



The reception before Nina Leopold Bradley's talk was attended by farmers, scientists, legislators, candidates for governor, and Iowa Secretary of Agriculture and Land Stewardship Dale Cochran.

PFI cooperators Dick and Sharon Thompson spoke to the general session of the conference about their farming operation near Boone. Cooperator Tom Frantzen assisted ISU professor Rick Cruse in the workshop on sustainable cropping systems. Harlan Grau, PFI cooperator from Newell, described his practices on the panel discussing alternative weed management systems.

SWCS Conference

On March 26, the Soil and Water Conservation Society sponsored a conference in Ames entitled "Sustainable Agriculture: Farmers' Perspective." Two of the farmers on the program turned out to be PFI members. Featured was Larry Neppel, farm manager and president of Iowa Farms Associates. The Fort Dodge firm recently won a national conservation award for conservation. Larry and two of his clients discussed their use of ridge tillage and its economic and conservation advantages.

One of those clients on the panel was Greg Schmadeke, a PFI cooperator. Greg and his wife Amy farm near Callender. Greg described to the audience the line of equipment he was able to sell when he converted to ridge-till. Schmadeke feels the change kept him in farming.

Each of the conferences had much to recommend it. However, combining such meetings might allow



PFI members Greg Schmadeke and Larry Neppel described ridge-till farming at the SWCS conference.

the strengths of separate efforts like these to complement each other. Next December, for example, the PFI winter meeting will be followed the next day at the same location by a sustainable agriculture conference held by the Central Iowa Area Extension Service. People will be able to travel once and yet attend two events, each of which will offer something unique.

ISU, PFI REPRESENTED IN IAA

The Institute for Alternative Agriculture (IAA) is a national information, policy and networking organization. Among the activities of the institute are a newsletter, a magazine (*The American Journal of Alternative Agriculture*), and an annual conference dealing with some aspect of sustainable agriculture. Members of the IAA Board of Directors have included PFI cooperator Richard Thompson and Associate Director of ISU Extension Jerry DeWitt.

Jerry DeWitt was recently elected President of the IAA board. The move will increase the visibility of Iowa sustainable agriculture, and will enable efforts around the country to benefit from the leadership DeWitt has demonstrated in Iowa.

The IAA board also selected 25 nationally-known leaders in agriculture and national resources to be the charter members of a President's Council at the Institute. This Council will "provide guidance and support for Institute activities in furthering a more scientifically, economically, and environmentally sound agriculture."

Practical Farmers of Iowa President Ronald Rosmann was selected to serve on the council. Among the others chosen were: William Marshall, Pioneer Hi-Bred International Inc.; David G. Topel, ISU dean of the College of Agriculture; Dennis R. Keeney, director, Leopold Center for Sustainable Agriculture; Karl N. Stauber, Northwest Area Foundation; Bob Bergland, National Rural Electric Cooperative Association; and Lester Brown, World Watch Institute. Other farmers named to the Council

along with Rosmann include Ron Ellermeier, from Glenvil, Nebraska, and Fred Kirschenmann, Windsor, North Dakota.

THOUGHTS ON CROP PRODUCTION

Don Davidson

(Editor's note: This bit of philosophy was part of a letter Don sent outlining several economic scenarios for crop production.)

All this pondering and budgeting and wondering has led me to draw some analogies in crop production. Being the big basketball fan that I am, I realize that crop production can be like a basketball team. Let's take a basketball team that wins about seven out of 10 games and is comprised of five players - a consistent 20-points-per-game scorer, a hawking (no inference, please) defensive player who guards every opponent's high scorer, an aggressive rebounder who occasionally goes on a scoring binge, a deft point guard who sees the entire court and knows where every one of his teammates is at all times and a basic all-around player who contributes in all ball-playing abilities. Well, our crop inputs are just like this basketball team! Instead of a big scorer we have water or moisture needs. Instead of a big defensive center, we have soil which supports plant life. Instead of a greedy rebounder, we have sunlight and temperatures, which influence crop growth. Instead of an all-seeing, all-knowing point guard, we have management which puts all of the ingredients together in the best package possible. And of course, instead of an all-around player, we have the ingredients that balance out our crop inputs - variety, fertilizer, and weed control.

Now, as I said, this has been a pretty good ball team, winning seven of 10 games. But one night the big scorer made only four points, and another night the rebounder lacked his normal energy, and the third night the all-around player was just really awful - and three losses were the result. But these losses weren't just because these individual players failed to play to their abilities - they failed to play as a *team*. In other words, all the players contributed to the losses because

no one stepped in to help the player with problems that particular night.

Likewise, in our attempts at crop production, we may have put too much emphasis on the inputs of variety, fertilizer and weed control in contributing to a winning yield and not enough emphasis on water, weather, and soil. I know that after the years of 1986 and 1987, I felt that I should be consistently getting corn yields of 150-180 bushels per acre because that was what I had been achieving up until then. I thought it was all because of my management practices. I started planning for these yields and started fertilizing and planting accordingly!

But in 1988, it became woefully apparent that my good yields had not only resulted from my selection of varieties and fertilization practices, but also resulted from the excellent weather and abundant rainfall that we received in those years. I had neighbors who produced adequate yields in 1988, then had relatively poor yields in 1989. They've been driving themselves crazy all winter trying to figure out what went wrong because, "It couldn't have been the weather - we had less rain last year!"

What I (and my neighbors) haven't realized is that it takes a team effort in crop production to produce a winning result. When we have a loss, it *may* be because we lacked enough fertilizer or used the wrong varieties, but lack of rain or too much wind may also have played a role. I guess my main point is that we can research individual cropping practices to find where we can cut costs, but we have to keep in mind there are three big inputs that we have little control over (weather, water and soil), which may influence our yield results more than our choices of hybrids and nitrogen rates. Still, in years when it all comes together, we can have winning results just like that basketball team!



NOTES AND NOTICES

Internship with Center for Rural Affairs

The intern will work at the Center's Sustainable Agriculture Project, at Hartington, in northeast Nebraska. This project conducts on-farm demonstrations with farmers to develop practical, low-investment farm technologies and is currently developing beginning-farmer educational materials in sustainable agriculture.

The application deadline is May 11, or until a suitable candidate is found. The internship, which could begin as early as June 1, will have a term of six months to a year. Stipend plus benefits provided.

Send a resumé and letter of interest to Larry Krcil, Box 736, Hartington, NE 68739.

Education Specialist with Leopold Center for Sustainable Agriculture

The specialist will coordinate the Leopold Center's educational programs in sustainable agriculture, write educational and outreach materials, working with other departments, institutions and agencies. Also will act as liaison between the Leopold Center and the Cooperative Extension Service.

Qualifications required: Master's degree in education, undergraduate degree in an agricultural discipline or in education, clear evidence of excellent written and verbal communication skills.

Deadline: May 1, or until the position is filled. Contact Bruce Brown, Assistant Director, Leopold Center for Sustainable Agriculture, 126 Soil Tilth Building, ISU, Ames, IA 50011.

Late Spring Soil Nitrate Test Meeting

Anyone living near Hampton and planning to use the late spring soil nitrate test for the first time may

want to attend an informal meeting in the field to go over soil sampling, timing, the test kit, and any other questions people have. The meeting will be held some evening around the first week of June, depending on crop development. Call Al Hagensick, (515)-456-2945.

IOGBA/Extension Win \$118,000 Marketing Grant

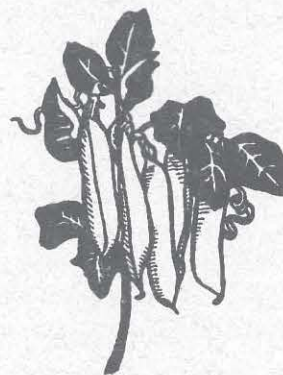
(This item is reprinted with permission from literature of the Iowa Organic Growers and Buyers Association.)

The grant comes from the Iowa Department of Agriculture's Rural Revitalization Grant program, which is funded by the Iowa Lottery. The project, "Marketing Iowa's Organically Grown Foods," involves hiring a project assistant who will develop strategies for locating markets and pricing, create a marketing database, coordinate farm tours, link individual growers with technical and marketing assistance, and publish a bimonthly newsletter.

ISU Extension will be committing personnel and services as a "public partner" in the project. Writing in support of the project, Elizabeth A. Elliott, interim

dean of the Cooperative Extension Service, and Jerry DeWitt, Associate Director of ISU

Extension, stated: "We anticipate significant agricultural economic development as Iowa develops the infrastructure needed to meet market demands for organic food."



IOGBA's Rural Revitalization Grant Committee, Carolyn Frazier and Hilary Strayer, report that the job should be advertised soon and that the project assistant should be on duty in June.

Pesticide Drift Complaints – Who You Gonna Call?

With the strong winds this spring, reports of herbicide drift have been noted. The Pesticide Bureau of the Iowa Department of Agriculture and Land Stewardship handles cases of pesticide misuse. Someone with a complaint can contact Mark Lohafer, at (515) 281-3981. There are obvious social pressures discouraging people from complaining about their neighbors. However, the only response the Bureau can make to an anonymous complaint is a "personal appeal" to the alleged offender.

In response to a public complaint, the Bureau will take samples for residue analysis, and may issue a warning letter. A second offense would lead to a "settlement conference." However, Chuck Eckermann, of the Bureau, reports that the office has never received a second complaint on an individual. The ultimate action by the Bureau would be lifting of the operator's application license. According to Eckermann, however, the Bureau is reluctant to deprive operators of their livelihood by license revocation. Proposals for a less drastic penalty – civil fines for pesticide abuse – have twice been turned down by the state legislature.

Residues Surprise Researchers

(Editor's note: This article appeared in the ISU Extension publication "Making a Difference," December, 1989.)

Pesticide residues may remain in farm clothing for years, according to a recent case study by two ISU researchers: Extension textiles and clothing specialist Jan Stone and H. Michael Stahr of the Veterinary Diagnostic Laboratory. In the study, a farm family delivered a pair of coveralls to ISU that had been worn for four planting seasons and had been washed daily according to research-based recommendations.

Despite the odor-free condition and clean appearance of the coveralls, researchers found unexpectedly high levels of Treflan, Dursban, and Counter. The levels of Dyfonate, which had not been used since 1986, and Thimet, which had not been

used since 1985, were also unexpectedly high. No Lasso/Atrazine contamination was found.

LISA BEEF AND FORAGE CONFERENCE SET FOR OMAHA

On June 13 and 14, a conference will be held in Omaha on beef and forage in sustainable agriculture. The event is sponsored by a consortium from Iowa, Nebraska and Missouri, with funding from the federal LISA (Low-Input Sustainable Agriculture) Program. Session topics will include: controlling input costs, matching cow types and management systems, low-input growing-finishing, pasture establishment and insects, intensive grazing, summer grazing, cornstalk grazing, forage stockpiling, and innovative leasing arrangements. There also will be a farmer panel and an informal session with the speakers.

Registration by June 1 costs \$25. The cost is \$30 thereafter. Mail registration to Rick Rasby, C204 Animal Science Bldg., University of Nebraska, Lincoln NE 68583-0908. A block of rooms has been reserved at the Holiday Inn – Central, where the conference will take place. Room rates are \$48 for one bed, \$58 for two beds. Call the Reservation Department at (402)-393-3950.

NEW SUSTAINABLE AGRICULTURE LEGISLATION

Glen Draper

The "Sustainable Agricultural Adjustment Act of 1989," also known as the "Jontz" bill (HR 3552) was introduced last fall in the US House. All four of its objectives support adoption and practice of sustainable ag systems. The bill does not threaten present ag practices, as the programs for producers are voluntary. The bill would: (1) reduce farm program barriers to sustainable production systems; (2) provide technical and financial assistance and education to adopt sustainable production systems; (3) promote integrated, whole-farm, longer term resource management; and (4) review all current agriculture policies and programs for their impact on sustainable agriculture.

The bill authorizes the Secretary of Agriculture to assist producers (through Ext. Service, SCS, and ASCS) to set up five year, farm-specific management plans to enhance profitability and resource stewardship.

For producers following such a plan, the Jontz bill also provides: (1) program payment yields that cannot be adjusted downward; (2) that to the extent which a farm plan and crop rotation reduce total production of program crops, set-aside requirements would be reduced or waived altogether; (3) that base acreage history shall be maintained and deficiency payments shall be made on any portion of base acres devoted to resource-conserving crops; (4) cross compliance is waived - in other words, the farmer could plant wheat or other program crops on corn base acres without losing program benefits; and 5) farmers who follow such a plan and have low crop bases due to historic use of resource conserving rotations would have their bases increased for purposes of drawing payments on resource conserving crops. The Jontz bill would also provide all farmers cost sharing for the establishment of forage legumes in short-term rotations on set-aside acres.

The Extension Service would set up a Sustainable Agriculture Extension Program (SAEP) for assistance to producers adopting sustainable production systems by providing information, analysis, training, education, and technical assistance in designing and implementing such plans.

Legislation introduced on the Senate side by senators Wyche Fowler and Robert Dole (S 2409) includes an integrated crop management program similar to that in the Jontz bill, providing additional farm program options and benefits for farmers who implement a resource-conserving farm plan. The Fowler Dole bill would also provide for grants to organizations to conduct on-farm research with farmers who implement such plans. It would also establish a three year set-aside program which would include cost-share for establishing cover crops and forage legumes as part of resource conserving crop rotations.

Unfortunately, S 2409 also includes some provisions which would weaken conservation compliance and wetlands protection.

Senator Tom Harkin is also in the process of preparing legislation to remove program penalties on farmers who practice sustainable agriculture. The legislation had not been introduced at this writing.

In the process of developing a 1990 farm bill, both the Jontz and the Fowler Dole bills are currently being "marked up" (revised and amended) in subcommittees. Senate Agriculture Committee hearings in Iowa and other midwest states in early March provided input for senators Harkin, Daschle (SD), Conrad (ND), and Kerry (NE) as part of the process of developing the 1990 farm bill. PFI farmers Ron Rosmann and Tom Frantzen were among those on a panel that provided testimony to senators at the Iowa hearing. If enough support is generated in the ag subcommittees and full committees to get them voted out of committee, each bill, in some form, could become a part of the 1990 farm bill. Congress-watchers expect debate on the floor during the summer of 1990 and completion of the bill later this year.

However, the version of the ag. bill that will come to the full house and senate for floor debate is being determined now, as the sub- and full committees wrestle with different interests and solutions. For example, an issue in the second week of April was conservation compliance (whether or not to reinstate "T" as the basic conservation objective and whether or not to set an upper limit on allowable soil erosion). Also under consideration was the future of CRP and sodbuster/swampbuster rules.

Individuals wishing to learn the current status of bills and issues being considered can contact their legislators or Chuck Hassebrook, at the Center for Rural Affairs, P.O. Box 405, Walthill, NE 68067. (402)-846-5428. The Center also has available a packet of option papers on initiatives to incorporate sustainable agriculture in public policy.



SUSTAINABLE AGRICULTURE IN IOWA, PART #2

Jim Malia and Pete Korsching
Department of Sociology
and Anthropology, ISU

Following is the second of our reports on the sustainable farming practices used by members of Practical Farmers of Iowa (PFI). Data for these reports were obtained from 168 farmer members of PFI who responded last winter to our mail survey. In this report, we look at tillage and planting practices, and we look at how farming operations have changed as a result of using fewer chemical inputs.

Tillage Practices

Tillage practices that conserve and protect the soil are an integral part of any sustainable agricultural system. Therefore, we asked farmers about their current and past use of specific tillage and cropping practices. Table 1 gives the percent of farmers who indicated they use the particular practice and when they have used it.

A high percentage of PFI farmers currently use crop rotations and practice conservation tillage. A smaller number plant a fall cover crop, use ridge-till, or use no-till.

Many respondents indicated that they used fall plowing in the past but are not currently using it. Fall plowing is discouraged because the soil is exposed during the winter months, increasing the likelihood of severe soil erosion. Our data indicate that PFI farmers are adopting environmentally sound

tillage practices. The use of a fall cover crop and a ridge-till system are still considered experimental practices by many sustainable farmers. Thus relatively few farmers in our survey used these practices.

Since most no-till systems require a high dosage of chemical inputs to control weeds, many sustainable farmers do not use no-till systems, despite the soil conservation advantages they provide. PFI farmers are consistent with this pattern in that few of them currently use no-till systems.

Possible changes

The reduction of chemical inputs is an important element in sustainable agriculture. Thus, how farm operations change when fewer chemicals are used is an important consideration for any farmer who would like to reduce chemical inputs and adopt more sustainable practices. If a negative impact is likely, farmers will be less motivated to adopt sustainable practices than if positive changes can be documented. To examine how a reduction in chemical inputs affects key areas of a farm operation, farmers were asked to indicate the amount of change they experienced as they made reductions in chemical inputs. Table 2 gives the frequency of responses.

A decrease in costs and farm debt and an increase in profits were the changes most frequently experienced by PFI farmers as they reduced their chemical inputs.

Research on the relationship between level of chemical use and profits is inconclusive. Some on-farm research conducted by PFI indicates that profits will increase as inputs

Table 1. Percent of PFI farmers indicating use of various tillage and cropping practices.

	Use Currently	Used in Past but not Currently	Never Used
A crop rotation that includes forage or hay	77	18	5
Plant a fall cover crop	32	22	46
Conservation tillage (leave crop residue on the ground)	94	4	2
Ridge-till	35	6	59
No-till, or slot-plant	29	23	48
Fall plowing	18	57	25

decrease. Research comparing organic systems and conventional systems found that net profits were comparable for the two systems. Other research that compared low-input systems with conventional systems found that if market prices were used for the conventional crops, net profits were higher for the low-input system; if the government subsidized prices were used for the conventionally grown crops, then they had the higher net return. In summary, more research is needed to determine an optimum level of inputs that is environmentally sound and economically viable.

Yields, commodities grown, equipment needs and the size of operation primarily remained the same for most farmers.

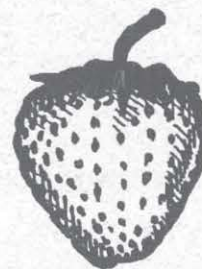
Our research also found that as the number of commodities grown increased, the level of chemical inputs decreased. This perhaps suggests that PFI farmers who are less dependent on chemical inputs are adopting crop rotations and intercropping practices as a means to compensate for reduced chemical inputs. Also, in a comments section on the questionnaire, many farmers indicated that they were experimenting with alternative crops as a way to diversify their operations to gain greater economic strength and to create a more diverse environment. Farmers that continue to use higher levels of chemical inputs have less diversified operations and are thus dependent on chemicals to control weeds, disease, and insects.

Table 2. Percent of farmers indicating amount of change in their farm operation when they reduced chemical use.

Possible Changes	Decreased	Same	Increased
Yield	30	57	13
Input costs	96	1	3
Number of commodities produced	7	75	18
Equipment needs	28	53	19
Size of operation	7	81	12
Farm debt	65	31	4
Labor needs	24	35	41
Management needs	3	22	75
Net returns (profit)	8	14	78

A majority of farmers report increased management needs. Their experience, however, with respect to labor is mixed. A majority indicated either no change or an increase in labor. This is probably an indication of the highly mechanized nature of commercial agricultural production. Regardless of the level of chemical inputs or the commitment to other sustainable practices, the majority of farm work today is done by machine.

The amount and kind of changes experienced by farmers in our study indicate that farmers have little to lose and some advantages to gain by adopting a system that uses more sustainable practices. The size of operation would not have to change. Equipment needs would not increase and could decrease if a farmer used a ridge-till system. Although a system which relies less on chemical inputs would require more management attention, the results of our research indicate that most farmers would be rewarded for their efforts with higher profits.



WHY SYSTEMS RESEARCH?

- Bill Liebhardt

(Dr. William Liebhardt is director of the University of California Sustainable Agriculture Research & Education Program. This article is reprinted with permission from the program's newsletter, *Sustainable Agriculture News*, Spring 1989.)

Land grant universities have delivered information to the agricultural community for more than a century. During that time the science of agriculture has played an increasingly important role. As science progressed, the questions asked became increasingly narrow in scope. We went from the farm, to the field, to the whole plant, to part of the plant, to the cells, to the subcellular level, and finally to the molecular level. All this was in the quest to learn more about how plants and animals function. At the farm level, however, *integration* of science and management of the numerous individual components required to produce still is the most critical skill needed to farm successfully.

As science and statistics evolved, university research primarily adopted a reductionist, single component approach for the study of agricultural production. We looked at the kill ratio of pesticides on target organisms but we did not look at how the balance of nature was affected by these compounds. We did not do general research because more narrowly defined questions seemed more amenable to a scientific approach. Now producers and society are asking broader questions. Growers want farming systems that are more economical and yet environmentally sensitive.

The cutting edge in farming is at this agricultural-environmental boundary. To meet this challenge, we must ask a broader set of questions and change the way we organize ourselves. The major problems and breakthroughs will occur at the disciplinary boundaries, therefore we must conduct more interdisciplinary farming systems research. We will not abandon the reductionist approach, but we need to realize that

there is a continuum of agricultural research and many ways to develop the information required today. We have learned that everything is connected to everything else, therefore we must find a balance between the narrow and specific, and the broad and general truths.

Increasing systems research will help accomplish this. Systems research is more difficult to organize and develop, but it has the advantage of putting all the components together so that systems knowledge is primary and components become a subset of the system. It involves more management decisions because more researchers are involved. But a project that looks at a particular agricultural problem from many different angles and disciplines is more likely to produce thorough and long-term results because it takes the entire agricultural vista into consideration.

As an example, we are frequently asked about floor management of orchards and vineyards. When you change one aspect of the floor management of an orchard or vineyard, you change the management of the entire system. If you are only evaluating one aspect of it - for example, the addition of a legume cover crop to add nitrogen to the soil - you may come away saying it had a positive effect in adding nitrogen. That is a very reductionist approach. That approach doesn't tell you that cover crops also affect pest dynamics, in both positive and negative ways. The cover crop may mean less dust in the vineyard or orchard, which would keep mites down, but there is evidence that certain cover crops tend to harbor nematodes. Cover crops may increase water infiltration, but they also tend to cool an orchard or vineyard floor and may add to the risk of frost damage in cold weather. Reductionist solutions often unwittingly lead to the creation of other problems.

Many of the continuing problems in agriculture cannot be solved by a single discipline. We feel that embracing and nourishing multidisciplinary systems research is the best hope for agriculture today.

SYSTEMS RESEARCH – HOW?

Rick Exner

The goal of systems research is to see how elements "fit together" to make a working whole. Agricultural research is sometimes criticized for being stuck in one particular specialty or another and not considering "the big picture." To be adopted in the real world, any new technology or practice must fit with other agricultural practices, technologies and even values held by the farmer. Recent efforts in cropping systems research represent a commendable effort at a broader understanding of agriculture. An examination of two cropping systems research projects in Iowa will illustrate some of the challenges presented by this type of work.

Nashua Study

In 1978, a study was begun at the Northeast Iowa Research Center (NERC), at Nashua, comparing three cropping systems. The first two systems utilized conventional herbicides and purchased fertilizers. System #1 used continuous corn, and system #2 used a corn-soybean rotation. The third system consisted of a three-year, corn-oat-meadow rotation, with all added fertility supplied by an application of 20 tons of manure, and no herbicides used.

Average yield in the continuous corn system over the 11 years of the experiment was 120 bushels. In the corn-bean system, average yields were 139 and 36 bushels for the two crops, respectively. In the three-crop system, corn yielded 98 bushels on average, oats yielded 58 bushels, and three tons of hay was the average yield from the meadow.

It is not surprising that corn yielded better following soybeans than did corn-after-corn. Corn-after-meadow should also have benefited from a rotation effect, especially in a period where precipitation was usually adequate. Why were system #3 corn yields so low? The answer could be nutrients or weed control, or both. I visited the plot only once, at harvest time, and weeds did appear to be a serious problem.



The organic farm of Cyril and Anita Venner, Arcadia – weed management in conventional tillage.

Most people familiar with sustainable agriculture would agree that weed control and nutrient deficiency can be problems in low-input cropping systems, but are not necessarily so. Just as farmers who change to reduced-input systems must master a new set of practices and skills in order to be successful, experiment stations are now faced with similar learning opportunities in systems research.

This study is continuing. An interim report was published last fall by ISU agricultural economist Dr. Michael Duffy. Duffy has worked with the Rodale Research Center on an extensive farming systems project, and he is probably as familiar as any economist in the country with sustainable agriculture. In his report, Duffy pointed out that without government payments system #3 was as profitable as



The media emphasized the relative unprofitability of reduced input farming.

continuous corn and was the *only* cropping system that produced more energy than it consumed. Nevertheless, the news media emphasized that reduced input farming was shown to be relatively unprofitable.

Allee Study

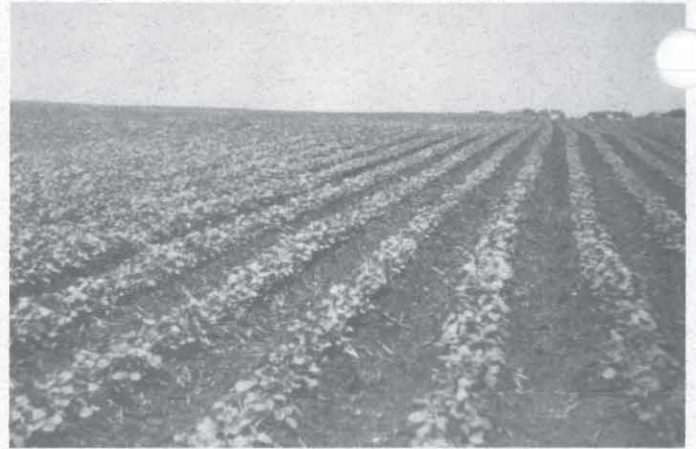
In 1987, ISU began a cropping systems study at the Allee Research Center, in Newell. The goal of this project is to examine several systems differing in management and input intensity. To provide oversight and advice, a review committee was organized consisting of farmers, consultants and conservationists from the area. At its inception, considerable public attention was attracted by the study.

Three basic systems are compared: #1, a "low-management, high-input" system; #2, a system that uses scouting and soil tests to reduce the costs of conventional inputs; and #3, a "low-input, high-management" system. Manure is available for systems #2 and #3, and is charged at the cost of application. Systems #1 and #2 each include both continuous corn and a corn-soybean rotation. In system #3, the original rotation was oats-meadow-corn/rye-rye/soybeans-silage corn.

While the intent and overall approach of the study were welcomed, aspects of system #3 appeared to be overly ambitious. While system #2, in which



The Allee research farm demonstration of ridge-till-without-herbicides, in 1989.



Side-by-side strips – ridge-till soybeans with-and-without herbicides on the farm of Harlan and Sharon Grau, Newell.

herbicides were to be banded, was allowed to be ridge-tilled, system #3, in which no herbicides were used, was in conventional tillage – in spite of evidence that in conventional tillage weeds are difficult to control without herbicides. (A separate observation plot of ridge till-without-herbicides was included at the northwest corner of the study.) Another evident source of trouble was the rye in system #3. Farmers who have experimented with winter cover crops recognize rye as an extremely competitive species.

Circumstances combined to turn these potential problems into disasters. Two of the study's first three years were dry, leading to trouble with the rye. In 1988, soybean yields following rye in system #3 were 11.3 bushels per acre. The field itself turned out to have considerable weed pressure, perhaps due to the years of manure applications at Allee. In 1989, 24.5 hours per acre of hand weeding were charged to the low-input system.

Any tillage system demands skill and experience to be successful, and ridge tillage is no exception. Ridge till-without-herbicides involves an additional set of skills to be learned. When this study began, the farm had no background in either of these practices. The ridge-till equipment available is not ideal for the task, though it has been improved over time.

The Allee study was reevaluated by the Leopold Center for Sustainable Agriculture, which has funded it

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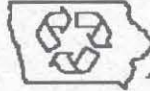
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PRACTICAL FARMERS OF IOWA MEMBERSHIP DISTRICTS



Acknowledgment:

The *Practical Farmer* and the PFI on-farm demonstrations are supported, in part, by Iowa State University Cooperative Extension and the Integrated Farm Management Demonstration Program of the Agricultural Energy Management Fund, State of Iowa, through the Iowa Department of Agriculture and Land Stewardship, with appropriations from the Iowa Groundwater Protection Fund.



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Recycled Paper

Practical Farmers of Iowa

Rt. 2, Box 132, Boone, Iowa 50036

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