the Practical Farmer

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PFI WINTER MEETING

PFI Winter Meeting Used to Announce ISU Demo Farm

If you didn't attend the PFI winter meeting last December 15, you might nevertheless have heard something about it. Several newspaper and television stations in the Ames-Des Moines area sent reporters to the meeting. PFI went to some lengths to promote the meeting, the first public event in the state to simultaneously address groundwater, farming practices, and consequences for human health. The "news," however, was the official announcement, delivered by ISU President Gordon Eaton, about the alternative farming demonstration to be established near Newell, Iowa. Eaton gave a knowledgeable description of the three systems to be included on the "Allee" experiment farm and why each is important.

The "control," or "check," will practice business-as-usual. The two other systems will represent various degrees of input reduction. Dr. Eaton described the control as a "high input and low management" farm. Part of it will be in a corn-bean rotation and part in continuous corn.

The second system will also contain both continuous corn and the corn-bean rotation. Crops will be grown using a ridge-till program. Herbicides will be banded instead of broadcast. Scouting and soil testing will be used to determine when economic thresholds have been reached for application of pesticides and fertilizer. Some manure will also be used for fertility.

The third system is to be the "organic" farm. Cultural practices will be used to control insect pests and weeds. A five year rotation of oats/alfalfa-corn/rye-soybeans-corn will be followed. Manure from livestock will be returned to the fields. The only outside fertility input will be some side-dressed urea, which will be used only as needed.

Mark Honeyman, coordinator of the outlying experiment stations for ISU, is in charge of the project. Eaton said he will have the input of nine departments in the University. PFI members Dick Thompson and Gary D'Agrosa are on a farmer advisory board that is also providing feedback.

This is an ambitious task. For instance, the design calls for each year of each rotation to be grown every summer. None of these three farming systems is being "set-up" for failure. However, reduced-input farming requires some special skills and disciplines, and this will likely be a learning experience for those involved.

Speaking after Eaton, Dr. Robert Crom, Dean of Extension in Iowa, told the December meeting that reducing input costs and improving water quality are considered top priorities. He also said that he is delighted that ISU and Extension are returning to demonstration farming.

Pesticides in Iowa's Groundwater

Dr. George Hallberg

The focus of public interest has shifted from surface water to ground water. Dr. George Hallberg, Chief of the Geological Studies Division of the Iowa Geological Survey, addressed the PFI winter meeting on the subject of Iowa's current drinking water status and prospects for the future.

Runoff water, the original concern, continues to be quite high in pollutants, not only at times of peak flow but also immediately afterwards. Hallberg believes that in the periods after these peaks it is groundwater that is contributing the pollutants to runoff water.

Right now, nitrates are receiving most of the attention. Statewide, about 50 municipal water supplies are having trouble meeting the standard for nitrate. For the present, the problem is confined chiefly to wells of less than 200 feet in depth. In northwest Iowa, where groundwater supplies tend to be closer to the surface, 40-70% of the wells exceed the standard. The solution is not to sink deeper wells, either, because the contamination is moving steadily downward in the soil.

Hallberg has worked closely with the Big Spring Project, which monitors a 103-square-mile basin in northeast Iowa. Since 1970, nitrate in the runoff has increased 230%. However, nitrate applied to the fields as manure or generated by alfalfa has increased only about 30%. Septic tanks produce less than a tenth of a percent of the total nitrogen put on Big Spring land. Statewide, they account for less than 1% of total N, and nationally they are responsible for less than 10% of the N applied. It's hard to escape the conclusion that the drinking water problem stems from farming's increased use of inputs.

Where there's a nitrate problem, Hallberg reported, there is also a distinct possibility of pesticides in the water as well. 25% of Iowans are consuming water with pesticides in it, he told the meeting. The concentrations of these chemicals are low -- generally less than 10 parts per billion by weight (ppb). This is far less than the levels that would produce acute toxicity. However, little is known about the long-term effect of these low concentrations. Possible toxic interactions between pesticides is another under-researched area. There is some indication from studies in different parts of the country that human health is, in fact, being affected.

Commonly found pesticides include atrazine, alachlor (Lasso), cyanazine (Bladex) and the other herbicides frequently used in the state. Most of these materials bind strongly to soil. Because of this it was thought they would not move into groundwater. Now it is evident

that water moving through the larger pores of the soil can carry pollutants farther and faster than was thought possible. Once they reach the water table, pesticides are very slow to break down, so even if use of these materials ceased now it could be years before the problem diminished.

Iowa farmers need to follow "best management practices" that achieve both productivity and protection of the environment. Work is needed to develop "integrated farm management" alternatives similar to those provided by integrated pest management (IPM).

In the mean time, it might be wise to check your water. The standard test is for coliform bacteria and nitrate, and it costs around $12. Tests for pesticides are much more expensive. Analysis for the most common ones is $80-$90 per sample. If you find you have nitrates over the 45 parts-per-million safety level, and you would like to check for pesticides as well, contact the University Hygenic Laboratory, Oakdale Campus, University of Iowa, Iowa City.

Which Farming Practices Might Be Associated With Cancer

Dr. Leon Burmeister

Dr. Burmeister provided his audience at the winter meeting a detailed listing of the cancers affecting Iowa farmers of different ages. It was hard to keep track of it all, but the main points are as follows:

In general, Iowa farmers suffer from less cancer than do urban residents of the state. This is probably due to the lower rates of cigarette smoking in the country (lung, bladder cancer, etc.) and to higher levels of physical activity (colon cancer). Farmers do have more lip cancer, because of their greater exposure to the sun, but this is seldom fatal.

Rural residents also exhibit a higher rate of stomach cancer than the population as-a-whole. Dietary factors associated with stomach cancer include high intake of starches or salted foods and a low intake of fresh fruits and vegetables. Additionally, there is evidence that nitrates in food or drinking water are associated with stomach cancer. Salt-preserved foods may contain both nitrates and sodium nitrite, a precursor to the family of chemicals called N-nitrosamines, which are capable of causing cell mutations. In the stomach, nitrates may also interact with traces of triazine herbicides such as atrazine to produce N-nitrosamines. Burmeister's study of white, male farmers showed the mortality rate due to stomach cancer in the period 1964-1978 was elevated about 30% over that in the general population.

There are at least three other cancers which male Iowa farmers suffer in greater proportions than their urban cousins: multiple myeloma, non-Hodgkin's lymphoma, and leukemia. In studying death records for the period 1964-1978, Burmeister found white, male farmers carried an elevated risk of 48%, 26%, and 24%, respectively, for these three causes of death.

The overall numbers do not tell the whole story, however. For one thing, Burmeister looked to see which farming practices were associated with each cancer. For each farming characteristic he divided the state into the 33 highest counties and the 66 lowest. Then he compared cancer rates in the high and low groups.

Multiple myeloma was associated with egg-laying chicken operations, herbicide use, insecticide use and, in farmers born between 1890 and 1900, with hog production. Non-Hodgkin's lymphoma was associated with layer, dairy, and hog operations and with herbicide useage, but only in those farmers born 1890-1900. The elevated risks of the two cancers for these farm enterprises ranged up to 265% greater than for the population-at-large.

Leukemia is of particular concern to epidemiologists like Burmeister. It occurs more frequently in farmers, and, unlike the other cancers mentioned here, its rates have been increasing. This increase seems to parallel the rise of modern farming practices, considering the age groups in which the disease occurs.

There are a number of kinds of leukemia. The two which have so far shown significantly elevated occurrence in white, male farmers are:

chronic lymphatic leukemia, with an elevated risk of 70%; and
unspecified lymphatic leukemia, with an elevated risk of 66% over that of the general population.

Studies in Iowa and Nebraska have associated the lymphatic leukemias with both dairy and corn production.

Dr. Burmeister anticipates having somewhat better data in the future. However, there is a limit to what can be done with county death certificates. One obvious shortcoming is the lack of cancer statistics for women, whose "occupation" is seldom specified in such records. Monitoring of water and air on the farm or workplace and routine biochemical monitoring of levels of "suspect agents or their metabolites" in body fluids or tissues will be necessary in order to pinpoint environmental causes of cancer.

A member of the audience asked Dr. Burmeister to comment on the recently released study from Kansas which drew a correlation between cancer and the use of 2,4-D. Burmeister pointed out that the specific cancer found was non-Hodgkin's lymphoma. He also reported that where basic protective clothing had been used, the rate of cancer decreased to about the same as in the general population.

Ways to Clean Water

Dr. Richard Fawcett

Richard Fawcett, Extension Weeds Specialist, covered a lot of territory in his talk to the PFI winter meeting. He began with the statement that he believes any single method of weed control actually "selects" for those weeds which it cannot eliminate. Because herbicides, tillage and rotations each favor certain types of weeds, Fawcett said, the most effective control utilizes all three methods together. He credits the practice of summer tillage in Iowa with the fact that herbicide-resistant weeds have not become more of a problem in the state. Giving another example, Fawcett reported that "extended diapause" rootworms that are dormant for two years are now being found. If they become common, the corn-bean rotation will no longer be an effective control for the beetle.

Fawcett also doubted that a farmer should ever even want to kill all of the weeds. After all, early-germinating weeds such as foxtail can be managed to suppress other weeds for a period of time. Besides, he said, a monoculture

system probably lacks the diversity of soil microbes that a controlled weed population could support.

The precise economic threshold for a particular kind of weed depends on the August rainfall. If weeds are removed by 3-5 weeks after planting there will be no yield reduction, because weeds that germinate later than approximately three weeks after planting have little effect on crop yields.

Farmers can reduce the rates of pesticides they use by taking account of the soil type and other soil factors, by banding instead of broadcasting, and by correct sprayer calibration, said Fawcett. The integrated pest management approach (IPM) can be applied to weeds as well as insects. With IPM, you don't spend money on a treatment until the economic threshold has been reached, and you know when that point has come by monitoring the fields according to specific guidelines.

Fawcett gave the following characteristics of a pesticide capable of leaching into the groundwater. Such a material probably has a solubility of greater than 30 parts per million (ppm) and a "kD" rating of less than 2. kD is a measure of the strength with which chemicals adsorb to the soil. The molecule of such a pesticide has a net negative charge, so it is not held by the soil cation exchange. This pesticide has a "soil half-life" of three weeks or more and a "hydrolysis half-life" of twenty weeks or more. "Half-life" refers to the time needed for half the material to break down.

The insecticide Temik (aldicarb) is in the news because it has appeared in groundwater in potato-growing areas of Michigan and Long Island. It is the sulfoxide and sulfone breakdown products that are of particular concern. They have solubilities of 6,000 and 43,000 ppm, respectively.

In Iowa, the herbicide atrazine is usually the most concentrated pesticide in the groundwater. It has a solubility of 33 ppm and a kD of 0.4-8.0, depending on the soil clay and organic matter content. Its half-life in soil is 4-57 weeks, and its hydrolysis half-life is 10-106 weeks. This persistence and the frequency of its use make atrazine a problem in drinking water.

(Note: We thought it would be useful to provide readers of the Practical Farmer with similar data for <u>all</u> the commonly used pesticides. The search required a couple of weeks and took us all around the ISU campus. The information in the accompanying table had to be pieced together from many sources. It isn't complete, and the persistence values relate only to some kind of "average" soil conditions. Everyone we talked to agreed something like this should be available to all farmers who want to know about the groundwater hazards of pesticides. Maybe someday it will be available.)

Herbicide	Solubility in H_2O[b]	kD, Sorptivity	Persistence[a] in Soil
*Atrazine	33[c]	0.4-8.0[c]	300-500 days
Amiben	700	.04	40-60 days
Banvel	4,500	.009	30-45 days[b]
Basagran	500	weak[b]	15 days[b]
*Bladex	171	.54	60-90 days[b]
Blazer/Tackle	"soluble"	strong[b]	30 days[b]
Command	1100	very strong[b]	90-180 days[b]
Dual	530	strong[b]	30-75 days[b]
Eradicane	370	strong[b]	45-60 days[b]
*Lasso	242	1.86	40-70 days
*Lexone/Sencor	1,200	moderate[b]	150-200 days
Paraquat	"soluble"	very strong[b]	500 days
Poast	48	moderate[b]	7 days[b]
*Princep	5	.27	200-400 days[b]
Prowl	1	very strong[b]	90-180 days
Ramrod/Propachlor	700	.13	30-50 days
Roundup	"soluble"	very strong[b]	150 days
2,4-D	600	1.99	10-30 days
Treflan	1	173	120-180 days
Insecticide			
Chlordane		91	6.6-13 years
Counter	10-15[d]	.51	100-150 days[d]
Diazinon	?	3.23	20-611 days
Dieldrin	?	?	3.3-23 years
Dyfonate	13[d]	26.82	100-150 days[d]
Furadan	700[d]	.85	153 days
Lorsban/Dursban	2[d]	288	1/4-18 years
Methyl parathion	?	6.44	149 days
Thimet	50[d]	2.56	100 days[d]
Toxaphene	?	5.74	33 years

*Herbicides with groundwater statements on the label in 1987.

[a]"Persistence" is the time required for 90% degradation under "typical" soil conditions.

[b]Values taken from the 1987 Herbicide Manual for Ag Chemical Dealers, publication WC-92, Cooperative Extension Service, ISU, Ames.

[c]Values supplied by Extension Weeds Specialist Richard Fawcett.

[d]Values supplied by Dr. David Foster, Entomology Dept., ISU.

Note: All other figures supplied by or derived from EPA User's Manual for the Pesticide Root Zone Model and EPA User's Manual for Agricultural Runoff Management Model.

How can you know the hazards associated with the pesticides you use? This year, some herbicides at least have groundwater statements on the label: atrazine, Bladex, Lasso, Lexone/Sencor, and Princep. These statements caution against using the product where the groundwater is "shallow" and the soil is permeable.

Fawcett said that there is no good set of standards for permissible levels of pesticides in drinking water, although standards do exist for concentrations in food. You can't determine the risks by making guinea pigs out of people, but research on mice has drawbacks. Not only do mice process some toxins differently than do humans, animal research uses high doses on a limited number of subjects to simulate the effects of lower doses on a large population. Alternate metabolic pathways may be functioning to break down these higher doses. If so, results cannot be projected to the larger population.

Fawcett conveyed a lot of information in a short time. His approach to weed control clearly includes herbicides, but there was something useful for everyone in his talk. Much of this information deserves to become more widely known.

A Farmer's Approach to Clean Water

Richard and Sharon Thompson

The Thompsons offered the winter meeting a few thoughts on how farmers can be part of the solution instead of part of the groundwater problem. The three areas they emphasized were cover crops, weed control, and manure handling.

It is a goal on the Thompson farm to keep something growing on the land whenever possible. Cover crops are seeded into corn with the cultivator and onto the new ridges made after meadows are disked. They are also aerially seeded into beans and corn in early fall. Fall seedings are usually mixes of hairy vetch and oats. Oats protect the vetch and establish quick cover, then die. Vetch is easily removed with the planter the next year.

Growing cover crops scavenge soil nutrients, holding them in available forms and preventing their loss by leaching. The Thompsons use spring weeds for the same effect. Those weeds between the rows are left until the first cultivation in order to accumulate nutrients and suppress other weeds.

The Thompsons have modified their ridge system to avoid using herbicides. There are 4" extensions welded onto the planter sweeps to clear more soil and weeds off the ridges. Soybeans are planted at 12 seeds per foot, and corn at around 25,000 plants per acre. These populations offer strong competition to weeds. Crops are rotary-hoed twice, the first time being before the plants have even emerged. If weather prevents hoeing, a post-emergence herbicide could be used, although this has not been necessary on the Thompson farm. Adjustable cultivation shields and a Cultivision mirror allow the disk hillers to be set as close as 5" from the row. (Note: in 1986, Thompsons' basic weed control costs were $12.35/acre, including $6/hr labor. On average, walking beans adds another dollar or two per acre.)

The Thompsons are trying to close the nutrient "leaks" in their farming system. Good manure handling is important in this regard. In their hog operation they use plenty of bedding and bedding

boards at the hutch entrances to hold it all in. They now haul manure in a dump wagon instead of the spreader. The manure/bedding is kept cool and unaerated until spring in a concrete bunker similar to a silage pit.

The solids are spread just before planting. The planter incorporates this manure by throwing soil from the ridges over it. The liquids that collect in the manure bunker will be used in a starter fertilizer. The Thompsons used to compost the manure but found they were losing N and K in the process and that the compost did not break down fast enough for the corn. They presented research results from Maine which showed that in the time needed for manure to release 62% of its nitrogen, compost released only 20% of its N.

A farmer without manure would benefit both the crop and the groundwater by splitting the nitrogen fertilizer used on corn into two or more applications. The idea is to give N to the crop as it can use it. Fall applications and one-shot applications get less nitrogen to the crop and more into the groundwater.

There is plenty of discussion in any presentation by the Thompsons. On this occassion, the conversation centered around cover crops. Several people there use rye to inhibit weeds, and someone wanted to know if it can harm soybeans too. Someone else had observed such damage two years running. PFI member Bob Thompson is experimenting with 1 and 2 bushels of rye/acre to find a good seeding rate to control weeds in north-central Iowa. He wondered if oats have the same "allelopathic" effect as rye. The Thompsons are using oats in various ways and may have an answer to that question eventually.

Third Biological Farming Conference Held at ISU

"Management Alternatives for Biological Farming - III" was the formal title of the Feb. 5 conference, which took place in Ames, in the Scheman Continuing Education Center. Biofarming conferences have been occurring every other year since 1983, largely under the impetus of Dr. Robert Dahlgren, of the Animal Ecology Department.

These events have been historic in a couple of ways. First, they have made history. Second, they have provided a sort of snapshot or record of the state of the alternative farming movement, such as it is.

The first Biofarming conference was attended by about 135 people, despite an impending blizzard. It was probably the first time a group of farmers had come face-to-face with Extension and ISU over this subject. The very name "Biofarming" represented something of a compromise.

Two years later, the second conference drew 240. There was controversy, even acrimony. The speakers were definitely outnumbered, and some of them apparently couldn't understand why there would be any interest in some of the questions asked. Why, for instance, would you want to compare the feeding value of organically grown grain and grain produced conventionally? Unfortunately, speakers later in the day paid the price for the accumulated frustration of the audience.

Still, there were distinct signs at the second conference that Iowa

tate was beginning to get the essage. Jerry DeWitt, then head of Extension IPM, announced a conference on "Farming With Limited Inputs." (The crowd apparently wasn't impressed; it was later cancelled due to lack of registration.) Also that day, Boone County farmer Richard Thompson stood up and asked if people felt there was a need for a statewide organization. That was the beginning of Practical Farmers of Iowa.

The third biological farming conference was the best organized one yet. There were two sessions with everyone all together. The rest of the time, rotating workshops allowed people to meet in small groups to discuss three of the four topics presented:

- government farm programs and low-input and biological farming;
- forage and livestock management -- schemes to improve production efficiency and benefit wildlife;
- management effects on soil structure; and
- the economics of conversion to biological farming.

University and Extension personnel really outdid themselves. They definitely had something to show besides warmed-over research from the 1950s. There is now much work underway whose specific purpose is to increase input efficiency and improve the environment. Speakers were also wise enough to sidestep points of disagreement and to emphasize the areas of common ground.

Benton Auditorium was rented for this occasion, in anticipation of a big crowd. The crowd did not show up. Total attendance was around one undred, counting a number of SCS mployees. Attendance at these biofarming events was one reason ISU began seriously considering alternative farming research in the first place. Now that the university is tooled-up and ready to go, farmer input seems to be flagging.

The work will go on, certainly, because the issues of the environment and input costs will not go away. However, the directions taken in the research will not be the same without the active interest of those farmers who are practicing and searching for alternatives.

The future of the biofarming conferences, themselves, is also uncertain. Bob Dahlgren will be leaving ISU soon to accept a position with a wildlife refuge near Lacrosse, Wisconsin.

BOARD OF DIRECTORS MEETING

The PFI Board of Directors met January 24 to discuss plans for the coming year. The board agreed to a working relationship with The Iowa Natural Heritage Association. PFI will furnish Iowa Natural Heritage with data from the PFI demonstration plots around the state. Iowa Natural Heritage will pay for the testing. Iowa Natural Heritage will also publish the information and give credit to PFI.

Demonstration plots will be set up on the following farms:

- District 1) Bob & Diane Graaf, Palmer (ridge-till, corn with and without herbicides, fertilizer split applications, herbs as an alternative crop);
- Harlan & Sharon Grau, Newell (ridge-till, soybeans with and without herbicides);
- Ron Vos, Dordt College, Sioux Center (ridge-till with banding vs. conventional tillage with broadcasting);
- District 2) Allyn & Laura

Hagensick, Hampton (aerial seeding of cover crops);
Ray & Marge Stonecypher, Floyd (starter fertilizer);
Dick & Sharon Thompson, Boone (aerial seeding of cover crops for 1988, ridges with and without herbicides for corn);
District 3) Tom & Irene Frantzen, New Hampton (reduced fertilizer, cover crops);
District 4) Tom & Maria Hanks, Ackworth (ridge-till without herbicides, fertilizer reduction);
Vick & Cindy Madsen, Audubon (reduced fertilizer);
Ron & Maria Rosmann, Harlan (ridge-till corn vs. conventional, ridge-till with and without nitrogen side-dressing after manure and cover crop, open pollenated x single cross corn vs. single cross hybrid corn);
District 5) Rod Treimer, Durant (reduced fertilizer); and 2 others.

Field days will be scheduled as things develop. Announcements will appear in the June newsletter.

PFI members may also want to try to watch a television program "Common Ground." A full one-hour version will be broadcast in June on public television.

CORRESPONDENCE

Correspondence to the PFI directors' addresses is always welcome.

District 1 (Northwest) Gary D'Agrosa, Box 212, Boyden, 51234. 712-725-2175.
District 2 (North Central) Dick Thompson, RR 2, Box 132, Boone, 50036. 515-432-1560.
District 3 (Northeast) Dennis Harkrader RR 1, Box 284, Frederichsburg, 50630.
District 4 (Southwest) Ron Rosmann, Rt. 1, Box 177, Harlan, 51537. 712-627-4653.
District 5 (Southeast) Mark Mays, RR 2, Box 45, Wilton, 52778.

Practical Farmers of Iowa
Rt. 1 • Box 16 • Kelley • Iowa 50134

RICK EXNER
960 PAMMEL COURT
AMES, IOWA 50010