



Minnesota Board of Water and Soil Resources.
Minutes.

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DATE: October 16, 1990
TO: Board of Water and Soil Resources Members
Staff, and Advisors
FROM: Jim Birkholz, Executive Director
SUBJECT: October 24th BWSR Meeting

The October 24th BWSR meeting will begin at 9:00 a.m. in Room 112 of the State Capitol Building. Please note the location change. To facilitate the meeting at the Capitol please note the following items:

- For Board Members a parking permit has been included in your mailing. It is to be used to park at any hooded meter on the orange level of the Centennial Building parking ramp.
- It is suggested that you make your own room reservation at the Kelly Inn (612-227-8711). The Kelly Inn is located within walking distance or a short drive of the Capitol.
- A map of the Capitol complex.

Also included in the Board packet is a booklet published by the Farmer Magazine called "Operation S.A.V.E. 1990 Farmer's Directory". This project was funded through the Board's Environmental Agriculturalist Program provided through funding from the 1990 Groundwater Protection Act. It contains a lot of good information and is packaged in such a way that it can be used as a reference for farmers and those involved in agri-business. Let us know what you think of this publication.

Please note the following agenda items and packet contents:

- Our first order of business will be to introduce Diane Jensen as our newest Board Member.
- Included in the reports portion of the agenda is an update regarding the appeal presented to the Board by Mr. Francis Remerowski concerning a decision of the Yellow Medicine Watershed District regarding tile drainage. Staff

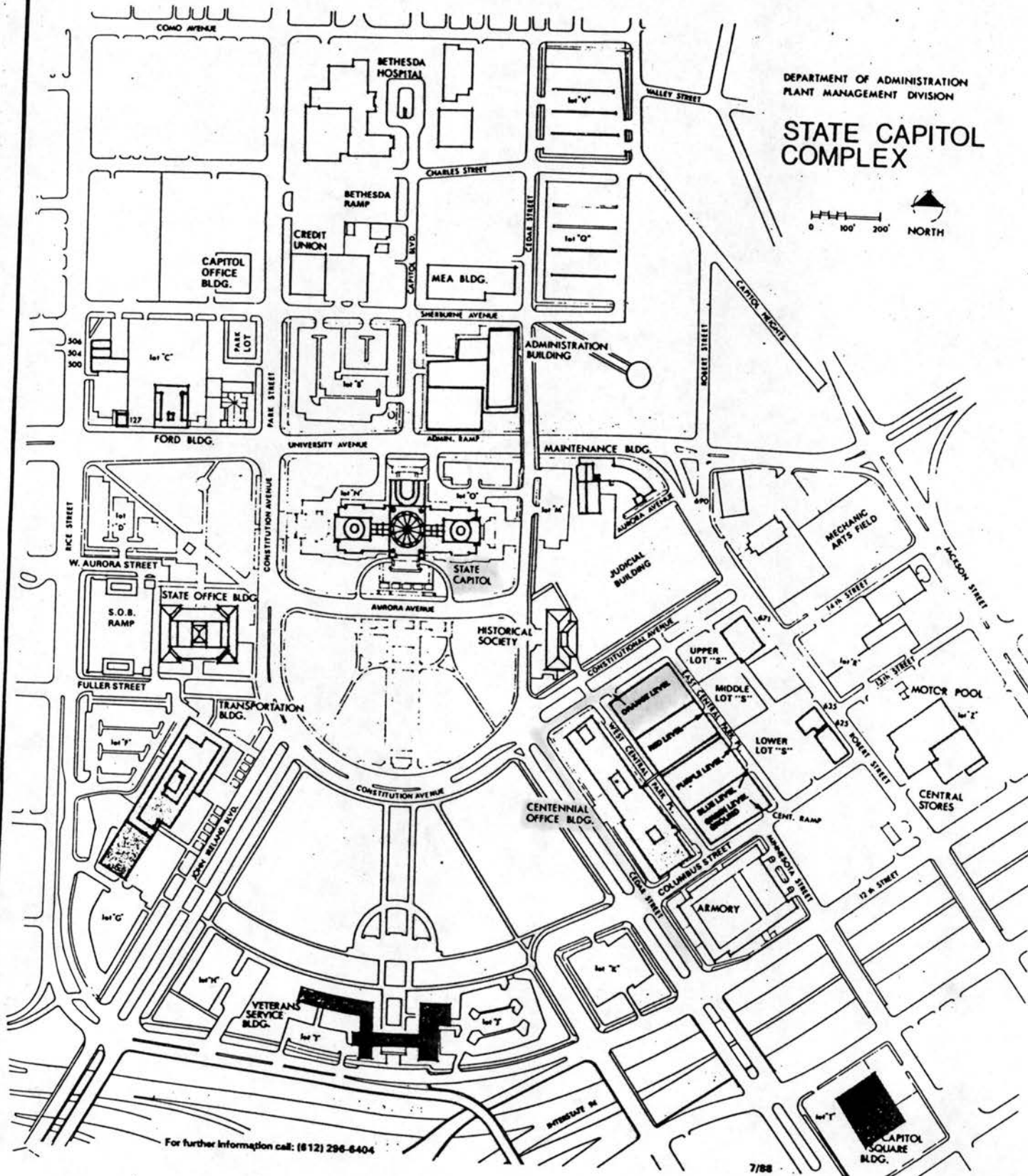
Board Members, Staff, and Advisors
October 16, 1990
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efforts to mediate this dispute have not been successful to date. The Board must decide whether to enlist an administrative law judge to prepare a record for the dispute resolution committee's consideration.

- FY92-93 Biennial Budget Request. This item will be a follow-up from the budget presentation at the last meeting. Staff will present at least two alternatives for internal reallocation of budget resources to comply with the Department of Finance's directives regarding budget submission.
- Policy Recommendations for the October 15th Report to the Governor and the Legislature. Staff is completing this report as required by law. The policy recommendations require Board action. Enclosed is a draft list of policy recommendations which have been developed based on the Board's Strategic Plan and ongoing evaluation of Board programs. Please review this list and bring comments or suggestions to the meeting.
- RIM Easement Allocations. The recently completed RIM sign-up generated between \$4 and \$5 million in landowner applications for perpetual easements only. Staff has prepared a prioritized list of easement allocations for the Board consideration. A Board decision is required at this meeting.
- Cost-Share Program Rules Report. Staff will present information regarding comments on re-drafted cost-share rules and share the current status of the rules of the draft rule update with the Board. I have also left time on the agenda for any comments from the audience regarding the cost-share program rules.
- Agricultural Land Preservation Program. After lunch Paul Burns from the Department of Agriculture will present a video tape and informational presentation on Minnesota's agricultural land preservation program. We have left time for Board Member questions and discussion.
- Comprehensive Local Water Plans. Four comprehensive local water plans are slated for approval. Staff will be dealing with final agency recommendations and adjustments prior to the meeting. Briefing papers on each of the water plans has been included in previous mailings.

If you have any questions regarding any of the locational arrangements for the Board meeting or have additional agenda items please call Chairman Ogaard or myself. See you on October 24th!

BUILDING LOCATIONS



**BOARD OF WATER AND SOIL RESOURCES
SENATE HEARING ROOM 112
STATE CAPITOL BUILDING
75 CONSTITUTION AVENUE
ST. PAUL, MINNESOTA 55155**

PRELIMINARY AGENDA

- | | |
|------------|---|
| 9:00 a.m. | 1. Call to Order |
| | 2. Adopt Agenda |
| | 3. Approval of Minutes of September 26, 1990 |
| | 4. Reports <ul style="list-style-type: none">● Chairman's Report - Donald Ogaard● Executive Director's Report - Jim Birkholz● EQB/Water Resources Committee Report● West Central Administrative Area Report - Ron Shelito, Board Representative● Action on Red Lake Watershed District Overall Plan - Mel Sinn● Francis Remerowski Appeal of Yellow Medicine Watershed District Decision |
| 10:00 a.m. | 5. BWSR Budget Items <ul style="list-style-type: none">● FY91 First Quarter Budget Report● FY92-93 Biennial Budget Request |
| 10:30 a.m. | 6. Policy Recommendations for October 15 Report |
| 11:00 a.m. | 7. RIM Easement Allocations - for decision - Wayne Edgerton |
| 11:30 a.m. | 8. Cost-Share Program Rules Report - Greg Larson <ul style="list-style-type: none">● Comments from meeting attendees |
| | 9. Advisor Comments |
| Noon | Lunch |
| 1:00 p.m. | 10. Agricultural Land Preservation Program - Paul Burns, Minnesota Department of Agriculture |
| 2:00 p.m. | 11. Comprehensive Local Water Plans - for approval <ul style="list-style-type: none">● Crow Wing County● Carlton County● Nicollet County● Freeborn County (tentative) |
| 3:00 p.m. | Adjourn |

**SUGGESTED MODIFICATIONS TO DRAFT COST-SHARE PROGRAM RULE
DISCUSSED AT REGIONAL INFORMATIONAL MEETINGS IN JULY**

Item 1:

Based upon comments received, annual allocations WILL NOT be modified as a result of proposed revisions to the program rule. Future allocations will likely be based upon the historical average (e.g., preceding 5-year average).

Greater administrative flexibility will be provided to SWCDs to utilize their allocation for high priority practices, or targeted high priority technical assistance, or for some combination thereof. However, when a SWCD desires to utilize more than 20% of their allocation for targeted high priority technical assistance, the SWCD must request approval of such use to the BWSR through its annual plan. Targeted technical assistance provides a SWCD with an opportunity to work, for instance, with communities on erosion and sediment control planning in developing areas. The BWSR will reserve the right to modify the request, based upon an evaluation of statewide allocation requests to ensure a reasonable funding split between practices and targeted technical assistance. This review and approval is necessary because a portion of the total annual legislative appropriation must be reserved for practices. Whether cost-sharing practices or providing targeted technical assistance, high priority problems, as defined in the rule, must be addressed.

Item 2:

"Special Resource Protection Areas" will be provided, upon approval by the BWSR, to address local (single SWCD) or regional (multiple SWCDs) resource protection needs by providing an administrative procedure within the overall program rule. This provision could allow, upon application by the requesting SWCD(s) and approval by the BWSR, the administering SWCD(s) to provide, as an example, 75% cost-share rate for a "single practice" approach due to extenuating circumstances. For example, due to the unique management of high value, low residue crops, a SWCD may not be able to successfully promote a "wind erosion control system". "Special Resource Protection Area" provision provides an opportunity for that SWCD to make a request to the BWSR for an exception.

Item 3:

(a) SWCDs will be allowed to retain a percentage (to be determined) of all slippage and canceled project funds and return the remainder to the BWSR. Locally retained funds could be used, for example, to approve projects during July and August before

SUGGESTED MODIFICATIONS TO DRAFT COST-SHARE PROGRAM RULE
DISCUSSED AT REGIONAL INFORMATIONAL MEETINGS IN JULY
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"new funds" become available. The returned funds, combined with the historically unallocated (10%) "special project fund", will be dedicated as the "supplemental fund" from which SWCDs apply for supplemental allocations. Allocation periods will likely be November, February, and June. Special project funds could also be used for targeted technical assistance for high priority problems, as defined in the rule.

(b) Cultural practices, such as conservation tillage, will be eligible for cost-sharing when a component of a "system."

THE FARMER / THE DAKOTA FARMER

OPERATION S.A.V.E. 1990 FARMER'S DIRECTORY

(Sustainable Agriculture/Voluntary & Economical)



Thanks, Partners

It's a thousand times easier to give lip service to a partnership than to make it happen. That's probably why a real partnership feels so good when it succeeds, and you can hold its fruits in your bare hands.

Operation S.A.V.E. (sustainable agriculture that's voluntary and economical) is first and foremost a project of partners, and this directory is its first major harvest.

Who are the partners who made this directory possible?

Farmers contributed ideas; this magazine provided a channel for their publication and exchange; the Minnesota state government underwrote the cost of this directory, and a host of agricultural professionals in extension, government agencies and private businesses shared ideas and useful criticism.

The directory is a milepost on the road we ventured out on a year ago — to involve farmers in defining and shaping sustainable agriculture, as an alternative to excessive regulation by folks who understand rule-making better than farming.

But it's not the final goal.

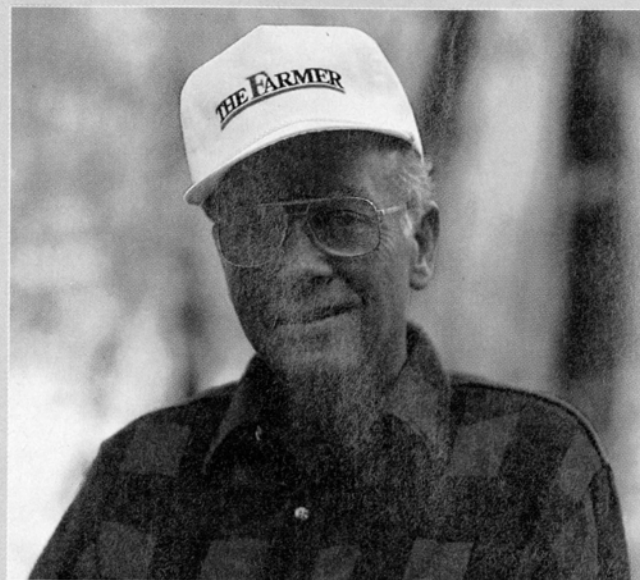
The partners who will make Operation S.A.V.E. continue beyond this first harvest are those readers who try out an Operation S.A.V.E. idea, send us a better one, or suggest new directions to explore.

Our thanks and a hearty salute to all Operation S.A.V.E. partners. First and foremost, to you farmers who shared your experiences in the many feature stories in this directory, and to you who responded to the call for practical, economical tips on sustainable farming. It goes without saying that we couldn't have done it without you.

Thanks, too, to all of you farmers who thought long and hard about how to respond to our request for ideas, but ended up either drawing a blank, questioning the "uniqueness" of your idea, or simply putting off the task of putting pen to paper.

Thanks to those of you who contributed ideas that don't appear in this directory. We hope to make use of some of them down the road.

We owe an immense debt of gratitude



to the Minnesota Board of Water and Soil Resources (BWSR), whose financial support made this directory possible. The board's grant to underwrite the cost of this directory speaks volumes about its commitment to involve farmers in shaping solutions to potential environmental problems in agriculture.

Many others deserve a big thank-you for supporting this effort — the county agents and district conservationists who tipped us off to innovative farmers; the Soil and Water Conservation Society, for providing the cover illustration.

Bob Rupp, editor emeritus of *THE FARMER/THE DAKOTA FARMER* and a consultant for Rural Technology Partnership, contributed several excellent leads. They resulted from sustainable agriculture workshops Bob conducted the past year in cooperation with the Minnesota Extension Service.

And a big pat on the back to Associate Editor Norman Senjem, who originated the Operation S.A.V.E. project and has "ridden herd" on it since its inception. □

Tom Doughty

Editor

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On the Cover: The illustration is by Jim Buckels, 1985 (Untitled). Courtesy of the Soil and Water Conservation Society, Ankeny, IA.

Sustainable Agriculture: Shape It, or Fight It?

Farmers may hold the key to future environmental regulation.

Unless farmers start designing and applying "sustainable" solutions to environmental problems voluntarily, they can expect the Sierra Club and the National Resources Defense Council to write the 1995 farm bill and force them to do it.

So says D'Wayne DeZiel, executive director of the Minnesota Association of Soil and Water Conservation Districts.

Until recently an active farmer from near St. Cloud, MN, DeZiel shudders at the thought of farmers lining up at county ASCS offices to get approval for fertilizer purchases, which some proposals would require.

"If we don't do something, I'll tell you what we'll be facing in the 1995 farm bill. We'll have regulatory policemen standing on everybody's front door," he says.



Schnepf DeZiel isn't the only one concerned. A growing number of farm leaders, government officials and political activists are urging farmers to get involved in protecting the environment against agriculture's excesses, instead of digging in their heels against change.

Surveys suggest that most farmers are willing to acknowledge and solve farming-related environmental problems.

"We've found that a majority of producers in the country buy into the idea of

Let's Shape It

We did it! Farmers, this magazine and a battery of ag professionals got together and answered the question posed last December in the article at left: "Sustainable Agriculture: Shape It, or Fight It?"

The answer, shouted from the rooftops in this directory, is "Let's Shape It." We've reached our goal for Operation S.A.V.E. — to start shaping a *Sustainable Agriculture That's Voluntary and Economical*.

The farmer ideas in this directory are our first word, not last, on sustainable ag. We'll continue writing on farmers' sustainable solutions.

Judging from farmer responses to our requests for S.A.V.E. tips, the most widespread idea about sustainable ag is that it means reducing chemical and fertilizer use.

Would-be organic farmers, who see absolute zero chemicals as their goal, are willing to spend much time and effort to get there.

Others put soil and water conservation first. No-tillers seek an ideal of zero tillage, and are willing to use the chemicals needed to make that possible.

It doesn't make sense to label just one of these approaches as "sustainable." Many farmers can make one extreme work.

But most will find a sustainable solution somewhere in the middle — maybe not far from where they are now.

That seems to be true of most farmers who contributed ideas to this directory. Their tips tell how to squeeze the fat out of chemical or fertilizer rates, keep chemicals where they belong and save more soil and water through reduced tillage.

We hope you'll find some that make sense to your approach to sustainable farming. □



environmental stewardship in exchange for commodity payments," says Max Schnepf of the Soil and Water Conservation Society of America, Ankeny, IA.

But farmers want voluntary measures to get a full and fair chance before mandatory regulations come into play.

Fred Swader of the USDA Extension Service says he is convinced that voluntary measures will work.

"But if that can't be demonstrated in a fairly short time, the specter of regulation is hanging there," he says. "We may have a two- to three-year window of opportunity to make something happen."

Wetherbee Bob Wetherbee, a Fairmount, ND,

farmer and president of the National Association of Conservation Districts (NACD), says farmers agree that agricultural activities degrade water quality in some cases. Incentive-based approaches, plus intensive education, are needed, he says.

The farmer-based NACD supports "back-up measures," such as mandatory Best Management Practices, he adds. These measures should be used as a last resort "for well-defined situations where there is an immediate threat."

University of Minnesota ag economist C. Ford Runge says farmers won't be able to avoid regulation, even if voluntary approaches are successful. But by helping to shape regulations, farmers and their representatives can reduce the potential to disrupt agriculture, he emphasizes. □

EXPOSURE CONTROL

The greatest potential for harmful exposure to farm chemicals is not through contaminated groundwater or tainted food.

As worrisome and worthy of attention as these potential problems are, they don't hold a candle to the potential harm of direct contact with a chemical that is highly toxic to people, as some (though by no means all) agrichemicals are.

Direct contact comes mainly through everyday tasks — pouring from a jug, fixing a nozzle, cleaning up a spill, or driving a tractor downwind from a sprayer.

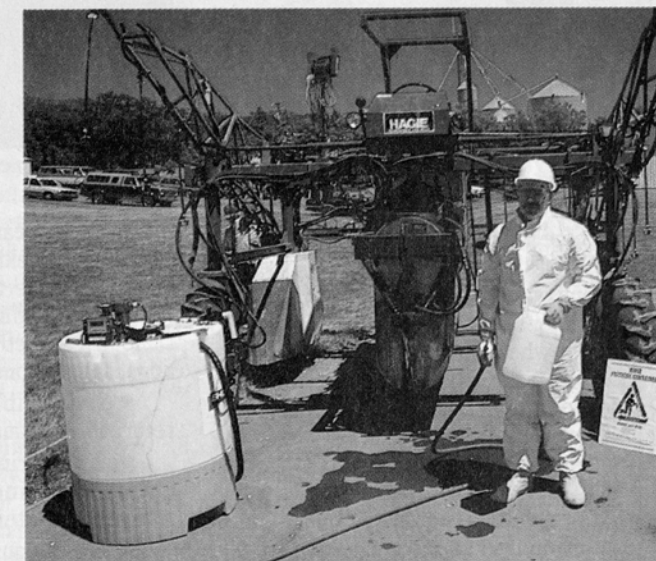
Measures that prevent direct contact are a logical first line of defense against potential environmental and health problems related to agrichemicals.

Not far behind direct contact in importance is what pollution professionals call "point-source pollution."

It's what happens when pollutants flowing from a small, definite point of origin, such as a tank or pipe, contaminate part of the environment, such as a groundwater aquifer.

("Non-point pollution," by contrast, is a possible side effect of land uses covering broad acreages, such as broadcast chemical application, spreading manure, or tillage that allows significant soil erosion.)

A 500-gallon tank of atrazine mixed with water sitting next to a well is a potential "point source" of water pollution. So are a rusting underground fuel tank, a manure stack within 50' of a well or a malfunctioning septic tank.



Reducing dangers from exposure to farm chemicals requires proper attire and equipment.

The most important point sources are those that have easy access to groundwater supplies. For example, a chemical spill 10' from a well or sinkhole is more threatening than one in the middle of a field with tight clay soil and a deep water table.

Measures to minimize direct contact with agrichemicals and the potential for point-source pollution can go a long way toward making a farm sustainable. As the following examples show, farmers are finding ways to get the job done — voluntarily, and economically. □

Handling Leftover Chemicals

These growers find it's not a big problem if they think ahead.



**OPERATION
S.A.V.E.**

Leftover chemicals can be a nuisance and a source of groundwater contamination — or an easy-to-handle and safe part of your spraying program.

In the rush of fieldwork, especially, having a plan for leftovers can help avoid contamination without wasting time, many farmers have found.

Tom Mund, Milnor, ND, tries to avoid having chemicals left over from spraying operations in the first place. Mund, who grows wheat, corn and soybeans, tries to buy and mix only the chemicals needed.

But if there's a gallon or two in the spray tank when he comes to the end of a field, Mund handles it in one of two ways.

In row crops, he dilutes the chemical with water and sprays it on the labeled crop, taking care not to exceed the maximum rate.

In small grains, he'll pour the herbicide back in the jug and use it to spot spray crops and ditches. That's a labeled way to use up some small grain herbicides, such as 2,4-D.

"I'm a stickler on keeping ditches clean because that's where weeds seem to come from," Mund says.

Mark and Bob Ehlers, Elbow Lake, MN, use leftover chemicals to respray thistle patches in corn and soybeans.

Usually, say the brothers, herbicide labels okay high rates on patches of hard-to-kill weeds.

They put unused small grain chemical back in the original container, and blend it with a new batch of the same chemical



Experts recommend pressure- or triple-rinsing containers while filling sprayers.

the following year.

Dean Herzfeld, Jim Wilson and Greg Dahl, pesticide training specialists for Minnesota, South Dakota and North Dakota, respectively, offer these additional suggestions:

- If possible, buy chemicals in returnable containers or mini-bulk tanks.
- Triple rinse or pressure rinse empty containers while filling the sprayer, not after.

• Clean equipment in the field and spray out the rinsate on a labeled crop or site. Conservation Reserve Program ground is a good place to spray out broadleaf herbicides labeled for such uses.

• Return unopened containers to dealers. Refunds usually are available.

• When storing compounds, follow label directions. Some can't be allowed to freeze, for example. The storage area should be ventilated and locked and heated, if necessary.

• Never store chemicals in a home. If there's a leak or spill, the home will have to be evacuated.

• If you have chemicals that are no longer labeled, or are physically unusable, contact your state ag department.

Pesticide specialists can tell you which products can be disposed of in a solid-waste landfill, and which are toxic and

must be handled by professionals.

Currently, there aren't many ways to dispose of toxic chemicals. Minnesota will begin a toxic pesticide waste pickup program this year. In South Dakota and North Dakota, where government-funded services aren't available, private companies can dispose of toxic wastes. Though sometimes expensive, in some cases this may be the only safe — and legal — option available. □

Information Sources

To learn more about handling leftover pesticides, contact:

Dean Herzfeld, Pesticide Training Specialist, 495 Borlaug Hall, University of Minnesota, St. Paul, MN 55108. Phone: 612/625-6920.

Jim Wilson, Pesticide Training Specialist, 212 Agriculture Hall, Box 2207A, South Dakota State University, Brookings, SD 57007. Phone: 605/688-4752.

Greg Dahl, Pesticide Programs Coordinator, Horticulture 209, Box 5658, North Dakota State University, Fargo, ND 58105. Phone: 701/237-7180.



This pile of soil, and a scoured spot in a ditch, are reminders of Vince Peterson's chemical spill.

Confronting a Chemical-Spill Nightmare

Quick action saved Vince Peterson from big cleanup problems.

Another threat of rain, another cornfield to spray, an intersection blocked by road construction and a detour through a ditch.

That formula turned every farmer's worst nightmare into reality for Vince Peterson — a chemical spill.

Before he knew it, his sprayer was tilting into the ditch. Herbicide sloshed out of the tank's filler vent. About 150 gallons of water and 3 gallons of Marksman herbicide soaked into the ground.



Peterson

This was one of 389 incidents, including everything from lawn to industrial chemical spills, reported to Minnesota and Dakota authorities in the past two years.

In such cases, cleanup must be conducted according to state regulations. Procedures depend on the chemical involved, soil type, location and volume of the spill.

In all three states, the state ag de-

partments play the lead role in spill cleanup. Phone numbers are below.

Immediate action, tempered by common sense, is the key to handling an emergency spill.

"The main thing a farmer has to do is protect himself, contain the spill and then clean it up," notes Jack Peterson, director of North Dakota's ag department pesticide division.

That's what Peterson did, and officials laud him for keeping a cool head.

"It was a long, hectic day, but it was all necessary," says Peterson, New Richland, MN.

What surprised him most was all the commotion over what he thought was a relatively minor incident.

"The product (the active ingredients are atrazine and dicamba) is fairly soluble in water and it was well above application rates, so there was potential for environmental damage," explains Roger Mackadanz of the Minnesota ag department.

Mackadanz supervised cleanup efforts over the telephone, after Peterson notified a farm supplier, who contacted local authorities. The sheriff's department, fire department and the rescue squad soon were on the scene. The sheriff's department contacted Mackadanz.

"He (Peterson) had the problem under control," says Mackadanz. As a result, it wasn't necessary to send a district inspector for on-site assistance, as often is the case.

The key cleanup requirement was to remove the affected soil, then refill the hole it was taken from.

Peterson dug out about 20 cubic yards of soil from the ditch. It was replaced from his nearby soybean field.

The two truckloads of contaminated soil are stored between two sheets of plastic. Because soil tests have shown no further contamination of the ditch, no more excavation was required.

Next spring, Peterson will spread the Marksman-contaminated soil over 15 acres of ground to be planted in corn, about the labeled rate.

Because he reported the spill and cooperated in its cleanup, Peterson is eligible for up to 90% reimbursement for cleanup costs above \$1,000, to a maximum of \$100,000, under Minnesota's 1989 groundwater protection law. (At press time, Peterson hadn't totaled up cleanup costs.)

If he hadn't reported the incident, he would have been subject to civil penalties, up to \$5,000 in some cases.

Says Peterson: "The accident's something we could have avoided by not going down the ditch, but we could also have tipped the sprayer back up and left. This (approach) was best for everyone." □

Reporting a Spill

The quickest way to report a spill is to contact local authorities, who will report the accident to state officials. Otherwise, contact the following 24-hour emergency lines:

Minnesota: 612/649-5451 (metro) or 800/422-0798 (non-metro).
North Dakota: 800/472-2121.
South Dakota: 605/773-3231.

BY JIM HOUTSMA

BY LON TONNESON



Photo: Minnesota Pollution Control Agency

Buried Fuel Tanks Ticking Time Bombs

Buried tanks are rusting away, threatening fuel and groundwater purity.

The fuel tank buried 20 years ago to stop evaporation losses and create more driving space could be about to spring a leak.

That's no exaggeration — just fact, experts say.

When a positively charged steel fuel tank gets wet, an electrical current runs between it and negatively charged soil particles.

The result is rust, then pinholes, and finally leaks.

The problem extends from filling stations to fertilizer dealers to farms. The U.S. Environmental Protection Agency (EPA) estimates that 25% of all underground storage tanks may now be leaking, and that many more will leak in the future.

BY NORMAN SENJEM

A check with state agencies and university ag engineers indicates that few farmers are reporting tank leaks.

However, buried farm fuel tanks may be especially prone to leaks, says Lee Morin of Cenex/Land O'Lakes' refined fuels marketing division.

That's because many are small, made of mild steel and are unprotected against corrosion. "Those are the tanks that may primarily be doing the leaking, not the larger tanks," says Morin.

There's a good chance that small fuel tanks will start leaking within 15-20 years after burial, says Vern Hoffman, a North Dakota State University ag engineer. "You're going to have to start watching them awfully close," he says.

However, lack of regulatory pressure may be giving farmers a false sense of security, says Doug Miller of the South Dakota Department of Water and Natural Resources. Farm and residential tanks holding less than 1,100 gallons of fuel are not covered by EPA rules requiring tank inspections and leak-prevention measures.

"I think farmers have found out 'We're not regulated, so I'm not going to worry about it,'" says Miller.

However, farmers can be held responsible for pollution caused by a leaking fuel tank, and should report

Ed Rafuse of Twin Cities Testing discovered a leak in this southwestern Minnesota farm tank, which had been buried for 29 years.

leaks to state officials (see phone numbers below).

If a tank is carelessly buried under mixed soil and debris, it could leak within five years. Most, however, remain intact for 15-20 years.

Checking for a Leak

There are several ways to check for a leak in your underground storage tank:

1) Equip the tank with a metered pump, and keep close track of gallons in versus gallons out.

2) Take soil borings to the depth of the tank. Using your nose, you can sense concentrations as low as 3 parts per million. If in doubt, have soil tested by a laboratory.

3) Have the groundwater or a nearby monitoring well regularly sampled if the tank has been buried 15 years or longer, if burial conditions were poor, or if time of burial is unknown.

4) Conduct a pressurized test to see if the tank holds air.

5) Apply water-finder paste, available from most farm supply stores, to the dipstick to test for water in the tank. It can seep in from above or below. Take monthly tests if a tank has been buried 20 years or longer, Morin suggests.

Protecting Your Tank

Careful backfilling of sand around a well-coated tank can keep corrosion at bay for years.

Another option is cathode protection. For about \$500, you can equip a small- to medium-sized tank with a band of magnesium or zinc that attracts corrosion, thereby protecting the tank.

Or buy a double-walled tank, or a tank and piping made of non-corrosive material, such as fiberglass-reinforced plastic.

Better yet, avoid the hassle and put your new tank above ground, advises Hoffman. □

For Buried Fuel Tank Information, call:

Minnesota: 800/652-9747
South Dakota: 605/773-3296
North Dakota: 701/224-2354
EPA: 800-424-9346

Chemical Metering System Handy, Fast and Safe

This home-built facility has made chemical handling a breeze for Darrel Oech.

When Darrel Oech fills his sprayer, he doesn't have to climb into a pickup carrying open chemical containers.

And he doesn't have to pour chemicals into the tank's open hatch, trying to keep the wind from spraying the liquid on his hands or gloves.

Instead, Oech, a Beach, ND, wheat and barley grower, pulls up to a unique bulk chemical metering facility that he designed and built himself.

At first glance, the facility may not look like much — an old Cass-Clay Creamery milk van parked next to his shop. But inside the 8 x 30' van is a simple, effective metering and mixing system that was put together for about \$1,000.

Here's how it works:

To mix chemicals and fill his pickup sprayer, Oech starts a gasoline-powered, 5-hp centrifugal pump and opens a valve to his sprayer fill line.

Then, with a twist of another valve, the pump starts drawing chemical from its container into a transparent measuring column. Markings on the column indicate how much liquid is in it.

When the desired amount of chemical has been measured, Oech closes the line to the chemical container and opens another line. Swoosh! The chemical is sucked into the sprayer tank.

A few minutes later, the sprayer is filled and ready to go again. Several different chemicals can be added to a tank

BY LON TONNESON

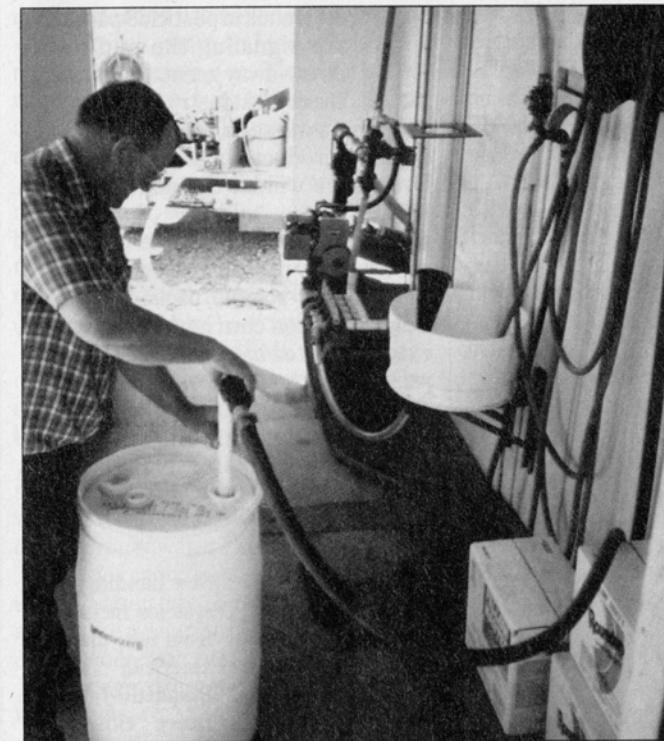


Photo: Courtesy of Darrel Oech

OPERATION S.A.V.E.

Darrel Oech's handling system includes a large water tank, a 5-hp pump, a measuring column and valves to draw chemicals and water.

by repeating the mixing process.

"It is handy, fast and safe," Oech says.

The system uses a venturi to create suction that draws chemical into the measuring column, then into the sprayer tank. The suction is created as the fluid moves through a tapering constriction, which causes an increase in the velocity of the fluid and a corresponding decrease in fluid pressure.

When transferring chemicals, the system fills the sprayer at a rate of about eight gallons per minute. When simply transferring water, the flow is 120 gallons per minute. Water is drawn from a 1,500 gallon tank, which refills automatically.

Oech had several goals when he began putting together the mixing system three years ago. He wanted a locked storage building separate from his shop where chemicals wouldn't freeze during

the application season. He wanted to be able to meter and mix chemicals inside. And he wanted to be able to quickly fill the sprayer tank without climbing to the top of the sprayer to pour chemicals.

The refrigerated van fit his requirements as a building. It was self-contained. It could be locked. It was well-insulated, so chemicals wouldn't freeze overnight. Oech bought the van, which was no longer fit for highway use, for \$1,500.

He remodeled the van to make room for the metering system on one wall, plus a storage area. Even 200-gallon shuttles can be slid through the van's rear and side doors.

Oech put the metering system into a stationary building because most of his land is close to his farmyard. But there's no reason it couldn't be put on wheels, he says. □

Pesticide Packaging: New Trends for the '90s

OPERATION
S.A.V.E.

Closed systems, soluble bags and small-volume refillables answer handling concerns.

BY JOHN RITTER

New trends in pesticide packaging are signaling the end to the throw-away mentality of the ag chemical industry.

Farmers will see a handful of new concepts in product packaging this year. Even more will hit the marketplace in 1991.

Safer and simpler. Those buzzwords describe new packaging trends:

- Water-soluble packaging. Ciba-Geigy's Beacon corn herbicide comes in exact-dose, tea bag-sized water-soluble packets. Each treats two to four acres. There's no need to pour or measure chemicals. Handling and storage are easier. Federal approval for Beacon is

pending, but is expected for the 1990 crop season.

Ciba-Geigy has used the concept for cotton insecticides and fungicides in other regions since 1983, but the concept is a first in the Midwest. A new wheat herbicide might be next in a water-soluble packet.

FMC and others are testing water-soluble tablets, anywhere from the size of an aspirin to a hockey puck.

- "Closed" systems. John Deere and American Cyanamid have joined forces to introduce a "closed" handling system for Counter insecticide. Grower exposure to chemical will be reduced and container disposal problems eliminated.

The returnable/refillable container — an alternative to 50-pound bags — fits on the lid of MaxEmerge planter insecticide boxes. When valves on the planter and the container are coupled, they open automatically to provide a path to the planter hopper.

The system will be marketed in Iowa and Illinois this year and expanded throughout the Corn Belt in 1991.

- Refillable containers. Mini-bulk containers are being downsized from 110 gallons to as small as 5 gallons. Along with being returnable, in many cases the containers offer closed handling. DowElanco, FMC, Ciba-Geigy and AgsCo. all

New handling systems include, from left, the American Cyanamid-John Deere "closed" insecticide system, Ciba-Geigy's water-soluble packet, easy-pour bags from DowElanco and an air delivery system from AgsCo.



are offering small-volume refillables (SVR) for certain products.

DowElanco's Lorsban 4E insecticide comes in a 15-gallon stainless steel container. It weighs 30 pounds when empty and 165 pounds when filled. The product is pumped directly from the SVR to the tank, minimizing accidental contact for the grower.

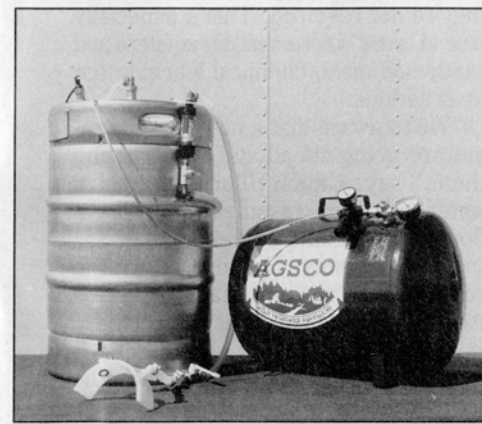
Similarly, FMC is offering its U-Turn system with 15-gallon and 30-gallon refillables for cotton, citrus and sweet corn pesticides. Where the system is impractical because of higher application rates, as with corn and soybean pesticides, the company is continuing to offer 110-gallon mini-bulk containers.

AgsCo., a chemical distributor in Grand Forks, ND, is expanding a test market for its 5-gallon air delivery system. When hooked to 2½-gallon jugs or 110-gallon mini-bulk containers, it offers closed chemical handling.

Ciba-Geigy's first closed system for liquid products was Farm-Pak, which dispenses Bicep and Dual herbicides. Introduced in 1987, it has eliminated more than a million 2½-gallon jugs from the waste disposal system.

- Better bags. DowElanco's Lorsban 15G granular insecticide is being sold in a new waterproof, single-ply bag in six Midwestern states, including Minnesota, South Dakota and North Dakota.

Many farmers say four-ply bags are hard to store and handle. The new bag has a carrying handle that provides more pouring control and a spout that doesn't require a knife to open. Pleated sides make complete emptying easier. □



Environmental Awareness, Safety Spur New Packages

In the past decade, the American public has become increasingly aware of chemical dangers to the environment. Farmers have become more aware of the personal health risks of pesticides. And media attention has fueled debate.

As a result, state and federal governments are stepping in. More stringent regulations are pushing the chemical industry to change. That includes adopting safer packaging.

"The public is getting smarter in waste management, whether you're talking hamburger wrappers or pesticide containers," says Tom Gilding, environmental affairs director for the National Agricultural Chemicals Association (NACA).

Says Dan Hopper of FMC: "We recognize that, as a company, we have to be innovative or we run the risk of being legislated out of business."

One of the most dramatic pieces of state legislation on pesticide containers was passed in Minnesota last year as part of the Groundwater Protection Act.

That law requires all pesticide containers sold after July 1, 1994, to be returnable to the dealer or to be delivered to a county collection site.

The original target date was 1992; that was pushed to 1994 after industry leaders objected.

Concerns remain, however, that the law still is unworkable.

"It could destroy the (chemical) industry in Minnesota," says Randy Brown of AgsCo., Grand Forks, ND, which does business in Minnesota and North Dakota. "I don't know if the industry can change that fast. It would wipe out most small dealers. It's totally unrealistic."

Other states are watching the Minnesota situation. In North Dakota, legislative hearings on container and pesticide disposal are under way this winter.

"The environmental voice is being heard more clearly," says Jack Peterson of the North Dakota Department of Agriculture.

"Landfills are shutting down because of liability 10 or 20 years down the road. Minnesota's idea is a good program and we're hoping to get something worked out ourselves," he adds.

Law changes haven't been proposed in South Dakota, but ag officials are collecting information and watching developments in other states, says Brian Scott,

state pesticide program supervisor.

At the federal level, last year Congress ordered the Environmental Protection Agency (EPA) to complete a study of pesticide packaging by late this year. The study will review industry developments, suggest new regulations and promote improved package design and labeling, says Rob Denny, chief of EPA pesticide management and disposal.

"We hope to get the burden of disposal problems off the farmer's back and share it with the registrant (of the pesticide)," says Denny. "Large companies are well on their way already. Smaller formulators and repackagers are more concerned."

Farmers could end up picking up the tab for new package research and development, but that remains to be seen.

"We don't anticipate price to be prohibitive," says Bob Dude, American Cyanamid's Counter product manager. "We won't determine prices until test marketing is done this year."

Says Larry Dull, a senior group leader of packaging and application for Ciba-Geigy: "We don't redesign an existing product's package if it will cost more to growers. But growers, like most consumers, will pay for packaging innovation that offers a return in safety and convenience."

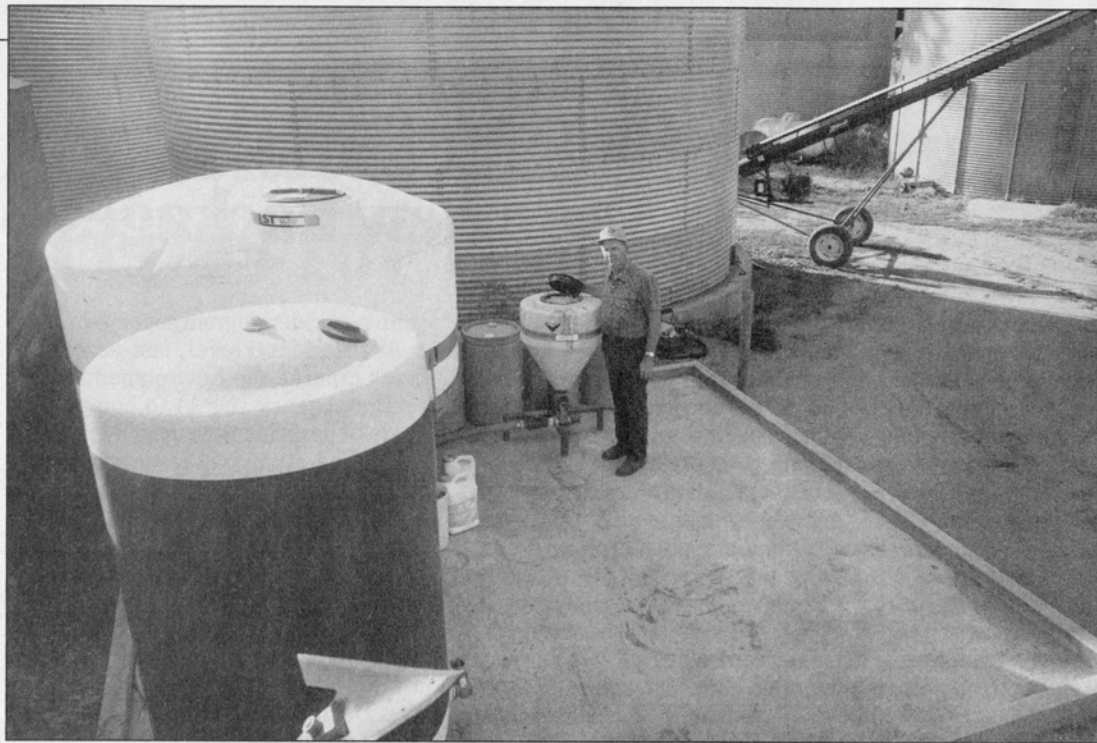
Gilding, of NACA, predicts reusable containers to be the most significant development in pesticide delivery systems. But it's not all that simple to put all pesticides into reusable containers, he cautions.

"We're headed into uncharted waters," he says. "With additional cost, plus concern about quality of some products, it may not be worth the cost of a (new) delivery system for lesser-used pesticides."

John Berg, public affairs director for the Minnesota Farm Bureau Federation, says farmers aren't shying away from the cost of safer pesticide handling. But, he says, farmers are frustrated because they can't automatically pass higher costs on to consumers.

"Our biggest concern is a means to dispose of pesticides in a safe fashion, whether that is a dealer or collection site program, at a reasonable cost," he says. □

NITROGEN MANAGEMENT



Ron Minnaert's chemical mixing pad also has improved handling efficiency.

Low-Cost Mixing Pad Reduces Spill Danger

Fear of chemical contamination led Ron Minnaert to protect his well.

When a custom chemical applicator accidentally spilled a herbicide on one of Ron Minnaert's fields a few years ago, it not only made the applicator sick, but it left a still-barren patch in the field to mark the spot.

Over the years, the accident, although minor, has stayed in the back of Minnaert's mind. In particular, he worried about the safety of his farm well.

With the well only 20-25' from where he did much of his chemical mixing, what might happen to his farm's water supply if he ever had a spill?

BY JIM HOUTSMA

Spurred on by that uncomfortable question, the Madison, SD, grain, hog and beef cattle producer took strong action to protect his water supply.

Last spring he built a chemical mixing center on a concrete pad located about 150' from his well.

The center's 16'-square concrete pad is ringed by a 4" lip to contain possible spills. The pad includes a drain to remove water when the pad isn't in use. It's plugged when chemicals are being mixed.

Eventually, the drain will be connected to a 500-gallon containment tank, which will simplify removal of spilled pesticides.

The handling pad is big enough to hold a 1,700-gallon water tank, a 1,000-gallon fertilizer tank, and several mini-bulk containers used for herbicide storage and mixing.

The biggest investment in the center was \$650 for the concrete.

In the future, along with the containment tank, Minnaert plans to add more fertilizer storage to the site. And he'd

like to upgrade to a completely "closed" handling system.

Minnaert says the pad investment has provided an unintended bonus, in addition to peace of mind. Having all his chemicals in one location saved chemical mixing and tank filling time. And that increased his efficiency.

During the first season of use, he estimates the center helped him to cover an extra 50-100 acres a day with his high-capacity sprayer.

But the biggest payoff comes from the satisfaction of knowing he's no longer posing a threat to his or his neighbors' water supply.

"I didn't want to contaminate my well and I didn't want to contaminate anyone else's," says Minnaert.

That philosophy evidently is spurring a growing number of farmers to build chemical handling pads, even though they're not required. That's especially true in areas where shallow aquifers and sandy soil make chemical leaching the most serious.

"We're aware that a number of farmers are going ahead and constructing them," says Chuck Ullery, extension water and natural resources specialist at South Dakota State University.

Says Minnaert: "I figure, down the road, the Environmental Protection Agency's going to make us control these things anyway. I don't like to get the environment all messed up. That's the biggest part of it." □

No farm input has been the focus of so much attention as nitrogen in the debate on agriculture and the environment.

It's no wonder.

As a highly water-soluble nutrient, N is highly subject to leaching. And, owing to large amounts of the nutrient in the soil at high-rainfall times of the year, such as spring, there's often a lot there to leach.

If you add vulnerable soils and hydrogeology to the equation — meaning an easy passageway to underwater aquifers through sand, sinkholes and other pathways — the potential for some degree of drinking water contamination rises substantially.

Unfortunately, some of the same factors that make N a potential groundwater contaminant also make it difficult to manage with precision.

To begin with, there are many possible N sources — soil denitrification, carryover N from a previous season, decaying manure, legume-fixed N and, finally, commercial N sources.

Particularly where several sources contribute to a field's total N, it's hard to predict how much soluble N — the nitrate form — will be available to the crop during critical parts of the growing season. It depends on the weather, plus other factors.

The challenge is to measure and then manage soil N to achieve target yields, while avoiding excess buildup of it where that could contribute to groundwater contamination.

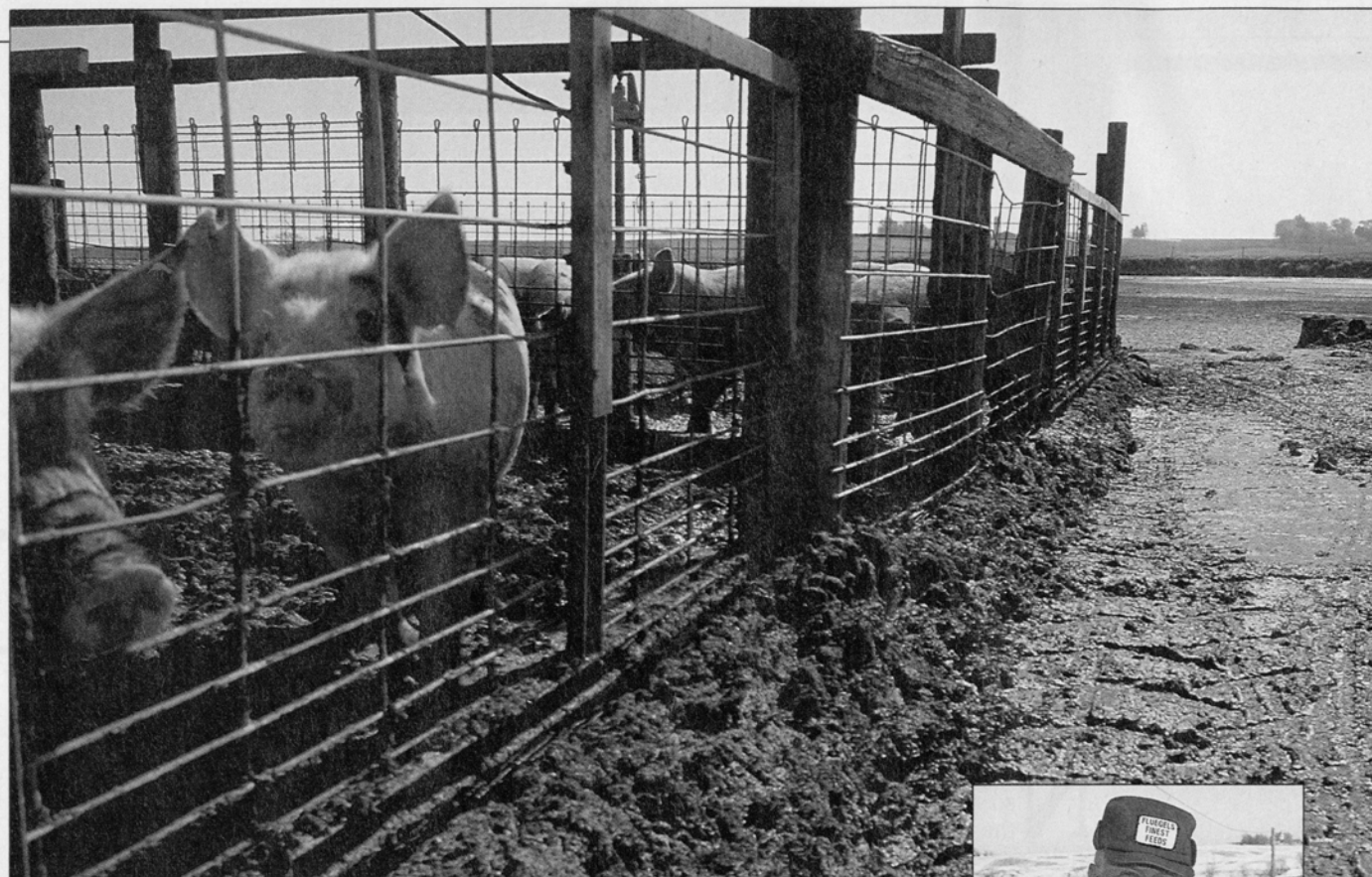
The soil nitrate test can be used reliably to that end in western Minnesota and



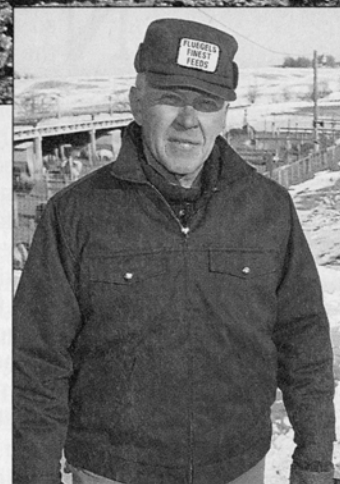
The soil probe is a vital but underused fertility management tool that also can minimize off-site environmental effects, says Jim Gerwing, South Dakota State University agronomist.

the Dakotas. Current experiments by farmers and university researchers in the higher-rainfall areas of eastern and southern Minnesota could lead to a similar testing tool to help farmers better manage N.

With or without a highly reliable soil test, however, a variety of guidelines and practices are available to match N application to crop needs. You'll find some of them in the following pages. If you know a better way, please send your ideas to the address on the back cover of this directory. □



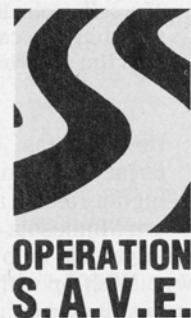
Don Nord, right, manages hog manure to optimize its nitrogen value.



Managing Manure for High Value

Here's the scoop on getting the most from livestock manure.

BY JOHN RITTER



of their dairy manure has helped the Fluegers slash commercial N applications, while reducing chances of groundwater contamination on their Hay Creek, MN, farm.

John Moncrief, a University of Minnesota soil scientist who's studied their

For Dale and Steve Flueger, the twice-a-year job of pumping manure from their 116-cow dairy barn is more than a smelly, grueling exercise.

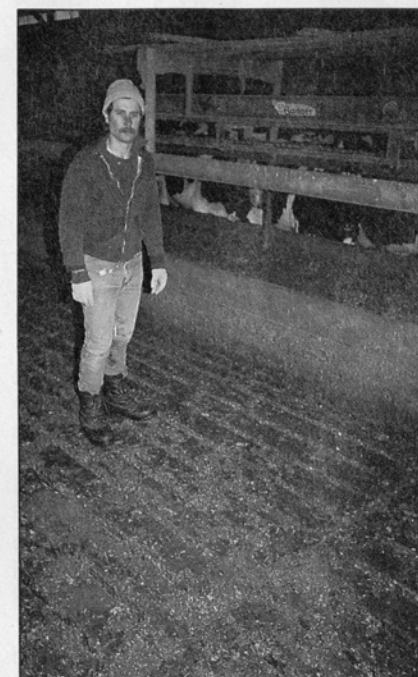
It is an exercise in nitrogen (N) self-sufficiency. Efficient management

manure management for seven years, says the Fluegers are a good example of a well-managed dairy farm that is nearly self-sufficient in N.

Together, the Fluegers, Moncrief and others are finding out how manure storage and application, tillage and crop rotation affect the total-farm N efficiency.

For the Fluegers, manure is a resource to help reduce the cost of growing feed. They know what's in it and know how to maximize its value. Their careful management typifies a movement we call Operation S.A.V.E. — Sustainable Agriculture that's Voluntary and Economic.

Research shows that livestock farmers apply a billion pounds of N needlessly in the Upper Midwest. Giving full N



Steve Flueger pumps the pit under his slatted free-stall barn twice a year.

credit to manure can help close the circle on environmental problems, says Michael Russelle, a USDA researcher stationed at the U of M.

The first step is getting a handle on composition of the manure via lab analyses. "You have to know what's in the manure," says Moncrief. "Then you can give more precise credit for N and use less fertilizer."

Variation in composition on a given livestock farm is minimal from year to year, say researchers.

A North Dakota State University study of 120 manure samples from 43 farms found that quality from year to year was comparable as long as handling and storage remained the same. Other than potassium, characteristics were not closely related to rations.

James Lindley, an NDSU ag engineer, recommends sampling two or three times a year over two or three years to establish a quality reading.

Each fall and spring when they empty their pit, the Fluegers knife in about 125 tank loads on about 40 acres.

That's about 9,000 gallons of manure, and about 230 pounds of N, per acre. At planting time, they add only phosphorus

(P) and potash (K) in a starter fertilizer to meet nutrient needs of their corn.

Over three years, they cover most of the 300 tillable acres they own. Anhydrous ammonia is applied only on 35 hard-to-reach acres and on 54 rented acres.

Another Goodhue County farm illustrates the difference that species, handling and application can make in the value of manure.

Hog producer and ridge-tiller Don Nord empties a pit and a lagoon with a traveling irrigation gun. A week before application, he loosens hilly fields with a subsoiler to reduce runoff.

But Nord is not N self-sufficient. In sharp contrast to the Fluegers' 230 pounds of N/a, Nord applies just 70 or 80 lbs/a.

Why the difference? Both livestock species and how manure is handled are factors.

On the Flueger farm, the dairy manure is concentrated in a pit under their barn. At Nord's farm, runoff from open feedlots in his 110-sow operation dilutes the waste. There's additional loss of nitrogen through evaporation during storage and application.

Nord readily admits he isn't getting the most benefit from N in his hog manure, though his P and K needs are met. When he previously applied with a pump wagon, N utilization was better, but labor requirements were higher.

"I try to keep inputs low and utilize what I have," says Nord. "I get a benefit even though it's not the most efficient from a nutrient standpoint. But the application cost factor is efficient."

The on-going U of M study on the Flueger farm has shown that of the 230 pounds of N applied with their manure, 170 pounds is available in the year of application. That's adequate for the yields their farm can support.

The study has shown that the N needs of corn the following year can nearly be met by residual N. But tillage enhances N availability to the crop that year.

The benefits of that practice are shown in the accompanying table, which summarizes some of the U of M research conducted on the Flueger farm. The research shows that chiseling enhances N release from the previous year's manure, giving a 13 bu/a yield advantage over no tillage.

The Fluegers vary manure application

Flueger Dairy Manure Study

Treatment	Average Corn Yield 1983-89 (bu/a)		
	No-till	Chisel	Average
Fertilizer*	142	147	145
Annual Manure	151	149	150
First-Year Manure	143	144	144
Year-After Manure	118	131	125
None	60	89	75

*Nitrogen was spring applied at 200 lbs/a as ammonium nitrate. Soil type is Timula silt loam.

Source: University of Minnesota

with their two-year corn, three-year alfalfa rotation. The first year after alfalfa, the application rate is cut to 6,000 gal/a because of residual N from alfalfa. The higher, 9,000 gal/a rate, is used the second year.

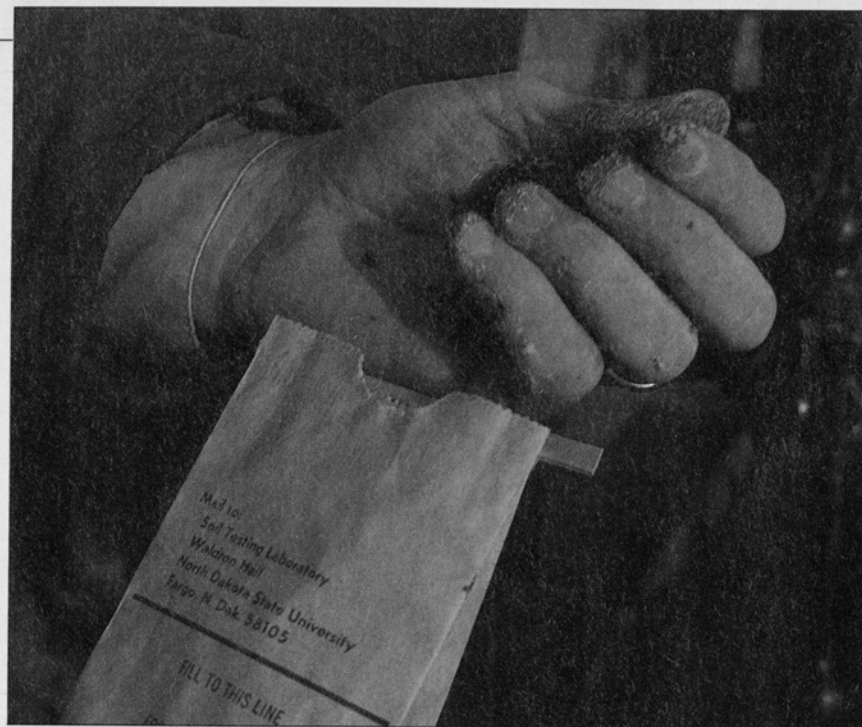
Researchers also have looked at N movement through the soil following manure application. An injector with shovels left a more uniform pattern for corn roots. And yields were better than when manure was injected with spear points, says Jim Swan, a former U of M soil scientist now at Iowa State University.

Swan also studied leaching of nitrates, a potential cause of groundwater contamination. But the past two summers have been too dry to cause significant movement past the root zone. □

Nitrogen Produced by Livestock

	Annual Nitrogen per Animal Unit (lbs)
	
Beef (1000-lb Animal Unit)	
Pit Storage	43-87
Open Lot-Solids & Runoff	50-62
Bedded Confinement-Solids	74-87
Swine (100-lb Animal Unit)	
Pit Storage	6-12
Open Lot-Solids & Runoff	7-8
Bedded Confinement-Solids	10-12
Dairy (1000-lb Animal Unit)	
Pit Storage	52-105
Open Lot-Solids & Runoff	60-75
Bedded Confinement-Solids	90-105
Poultry (4-lb Animal Unit)	0.4-0.6

Source: EPA



Nitrogen soil testing is limited to drier parts of the region. But scientists are working to expand the area.

Soil Testing for Bigger Profits

Profits — and the environment — are driving a growing interest in nitrogen soil testing.

In the future, Phil Rodriguez hopes to do what Lee and Francis Mayer did last year — trim their nitrogen bill by a whopping \$10,000.

But Rodriguez, who farms in central Minnesota, will have to wait awhile before using nitrogen (N) management methods the Mayers take for granted.

The Mayers, who farm near Mott, ND, relied on intensive soil sampling of their 3,000 acres of cropland to slice their N bill. (For more on the Mayers, see the story on page 13.)

BY JIM HOUTSMA

Analysis of 2' soil samples taken from representative 20-acre fields in the fall of 1988 showed 75-90 lb/a of available soil nitrogen, enough for a 30-35 bu/a wheat crop. Since the Mayers were shooting for a 40 bu/a yield, they were able to cut their normal anhydrous ammonia rates.

"Our testing really paid off," says Lee. "The bottom line is we want to know what our fertility levels are. N is our number-one (fertilizer) expense, so we don't overapply or underapply."

In the past several years, greater emphasis on reducing inputs and safeguarding groundwater from N leaching has made soil testing increasingly important, scientists and independent crop consultants agree. That's why it was selected as an Operation S.A.V.E. topic (see box for details).

Like the Mayers, Rodriguez also wants to save some money on N and protect the environment. And he believes that soil testing can help him do that.

But higher rainfall in eastern Minnesota can cause N leaching, making test recommendations less reliable than in drier regions.

OPERATION S.A.V.E.

So unlike farmers in the Dakotas and western Minnesota west of Highway 71, the Dalbo, MN, corn and soybean farmer doesn't have a standard N test to use.

University of Minnesota scientists are trying to develop one for central and eastern Minnesota. That's why they sampled Rodriguez's soils three times during the 1989 growing season. Samples were taken at five different depths in 1' increments in eight different test plots. They were analyzed for nine different forms of soil nitrogen.

Preliminary results of the tests were inconclusive. They showed varying soil N levels. And yield response to varying N applications was inconsistent.

For example, 180 lb/a of preplant N produced only 8 bu/a more corn than no N at all. And 150 lb/a of sidedressed N produced 1 bu/a less than a 60 lb/a N rate.

The results of the first year of the three-year study, which is a joint effort of the Minnesota Department of Agriculture and the U of M, are raising some questions about a new, widely publicized way of predicting N needs.

The test under question was developed by Iowa State University (ISU). It involves sampling soil



Rodriguez

to a 1' depth when corn is 6-12" tall. By delaying the test into spring, the effect of spring weather on N can be accounted for, an important factor in higher rainfall areas.

There's still time to sidedress N, if necessary. Nitrogen levels below 10 parts per million (ppm) indicate more of the nutrient is needed; levels above 21-25 ppm suggest there is adequate N.

The test can be analyzed on the farm with a special kit. It helped cut N rates on 23 Iowa fields by 62%, with no negative effect on yield in 1989.

However, like the Mayers' tests, those results may have reflected high residual N levels after the 1988 drought, experts say.

That's part of the reason why U of M scientists won't yet recommend the test. They say that in wet years, N could leach below the 1' test level, and still be available. For example, last year Rodriguez's fields showed residual N at 2'.

"We don't have any data to substantiate that the Iowa test works in that region," says Mike Schmitt, a U of M soil scientist.

No soil test is perfect, admits Alfred Blackmer, the ISU agronomist who developed it. But "our data is clear," he says. "So many farmers are so far over (their N needs) that we feel the test is ready to use."

In Iowa, where it's estimated that farmers apply a third more N than the corn crop needs, the test is widely recommended by ISU.

U of M scientists say they'll continue to study Rodriguez's farm, and the 11 other locations that are part of the study. After two more years, they hope to come up with a more comprehensive N test.

In the meantime, Rodriguez continues to use this rule-of-thumb N recommendation: 1.2 lbs/a of N for every bushel of his yield goal. A 1 lb/bu N credit is given for soybeans raised the year before. He also accounts for the N in manure he applies.

"We all want to be more efficient in the use of fertilizers, and to maintain yields and protect the environment," says Rodriguez. "It all boils down to the bottom line and the environment." □

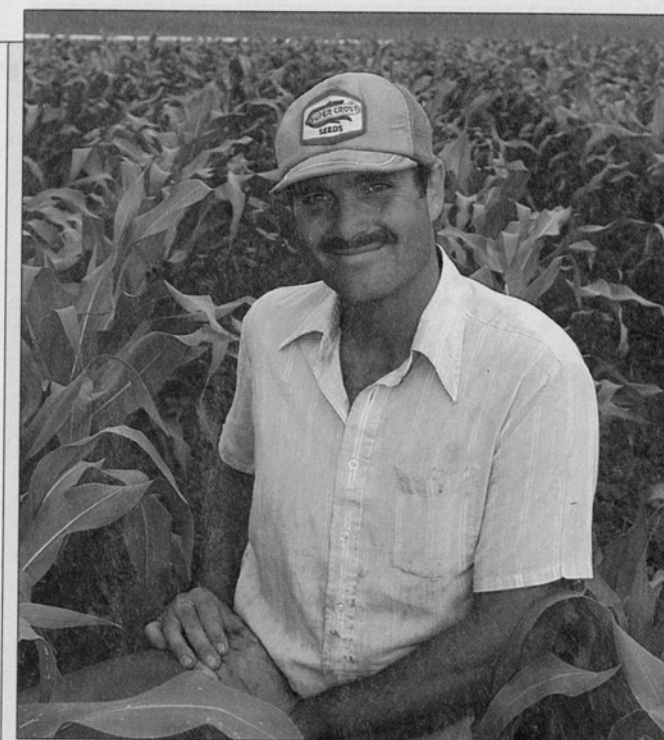
Soil Testing Information

For questions about soil testing, contact the following university laboratories. Private labs also can provide soil-testing services.

Soil Testing Laboratory, 1903 Hendon Ave., 135 Crops Research Building, University of Minnesota, St. Paul, MN 55108. Phone: 612/625-3103.

Soil Testing Laboratory, 201 Waldron Hall, North Dakota State University, Fargo, ND 58105. Phone: 701/237-8882.

Soil Testing Laboratory, Agriculture Hall, South Dakota State University, Brookings, SD 57007. Phone: 605/688-4766.



Dave Serfling says stalk testing could help him use nitrogen more efficiently in the future.

New Cornstalk Test Double-Checks N Rates

Added "crop coroner" to the list of skills you might need in the future to optimize fertilizer efficiency and reduce the chance of polluting groundwater.

This year, for the second year in a row, Dave Serfling will conduct a postmortem analysis on cornstalks as a check on nitrogen (N) rates.

If results turn out like last year's, he figures he might be able to cut N rates in the future.

"I wouldn't put this ahead of a soil test, but as a management tool, it gives you more confidence to go to the lower end of N recommendations," says Serfling, Preston, MN.

He and 12 other southeastern Minnesota farmers will test stalks this fall as part of a two-year study into N reduction and groundwater protection.

The stalk test shows nitrate-nitrogen levels in the stalks, which show whether N was under- or overapplied.

The procedure, developed at Iowa State University and tested there since 1986, is simple. Ten to 15 stalks are collected from a representative area 1-3 weeks after corn is black-layered.

An 8" section, from 6-14" above the

ground, is analyzed for N concentration. Amounts from 250 to 1,800 parts per million (ppm) indicate N applications were optimum. Amounts below 250 ppm show they were inadequate. Rates were excessive at concentrations above 1,800 ppm.

Experts are guarded on use of the postmortem test.

"Soil samples tell us one thing and stalk tests tell us another," says Gyles Randall, a University of Minnesota soil scientist.

A stalk test can tell if N was adequate in a given year, but it doesn't predict future N needs.

"But together, (the two tests) give you a broader picture of N utilization in your system," Randall says.

In Serfling's case, soil samples are taken to 1' depths when his corn is 6-12" tall. Sidedress anhydrous rates are adjusted accordingly. Rates were cut more than two-thirds in 1988 and '89 on fields with a history of beef manure or with legumes in the rotation.

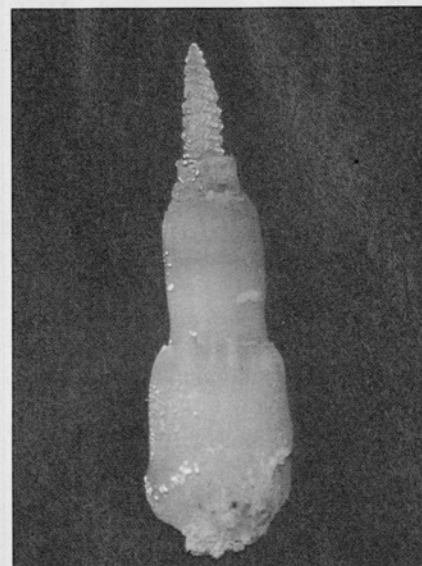
In 1989, Serfling's stalks showed nitrate concentrations of 3,000-10,000 ppm, indicating excess N.

"I'm pretty conservative, but if the test comes back like it did last year, I may be more aggressive in reducing rates," says Serfling. □

BY JIM HOUTSMA



Counting wheat spikelets can help decide whether extra inputs will pay.



A close-up view of spikelets.

In-Season Yield Estimates Refine Precision Wheat Feeding

*Counting spikelets
at the six-leaf stage
can boost profits
and reduce input
expenses.*

Profit-minded wheat growers are learning how to adjust fertilizer and chemical applications to a moving yield target.

By using spikelet counts to estimate wheat yields while the crop is growing, they are adjusting their nitrogen and fungicide programs as the crop's yield potential comes closer into focus.

MEY (maximum economic yield/most efficient yield) practitioners like Duane Finkenbinder, Crookston, MN, like precision wheat feeding mainly for its effect on the bottom line.

BY NORMAN SENJEM

It's also an answer to environmental concerns like nitrogen leaching, which makes it an ideal "Operation S.A.V.E." (Sustainable Agriculture that's Voluntary and Economical) topic.

For the past three years, Finkenbinder has been perfecting a system that could combine up to three foliar feedings with herbicide and fungicide applications.

Each year, he's counted wheat spikelets on a 15- to 20-acre MEY plot to determine eventual yield.

Finkenbinder normally applies three pounds of preplant nitrogen (N) for every bushel of wheat in his target yield — 180 pounds of N for his 60 bu/a yield goal.

But in his MEY plots, he's been holding back 40 units of N. He decides whether to topdress additional N based on in-season yield estimates.

For example, the first year, a spikelet count at the six-leaf stage told him to expect low yields. So he opted not to topdress N or apply a fungicide.

That decision ended up saving him \$6.65/a in N. But it cost him \$2/a in net revenue because, contrary to expectations, the conventional wheat produced 3½ bu/a more than the plot with less N.

Regardless, Finkenbinder is happy

that his MEY wheat was 3¢/bu more profitable than conventional wheat. He's sold on in-season spikelet counts and is waiting for the day they tell him to pour on more N to capture an 80 bu/a yield.

Counting spikelets is an estimate of wheat yields, not a hard-and-fast indicator, notes Ed Vasey, a North Dakota State University extension soils specialist.

Nevertheless, he says it's a good approach in deciding whether applying extra inputs will be profitable.

Making a count is a relatively simple, three-step process.

1) When the crop is between the fifth- and sixth-leaf growth stage, 30-40 days after planting, strip away the leaves from a stem. Feel for the uppermost node or joint with your thumb, and strip away the stem tissue to expose the developing head.

2) To determine the number of spikelets, remove the head from the stem. Using a magnifying glass, count the ridges on one side of the head. Multiply the number of side ridges by two, then add one more if a ridge has formed on top of the developing head. Do this on at least 10 plants per field, and take the

average, says Vasey.

3) Finally, calculate yield potential by multiplying the number of spikelets by three. Example: 15 spikelets × 3 = 45 bu/a. The estimate is based on 1 million plants per acre, a main head and two tillers from each plant, and two kernels from each spikelet.

After estimating yield, the next step is to determine whether the crop has enough N to produce the potential yield.

If the projected yield is lower than the one you fertilized for, the next step is easy: Don't apply N, fungicides or a growth regulator.

On the other hand, if the projected yield is higher than the yield you fertilized for, add 3 lbs/a of N for every bushel of extra yield, says Vasey.

Or, to be more precise, measure how much N is currently available to the plant from its tissue and the soil, adds Vasey. Above-ground plant analysis methods such as the near-infrared (NIR) test, and the N-TRAC nitrate soil test, can be used to determine just how much more N your crop needs.

If projected yield is 45 bu/a or more, it will usually pay to apply a fungicide, says Vasey.

This year, Finkenbinder is holding back 40 lbs/a of preplant N once more on a 20-acre MEY plot. But for the first time, he's combining tissue analysis and spikelet-counting to determine how much, if any, N to topdress.

At the three-leaf stage, he'll conduct an above-ground plant analysis to see if the crop has enough N. If not, he'll apply the 40 pounds of N in two shots, the first as a carrier for Bronate herbicide, and the second as a carrier for Hoelon.

If the test shows that the crop has enough N, he'll apply the herbicide with water, as usual, and save the expense of additional N.

Later, at the six-leaf stage, he'll count spikelets to see if an above-normal yield estimate justifies still more N. If it does, he'll put it on with a fungicide application.

The way Finkenbinder figures it, he can't lose. He can save up to \$10/a by reducing N applications if poor yields are projected. Or, he could earn many times that much by pouring on the N needed to produce above-normal yields, if that's what the tests project. □



Best of S.A.V.E.

Farmer Tips on Mechanical Weed Control

When we asked farmers to send in S.A.V.E. ideas, many responded with tips for substituting mechanical weed control for herbicides — in part, or in total. Whether you're on the road to organic farming or simply want to trim your herbicide bill, an idea listed here or in another *Best of S.A.V.E.* features in this directory could be worth a trial on part of your farm.

► **Tillage Tweaks Weeds.** When soil is ready for tillage, work lightly to stimulate growth. Then let it be until planting. Work again, then plant. On corn, drag or rotary hoe in 7 days — again if needed in 7 days. Then be ready to cultivate. Remember, it's how good a job you do, not how fast. — Kevin Todd Prink, Cannon Falls, MN

► **Delayed Planting.** Delaying corn planting by a week to 10 days helps control weeds. To kill weeds in corn ground, cultivate small grain stubble lightly early in the spring. That helps warm the soil to 45°F, which brings on the first flush of weeds. When the soil has warmed to 55°, the germinating temperature corn likes, field cultivate again, at 3-4" — deep enough to kill sprouted weeds but not to bring up more weed seeds. Then plant within 24 hours.

Waiting until the soil is at 55° gets my corn up about as fast as the weeds. In a good year, I produce 150 bu/a corn on my better fields.

Weed control is similar in soybeans,

except I may add a third preplant cultivation if lots of weeds are evident. I usually plant beans June 10-15, two weeks after normal for here. They germinate in 5-7 days and usually yield from 30-35 bu/a. — Carmen Fernholz, Madison, MN

► **Narrow-Row Wheat Crowds Weeds.** Starting this year, I'll use a homemade narrow-row drill to seed my small grains in 3½" spacings instead of 6-7" rows. That will let the grain form a thick canopy by the three- to four-leaf stage, crowding out all but the first flush of weeds and cutting chemical costs. It also might increase yields.

I took apart four used 14' John Deere LLA press drills, which had 7" spacings. I put them back together as two 28' drills, one welded behind the other. The front drill offsets the rear one by 3½". The result is a 28' planting unit with 3½" spacings. A big job! — Lyndon Minske, Hallock, MN

► **Rotary Hoe Tips.** Rotary hoe corn and beans early, before weeds come up in newly seeded fields, to kill white-rooted weeds before they emerge. Check soil daily, looking for fine, white roots of the germinating weeds that haven't yet broken the surface. When you see those roots, hoe. Ideal hoeing conditions are mid-afternoon on a sunny day when it's 75°F and there's an 8-10 mph breeze to dry out weed roots. — Carmen Fernholz, Madison, MN

Quicker Cultivation

I'm using a 9-19-9 starter. It gets the corn and beans out of the ground sooner, so I can cultivate quicker. And I'm just banding chemicals (no broadcasting). Also I'm split-applying nitrogen — once with the cultivator and then by foliar feeding when corn is waist high. I'm using 25% less N and still holding yields up there. I'm using a 21% N, which also is safer for the environment. — Scott Vaksdal, Canton, SD □



Incredible N Credits From Alfalfa

New research pushes nitrogen credits higher for good alfalfa.

You may not be giving your alfalfa credit where credit is due — nitrogen credit, that is. According to new University of Minnesota recommendations, a good alfalfa stand plowed under should count for a 150 lb/a nitrogen (N) credit for first-year corn. That's up from the old recommended N credit of 100 lbs/a. In areas where soil nitrate testing does not provide accurate fertilizer N recommendations, understanding of N credits is important. The soil nitrate test is recommended for the western third of Minnesota, roughly west of Highway 71, and in the Dakotas.

The new recommended N credits in Minnesota assume a well-drained silt loam soil with high organic matter. With a 150 bu/a corn yield goal, no additional N is recommended.

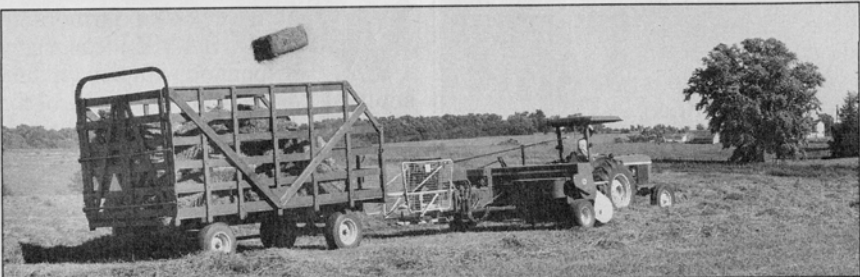
Farmers tend not to give alfalfa as much credit for providing nitrogen as they should, says James Gerwing, a South Dakota State University soils specialist. "It's hard to take that risk and they end up putting on more N than needed," he adds.

For the new N credits, the U of M defines a good stand as five or more plants/sq ft. SDSU defines a good stand as three or more plants/sq ft. A poor stand is worth only a 75-pound credit.

A second year of corn should get half, or a 75-pound credit, from a preceding good stand of alfalfa and 40 pounds from a poor stand.

Research in four southeastern Minne-

BY JOHN RITTER



Minnesota Nitrogen Recommendations for Corn When a Soil Nitrate Test Is Not Used

Yield Goal		Previous Crop					
		Alfalfa (Good Stand)		Alfalfa ¹ (Poor Stand)		Soybeans, Field Peas	
		Organic Matter ²					
		Low to Medium	High	Low to Medium	High	Low to Medium	High
Grain (bu/a)	Silage (ton/a)	N to Apply (lb/a)					
75 or less	10 or less	0	0	0	0	50	40
76-95	10-12	0	0	15	0	70	50
96-115	13-15	0	0	45	0	100	70
116-135	16-18	0	0	75	45	120	90
136-155	19-21	30	0	105	75	150	120
156-175	22-24	50	20	125	95	160	130
More than 175	More than 24	70	40	145	115	180	150

¹Recommendation for second-year corn after a good stand on fine- and medium-textured soil, as well as alsike clover, birdsfoot trefoil, grass-legume hay, grass pasture and red clover.

²Low to medium: less than 4.5%; high: more than 4.5%.

¹Recommendation for second-year corn after a good stand on fine- and medium-textured soil, as well as alsike clover, birdsfoot trefoil, grass-legume hay, grass pasture and red clover.

²Low to medium: less than 4.5%; high: more than 4.5%.

Source: University of Minnesota

sota counties showed that yield of first-year corn after alfalfa did not respond to N applications made in 40 lb/a increments from zero to 240 pounds.

Tests were conducted on well-drained silt-loam soils that had good stands of legumes the year before. They probably had histories of manure applications, too.

Previous recommendations were based on research from the late '50s and early '60s, says Tim Wagar, area extension crops specialist in Rochester, MN.

"But today farmers are managing their alfalfa better," he says. "Once they reach that third or fourth year, they're rotating back to corn. Maintaining that older stand isn't cost-effective."

The potential savings from the higher N credits might be \$6-7.50/a, depending on the N source used, says Wagar. "It's not so much a big economic savings as it is an environmental savings," he adds.

N credits for soybeans, peas and other crops remain unchanged. Soybeans are worth 40 lbs/a and red clover and birdsfoot trefoil qualify for 75 pounds.

Timing is critical, Gerwing says. That means plants should be killed in late summer rather than fall, so root masses have time to break down.

In South Dakota's drier climate, Gerwing says, lower-than-expected yields may be unfairly blamed on N levels. Often, the low yields are from lack of moisture. □

Define Your Terms

"Who can tell me what a nitrate is?" the teacher asked his ag class.

"That's easy," John said. "It's the low rate Dad uses after dark."

CHEMICAL EFFICIENCY

Farmer ingenuity is hard at work making every chemical ounce and dollar pay its way in today's agriculture.

Farmers contributed far more high-quality Operation S.A.V.E. tips in the area of chemical efficiency than in any other project category.

You'll find a variety of approaches to getting more bang for the ounce in this section. From drop nozzles and rope wicks to nighttime spraying and precision rotary hoeing, you'll find a host of ways to help you tackle more weeds with less chemical.

Of course, it must be pointed out that dipping below labeled rates can be risky. No company will stand behind its product in case of poor performance if the customer didn't follow instructions. And some practices that make economic sense for an organic farmer selling to a high-value market may not be profitable for farmers who rely on usual market outlets.

These cautioning notes aside, chemical rate-trimming clearly presents rewards and challenges that attract producers of all stripes. It takes finesse and good judgment to do the job with less.

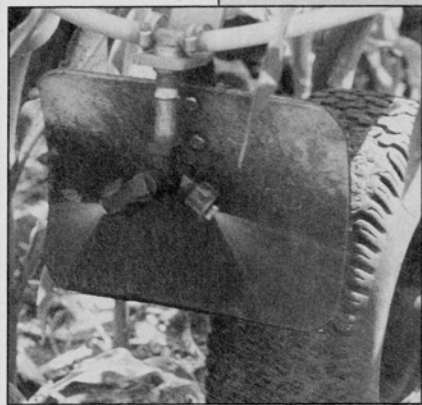
Trimming isn't always the name of the game, of course. As the article on precision farming points out, a program of regular scouting for insects and weeds can uncover a need for chemical treatment that otherwise would go unnoticed. The important thing is to match the treatment to the problem. Therein lies the challenge — and the payoff.



University of Minnesota entomologist David Andow and Don Nord, a Goodhue, MN, farmer, use an electronic scale to calibrate the insecticide meter on Nord's planter.

Perhaps in this area more than any other, it's wise to try new ideas on small fields, ask farmers or researchers about their experiences, and prepare a backup plan in case of failure. Because as rates go down, margins for error tend to shrink.

This section also includes many farmer-contributed tips. If you find an idea that strikes your fancy, we hope you'll pursue it further. But if you discover you're using a better method, please let us know by sending in your tip to the address on the back cover of this directory. □



Darwin Reyne, right, uses rope wicks to clean up weed escapes in soybeans. Drop nozzles, above, are used in corn.



Low-Risk Rate Cutting

OPERATION S.A.V.E.

Farmers, crop consultants and researchers are finding low-risk ways to cut herbicide rates without sacrificing yields.

Improving profits is a major motivation. Environmental concerns are a factor, too.

"It's not just a pocketbook issue," explains Luther Berntson, Adams, ND, one of the first in the Upper Midwest to no-till small grains.

It's also an issue of sustainability, he says. "Farming with the plow wasn't sustainable. Our topsoil blew away," he says.

Farming solely "with a can" isn't sustainable either, contends Berntson.

Berntson is experimenting with what he considers to be a better way of con-

trolling weeds: Light tillage, crop competition and low herbicide rates, when appropriate.

Other examples abound across the region, as farmers take a new look at production methods that are both economic and environmentally sound. They're all part of a movement we're calling S.A.V.E. (Sustainable Agriculture that's Voluntary and Economical). More stories on this topic are on the following seven pages.

Here are some of the examples of rate-cutting approaches being taken by innovative farmers:

Drop Nozzles, Rope Wicks

Darwin Reyne, Rushmore, MN, has cut the amount of herbicides he uses in corn and soybeans by half in the past five years.

Reyne, who farms 500 acres with his son, Jim, used to broadcast herbicides routinely.

Now he ridge-tills. Rather than broadcasting, he bands Lasso and Lexone over the row at planting. The rate, applied in a

14" band, is 1½ quarts/a, compared to 4 quarts/a broadcast.

Rather than spraying whole fields with postemergence products, Reyne cultivates corn and soybeans twice and spot sprays using drop nozzles in corn and rope wicks in soybeans.

On soybeans, the cultivator is rigged up with rope wicks over each row. Reyne devised his rope wicks, called Weed Attacks, five years ago and is now marketing them commercially.

Each wick, soaked with Roundup, brushes over weeds that poke through the soybean canopy. The wick wastes no chemical, applies herbicide only to target weeds and eliminates accidental chemical exposure, a problem that plagues bean buggy riders.

In corn, Reyne cultivates twice and spot sprays during each operation.

Spot spraying is done through drop nozzles mounted on the front of the cultivator bar. The nozzles are set 14" from the ground and are directed at the center of each corn row.

Coverage is excellent, especially dur-



Berntson



Anderson

ing the second cultivation, when the corn is knee high. At that point, the nozzles are positioned below the first corn leaf, he says.

Cultivation

Robert Anderson, Little Falls, MN, doesn't have much choice but to use as little chemical as possible.

Anderson grows irrigated corn, soybeans and potatoes on light, sandy soil. Chemicals not used by the crop could leach directly into the groundwater, he says.

And because he farms along Minnesota Highway 371, a main route from the Twin Cities to Brainerd-area lakes, he is extra careful about chemical use.

Vacationers don't like to see crops being sprayed, he says.

On corn and soybeans, Anderson applies the minimum labeled rates of pre-emergence herbicides at planting. On corn, he applies atrazine and Lasso; on beans, Sencor and Lasso. If it doesn't rain, he puts on ½" of water through the pivots to move the herbicides into the soil and to aid germination. He follows up with a rotary hoe and cultivates twice.

Weeds must be rotary hoed and cultivated while they are small, Anderson says.

Though rotary hoeing may take out some corn and soybean plants, it doesn't affect yields, says Anderson, who in 1988 won both the corn and soybean yield contests in the state's irrigated division. He increases planting rates slightly to compensate for possible stand loss.

Postemergence herbicides are generally the last tool Anderson reaches for. His mainstay is Fusilade for grass control in beans, but he uses it at the minimum labeled rate.

If a post herbicide is applied when weeds are small and the weather is good (warm, with high humidity so the weeds are growing vigorously), minimum labeled rates can be effective, he says.

"I don't want to use chemicals unless they're absolutely necessary," he says.

"It's better all around for the crops, my balance sheet and the neighbors."

Big Sprayers, Low Rates

Don and Bruce Ogaard combine a keen sense of timing and big sprayers to cut some wheat and sugar beet herbicide rates by as much as 75%.

The father and son raise 2,000 acres of wheat and barley, 750 acres of beets and 200 acres of either soybeans or dry, edible beans near Ada, MN.

Bruce says they have applied Hoelon at a half rate or less and gotten good control of wild oats in small grains. But the temperature must be 70°F or higher and the humidity 70% or greater. And wild oats plants must have one to two leaves.

The same principle applies to their use of Betamix and Betanex on sugar beets. When conditions are right, quarter rates (rather than half rates) applied in split applications can give good results.

If it's cold and cloudy, weeds won't be growing rapidly and herbicide uptake will be slowed, so reduced rates may not work as well. Another key to success is being able to spray all the fields while conditions favor low rates, Bruce says.

The Ogaards use a 95' pull-type Flex-Coil shielded sprayer for small grains and two 36-row sprayers for beets. The pull-type beet sprayers are equipped with homemade tunnel shields that apparently improve herbicide coverage by helping break the spray down into a fog.

"It might look as if we have too many sprayers," Bruce says. "But we learned that we had to be geared up to do it right. Otherwise, cutting rates would come back to haunt us." □

Calibration Card

Accurate sprayer calibration is crucial to efficient chemical use. An organization called ACRE (Alliance for a Clean Rural Environment) makes a pocket-sized laminated calibration card. It lists eight calibration steps on one side, and matches driving distances to nozzle spacings on the other.

For a free card or for water-quality information, call ACRE at 800/545-5410.

Water Hotline

For answers to questions about your drinking water, call the Environmental Protection Agency toll-free hotline during business hours: 800/426-4791.

Reduced-Rate Success Checklist

Plan ahead if you want to try to reduce herbicide rates this spring.

There are several details to nail down long before you pull a sprayer into a field.

Paul Miller, a consultant who operates Agro-Economics, Waseca, MN, and Jeff Gunsolus and Bev Durgan, University of Minnesota extension weed specialists, offer the following checklist:

- Focus rate-cutting efforts on high-cost chemicals. In most cases, postemergence chemicals are the best bet for rate-cutting. Unless there are environmental or rotational considerations, it makes little economic sense to attempt to trim your least-expensive herbicides. They're usually cheap insurance.

- Go slow. Plan to trim rates only slightly the first year on a small field or part of a field. Don't drop from a full rate to a half rate on the whole farm this year. Experiment to see what works for you.

- Identify target weeds and select the right herbicide. The more susceptible the target weed to a particular herbicide, the more likely reduced rates will work.

- Monitor weed populations. Reduced rates work best when attempting to control low levels of weeds. Heavily infested fields, such as ones coming out of set-aside, aren't good candidates for low-rate herbicide treatments.

- Evaluate growing conditions. Weeds have to absorb most foliar herbicides to be killed by them. So it's best to try reducing rates when the weather is warm and humid, conditions under which weeds grow rapidly.

- Spray early. The smaller the weeds, the better. It may be worthwhile to spray with reduced rates, even if all the weeds haven't emerged. In soybeans, this means you should be ready to spray 14 days after planting, rather than the traditional 21-28 days, for example.

- Be ready to cultivate row crops. Odds are that you will get better weed control if you cultivate.

- Know the risk. It's legal to apply less chemical to a crop than the label recommends. But if you spray below-label rates, the company has no liability if the treatment doesn't work. □

Practical Farmer Tips on Sustainable Agriculture

Since January 1990, *THE FARMER* and *THE DAKOTA FARMER* have asked farmers in Minnesota, North Dakota and South Dakota to share in accomplishing the goal of Operation S.A.V.E. — to let farmers play a big role in defining and shaping sustainable agriculture, rather than letting non-farmers take the lead.

We've collected the best of these ideas for this *Best of S.A.V.E.* feature to advance this process. Now, you can help by gleaning through these ideas to see which ones might work for you — at first probably on a limited trial basis, and eventually perhaps as part of the way you farm.

Just as important, if you have another good sustainable agriculture idea, let us know by writing: Operation S.A.V.E., *THE FARMER/THE DAKOTA*

FARMER, 7900 International Drive, Minneapolis, MN 55425.

► **Safeguard Dugouts.** Farm dugouts should have a ridge of dirt around them so no runoff from fields sprayed with insecticides or herbicides can flow into them. Most dugouts are fed from a vein of water, so pollution can foul the vein and any wells downstream. My neighbor's dam broke a few years back. He lost three cows when they drank the poison water. Those poisons cannot naturally deteriorate in the bottom of a pond or dugout. — Anthon J. Begeman, Parker, SD

► **Intertilling Sugar Beets.** I'm intertilling sugar beets in grain stubble, using two specially designed machines to band on herbicides and band in nitrogen and phosphate. I till a black 7"

wide strip in standing stubble. Benefits are: 1) no wind erosion; 2) runoff water is held back in spring; 3) snow catch for added moisture; 4) one-third of normal chemical rate applied effectively; 5) nitrogen utilized efficiently; 6) young seedlings protected from winds; 7) two-wheel-drive tractors instead of gut-wrenching tillage, and consequent fuel savings; 8) two fall trips across the field instead of five or six. — Lonn Kiel, Crookston, MN

► **Weed Seed Box.** To eliminate the use of chemicals, we must stop our combines from spreading all the foul seed back on the land to sprout and grow again, requiring chemical control. We did not need chemicals in the early days, because the old threshing machines blew the foul seed in the straw pile. We must tie a forage box behind the combine to catch the foul seed, and dump it at the end of the field to feed or burn. Like a commercial forage box, but wider and stouter. — Milo Hensler, Grace City, ND

► **Aerate Grain.** Having a fully aerated floor in grain bins can probably eliminate the need to fumigate for insects. Especially if the bin also has a Stir-ator to mix the grain occasionally. — Richard Eltgroth, Sauk Centre, MN

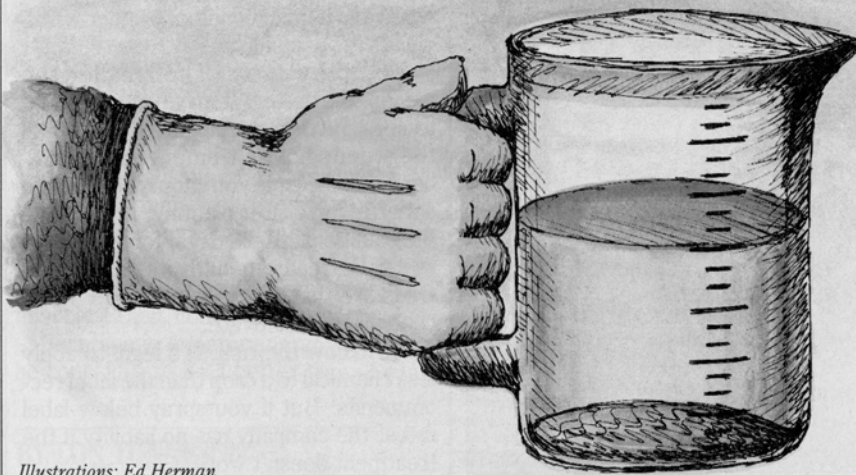
► **Low-Cost Weed Control.** On corn, use low rates of herbicides in bands for grass control in combination with cultivation. Low-rate banding will thin and slow the growth of grass enough so that the cultivator will get the grass in the row. Band just the earlier-planted fields. The most economical broadleaf control is still 2,4-D. Save chemicals like Banvel for problem fields, and spot spray. Also rotary hoe.

On soybeans, low rates of Treflan work well for grass control on rowed beans. For broadleaf control, banding herbicide is more economical. Try to

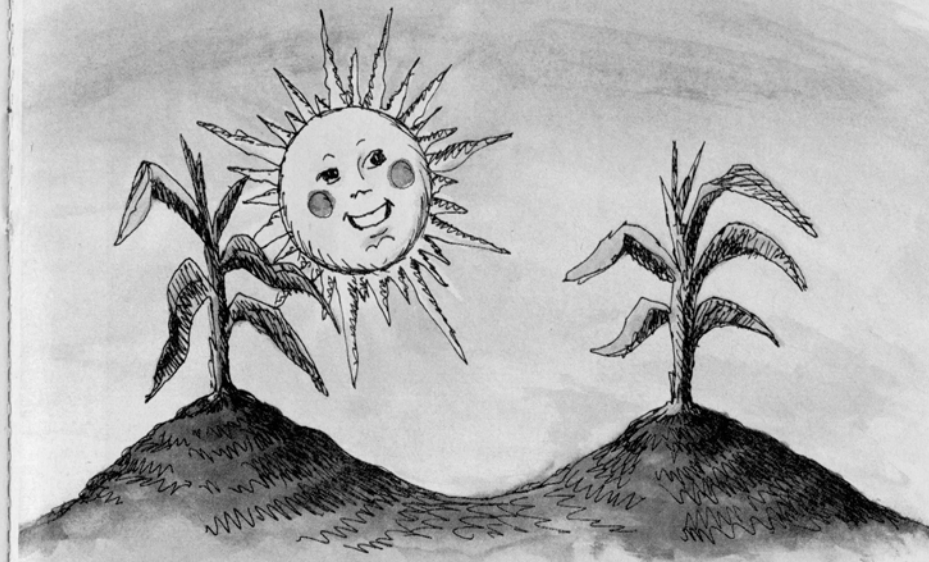
I also tested half-rate insecticide for corn rootworm control in 1989 and had no control differences between full and half rates. I do not use any insecticide on first-year corn following alfalfa hay. — Mike Rupprecht, Lewiston, MN

Half Rates Work

The past four years I've tested reduced-rate herbicide use on corn and have yet to see any control differences between full rates and reduced rates (down to one half of recommended rates).



Illustrations: Ed Herman



Whack Chemical Costs

Switch from conventional tillage to ridge-till and save \$40/a each year. Meanwhile, surface organic matter will increase and erosion will be controlled. Save 73% of herbicide costs by switch-

ing from conventional tillage and broadcast herbicide to ridge-till and 8" bands. Apply the herbicide with the planter and ridge-till cultivator with tiller disks set 3" from row. — Winton Nelson, Litchfield, MN

spot spray with a field sprayer if weeds aren't too widespread. — Dale Biterman, Delmont, SD

► **Double Boom for Spot Spraying.** To cut herbicide use, mount a second boom and chemical-supply tank on a sprayer, and spot spray for certain weeds like quackgrass that require herbicides more expensive than 2,4-D. When the sprayer reaches a quackgrass spot, a valve is activated to spray the spot as the regular boom sprays 2,4-D. — Lloyd Twite, Minot, ND

► **Partial Tillage.** We chisel end rows in fall and leave stalks until spring. In spring we disk as early as possible, when conditions permit, then leave the ground unworked for a week. That way, some of the grasses and early weeds germinate. Then we cover the field again with a tandem disk, and plant using a band applicator. This method saves chemicals. — Allen Willers, Beaver Creek, MN

► **Dry Dams Across Waterways.** In glaciated areas the topography is too irregular for terraces. And grass waterways are sometimes impractical. In the last 20 years I have built about 40

"dry dams" or dikes 4-16' high in my cultivated fields. They hold water back temporarily to allow sedimentation. Then water drains out through a pipe or culvert in the bottom of the dike so the land can be farmed. Water is "stepped" down a waterway through a series of dikes that can be pushed up easily with a farm tractor loader. Cost share may be available, but current SCS engineering specs are excessive. So farmers may wish to do it on their own. Mine are serving very well. — Ardon Herman, Brinsmade, ND

► **No-Till Fallow.** The best way to save residue is to no-till fallow. Also, straw from heavy crops could be spread on fallow ground. — Lloyd Twite, Minot ND

► **Paper Over Weeds.** As a method of weed control on newly planted trees, an inexpensive and innovative alternative to chemical use has been developed by simply using cardboard ends of paper rolls from paper presses (or other large cardboard pieces). By making a 1/4" slit from the edge to the middle of the 38" round and inserting the tree into the slit, you provide a cardboard mulch to suppress weeds.

These new weed-control devices can be purchased for 15¢ apiece from Snowy Pines Reforestation, Rt. 3, Browerville, MN 56438. Or, make them yourself. — Cindy Beving, Elbow Lake, MN

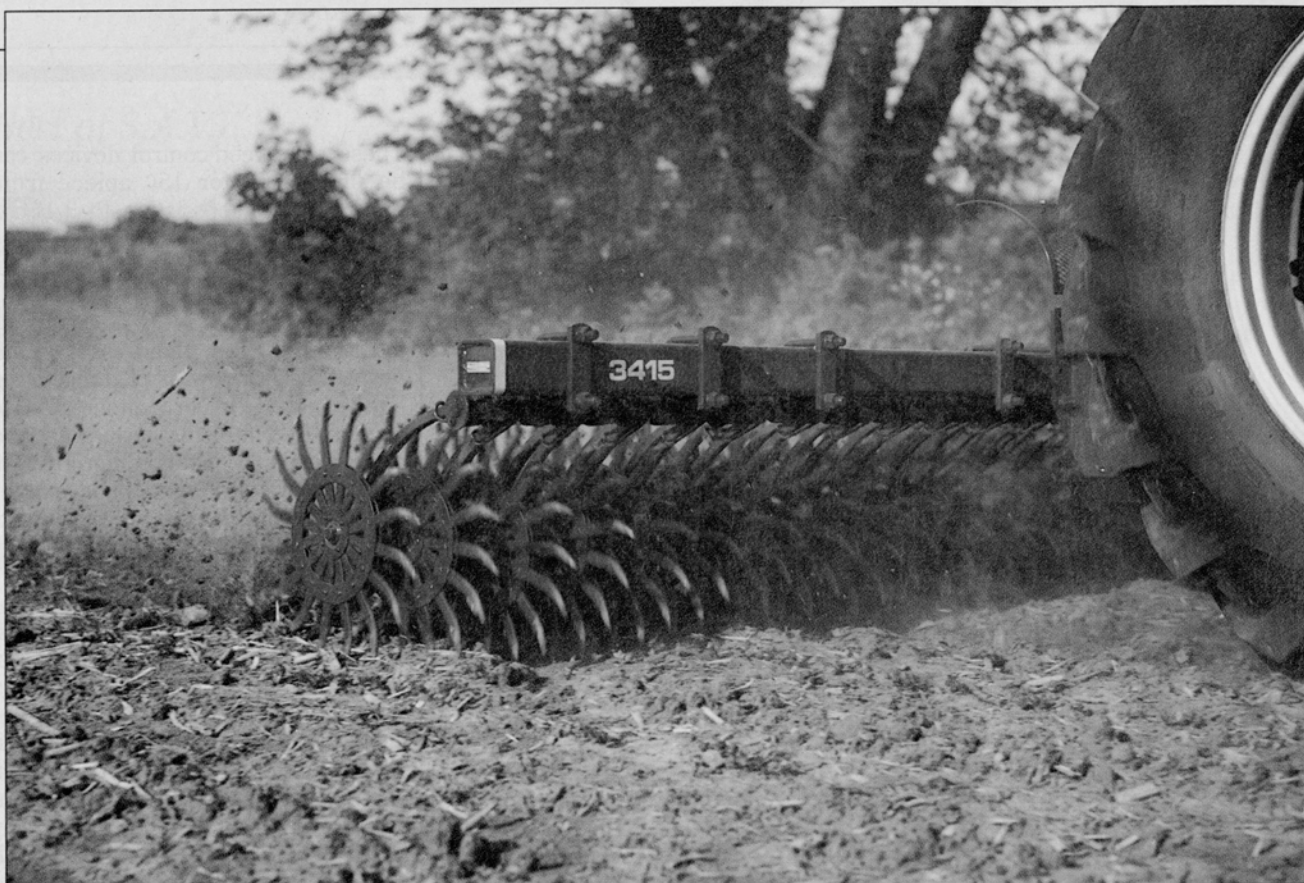
► **Banding Plus.** Band a 14" swath down the corn row at planting. Drag lightly before the corn comes up. Use a rotary hoe after the corn is up, and when weeds are just coming through. Cultivate twice and use a band sprayer attachment on the cultivator the second time through. — Harold Schroeder, Meridan, MN

► **Easy Planter Modification.** Most farmers in my area still plow their cornstalks, chisel plow their bean ground and use disks extensively — all because their planters can't handle the residue. I mounted danish tine cultivator shanks with 1" points on the front bar of my Max-Emerge planter, directly in front of each row. These points kick the stalks out of the way so the planter doesn't press the residue into the seed trench. Now I do not have to do any heavy tillage. I haven't plowed in 10 years. The total cost was \$25. — Michael Lebrun, Wilmont, MN

► **Cover Your Tracks.** Instead of chisel plowing all of the soybean ground, we just chisel where the combine tracks are. A lot of the residue is mixed into the soil (mulched), but the two to three rows on the outside remain undisturbed. It saves a lot of time and fuel, and seems to dry well the following spring. — Tom Kuehl, Ormsby, MN

► **Rotate Religiously.** Rotate corn and soybeans so no insecticide is used. Band herbicide to cut usage. Split-apply anhydrous ammonia according to soil test, once at preplant and once at cultivation. Do not use N-serve as it destroys soil microbes. Also band P and K fertilizer to cut down on groundwater contamination. — Jon W. Brower, Claremont, MN

► **Attitude Is Key.** Be open-minded — that's probably more important than any S.A.V.E. tip. You must start to use products not endorsed by universities, but beware. . . . Try to find someone local you can trust. Also remember that learning can be uncomfortable, but very rewarding. — Todd Prink, Cannon Falls, MN □



Rotary hoeing when weeds are in the white stage can significantly improve herbicide performance, especially in dry weather.

Rotary Hoe: A Dry-Year Show-Off

After "tremendous" results last year, the Stensruds plan to hoe their corn again if it's dry.

OPERATION S.A.V.E.

Rotary hoe your way to better weed control.

That's advice from a growing number of agronomists in Minnesota and the Dakotas.

Rotary hoeing can help herbicides control weeds, especially when it's dry.

"It gave us excellent weed control in our corn last year," says Rodney Stensrud, Cottonwood, MN. He and his brothers, Larry and Donnie, grow corn, soybeans, wheat and navy beans.

The Stensruds have always rotary hoed problem cornfields and navy beans, which are tough to keep clean because there are only a few herbicides approved for use on the crop.

But last year their crop consultant — Leo Langer from Centrol at Cottonwood — found weeds germinating through

Eradicane and other herbicides. He recommended rotary hoeing all the corn, too.

"The results were tremendous," Stensrud says.

Some cornfields in the area were plagued by weed escapes, he says, but the fields they rotary hoed stayed clean.

"If it's dry after planting this year, we'll probably rotary hoe all the corn automatically," Stensrud says. They don't hoe their soybeans, which are solid seeded, because of potential wheel traffic damage.

It costs the Stensruds \$2-3/a to run their 30' rotary hoe. Those costs are offset somewhat by lower costs for other operations. They're able to apply the low end of the label rates of herbicides and still feel confident they'll get good weed control. Plus, they can delay or eliminate the first cultivation.

"It's cheaper to run a rotary hoe than a cultivator," Stensrud says. "It's faster and repair costs are lower."

Rotary hoeing also ups their odds of settling herbicide failure claims favorably. Some labels now require fields to be rotary hoed if it doesn't rain seven to 10 days after application, Langer says.

"Most companies are requiring that a field be rotary hoed before they will even look at it on a performance complaint," he says. "They feel the grower has to do his part by mechanically helping the herbicide when field or weather conditions are not ideal."

Though rotary hoeing has been around for a while, there are some new ideas on how to get the most out of the operation.

Langer offers the following tips:

- Time rotary hoeing carefully.

A rotary hoe, drag or harrow is most effective when weeds are at the "white stage." This is when the weeds have germinated, but have not yet emerged from the soil.

An old rule of thumb is to rotary hoe if no significant rain occurs within seven to 10 days after planting corn. But Iowa State University specialists say that this may be too late; they suggest rotary hoeing three to five days after planting corn if it doesn't rain.

"Daily monitoring of weed growth is the surest way to time the rotary hoe," Langer says.

If you have to delay hoeing, or if the weather is wet before or after rotary hoeing, the operation won't be as effective.

- Weigh stand loss potential.

The rotary hoe rarely does serious damage to corn, even when it is spiking.

But rotary hoeing when soybeans are in the early crook stage will reduce stands, since the soybean plants are easily broken off at this stage.

Rotary hoeing before the soybean crook is at the soil surface is usually better for weed control and much easier on soybeans.

Check the crop when rotary hoeing, but don't be scared off too easily. Damage to the crop usually looks much worse than it is.

"The right herbicides with timely mechanical weed control can increase crop safety and reduce input costs," Langer says. "Both herbicides and mechanical weed management are usually necessary if weed control is to be successful." □

Best of S.A.V.E.

Farmer Tips on Sustainable Farming

► **Spread Out Spreader Weight.** Soil building does little good if soil becomes compacted while adding nutrients. We haul considerable manure and have developed a system to minimize compaction: 1) When possible, spread when ground is dry or frozen enough to prevent compaction. 2) Plan your haul roads; don't double back with an empty if you can exit the field at another driveway. 3) Also, road ditches usually make good haul roads to the point of entry into the field. — Delton Wordes, Renville, MN

► **P and K Every 2-3 Years.** If you make larger phosphorus and potassium applications every 2-3 years instead of annually, you will save money. The exceptions for potassium would be on sandy soils or where no-till is used. Naturally, this is intended only when the soil is built up to the right fertility. — J.E. Terzich, Hibbing, MN

► **Check Valve.** I installed a check valve in the hose I use to fill the sprayer as a preventative to back-siphoning if the hose end gets into the spray and the electricity goes off at the same time. — Richard Eltgroth, Sauk Centre, MN

► **No More Fertilizer.** I have substituted legumes, plowdown and manure for purchased fertilizer, and cultivation for chemicals for controlling weeds in corn. I did this 15 years ago after getting a bad reaction while mixing herbicides. That, along with a corn, small

grain, alfalfa, alfalfa rotation, has boosted organic matter, cut compaction and improved water-holding capacity. I have almost eliminated erosion, and corn yields haven't suffered. — Dave Minar, New Prague, MN

► **Cutting Rates, Not Yields.** I have found that by cutting back on pesticide use and reducing the rates of commercial fertilizer, I have not reduced my corn or soybean yields. I am using Na-Churs liquid fertilizer, one of the most environmentally safe products on the market. I had a complete soil test done so that the proper quantity of nutrients was applied, no excess amount. I also have been maintaining contact with the Minnesota Department of Ag on information about effective pesticide management and for waste pesticide disposal. — Douglas Venekamp, Verdi, MN

► **Black Out Thistles.** Why not use 6 mil black plastic to cover small patches of Canada thistle instead of making repeated chemical applications? Stake the plastic firmly over the patch and ballast it with dirt. Keep it covered until the lack of sunlight has killed all the plants. — Robert Christensen, Kennebec, SD

► **Injection.** I inject liquid manure whenever possible to reduce air pollution and to save more nutrients for the crop. — Richard Eltgroth, Sauk Centre, MN

Set-Aside Clover

On acres that I have determined will be set-aside acres the following year, I seed sweet clover directly into wheat or barley stubble as soon as harvest is completed. Seeding must be completed before Aug. 10 for the sweet clover to overwinter. — Robert Amstrup, Northwood, ND □





Up-close farming means looking at the right time in the right place for the right pest, as shown in the wheat and corn fields here.

Precision Farming Cuts Costs, Boosts Pest Control

Regular scouting helps time applications for maximum effect, minimum cost.

BY NORMAN SENJEM

For Everett Gilbertson, field scouting is the key weapon in his arsenal against insect and weed pests.

By scouting, he has been able to prevent potentially devastating damage from grasshoppers, armyworms, leafhoppers and other insects — with minimal insecticide use. And he's been able to slice herbicide rates in half, in some cases.

Along with a growing group of farmers, Gilbertson, who farms near Battle Lake, MN, has found that scouting — the topic of this issue's S.A.V.E. feature — is a way to boost profits, reduce total input use and leave a smaller footprint on the environment. (See the box on the

next page for more details on S.A.V.E.)

A former vo-ag instructor, Gilbertson says his college training and six years of teaching helped give him the background to scout crops. But anyone who can read and has the initiative to look for telltale signs of pests can benefit from scouting, the dairy farmer says.

Scouting has concrete benefits for each of the crops Gilbertson grows on his 400-acre farm. Three years of alfalfa are followed by two years of silage corn, a year of soybeans and a crop of barley or oats underseeded with alfalfa.

Hoppers and Armyworms

Gilbertson's scouting strategy aims at



Clara City, MN, farmer Scott Gerdes (right) checks a soybean leaf for spider mites with the help of Control consultant Larry Braem.



Gilbertson

preventing damage: "The earlier you treat, the better return you get," he says.

He looks for grasshoppers about the first week of May, when they first become visible. If he counts more than 50-70/square yard, he treats with malathion in time to prevent damage.

Curled alfalfa leaves signal a leafhopper infestation. He checks leaves low on the stem before the first cutting. If leaves are curled, he looks in earnest for more of the dandruff-like insects. If the insect count exceeds 25-30/square yard, he sprays.

Last year was the second time in 10 years that his diligence detected a serious leafhopper problem. Early control prevented crop stunting, yield and quality losses.

If the spring is wet and stormy, with strong southerly winds, Gilbertson turns his attention to armyworms. An undetected outbreak can leave a crop of wheat or barley looking like a hailstorm struck.

Before the crop heads out, Gilbertson checks the nearest clump of foxtail in a small grain field. That's where platoons

of armyworms may be camping under the moist protection of a thick canopy. He parts the stems, searches the ground for castings, and sprays if he spots some.

Gilbertson last spotted armyworms in the mid-1970s. But every year he's on the lookout for a sneak attack.

Rootworm Rollercoaster

Over the years, Gilbertson has become more convinced that scouting is far superior to the "generic" solutions that depend on what happened last year — or on what the neighbors are doing.

Steve Sodeman, a crop consultant from Trimont, MN, agrees, pointing to changes in rootworm problems facing his clients over the years.

"Five years ago, I probably would have said 90% of the fields don't need to be treated (for corn rootworms)," he says. "Now, we're saying it's more like 20% that don't have to be treated — because the beetle numbers have changed."

On his farm, Gilbertson keeps rootworms at bay in true IPM (integrated pest management) fashion — with dairy manure applications.

He's had no problems even after raising corn for three years running — a result he attributes to red spider mites that thrive on manure and rootworms.

University of Minnesota entomologist David Andow says the spider mite role isn't clear, but research and farmer experience suggest a connection between manure and low root injury.

More research is needed to sort out the influence of soils, soil organisms and manure types, says Andow. But he knows of five southeastern Minnesota farmers who report low root injury from second-year corn where manure is applied and no insecticide used.

(Andow is looking for at least 10 more farmers with similar experiences. He can

be reached at the Department of Entomology, University of Minnesota, St. Paul, MN 55108.)

Waiting on Weeds

The most dramatic part of Gilbertson's weed control program is rate-cutting. By spraying in the evening, when the air is calm and plants are breathing instead of growing, he gets good results from rock-bottom rates of post-emergence herbicides. He applies ½ pint/a of MCPA in barley, ¼ pint/a of Banvel in corn and wheat, and ¾ pint/a of Blazer (mixed with ammonium sulfate) on soybeans.

But low rates are just part of the program, which combines crop rotation, cultivation and chemicals.

Alfalfa chokes Canada thistle and lets him zap quackgrass patches with Roundup at the end of the final year in the rotation. Weed control in soybeans and corn keeps wild oats from gaining an upper hand in small grains.

He scouts for weed seedlings to time rotary hoeing for maximum impact. In early morning, he looks for a purple haze on the soil surface in the case of lambsquarters and pigweed, and for a frosty appearance in the case of foxtails and other grasses.

Combined with regular field scouting, Gilbertson says his crop rotation suppresses weeds enough that he can get by with low-cost chemicals with spectrums just broad enough to cover his problem weeds.

"You not only have to scout the fields, you have to scout the chemicals, too," he says. □

IPM Information

For information on integrated pest management demonstration programs and practices for your area, check with these specialists:

Kenneth Ostlie, extension entomologist, 219 Hodson Hall, University of Minnesota, St. Paul, MN 55108. Phone: 612/624-9272.

Paul Johnson, IPM Coordinator, Agriculture Hall 237, Box 2207A, South Dakota State University, Brookings, SD 57007. Phone: 605/688-4595.

Marcia McMullen, IPM Coordinator, Walter 306, Box 5012, North Dakota State University, Fargo, ND 58105. Phone: 701/237-7627.

HIGH-TECH SUSTAINABLE AG

An idea called "High-Tech Sustainable Agriculture" could advance the goal of Operation S.A.V.E. — to help farmers *shape* and *define* sustainable agriculture.

As the article at right explains, High-Tech Sustainable Agriculture suggests that new technologies in weed control, equipment guidance, soil mapping and other areas can lead to new solutions to environmental concerns in farming. We are indebted to Dwayne Beck of South Dakota State University for pointing this out in compelling terms.

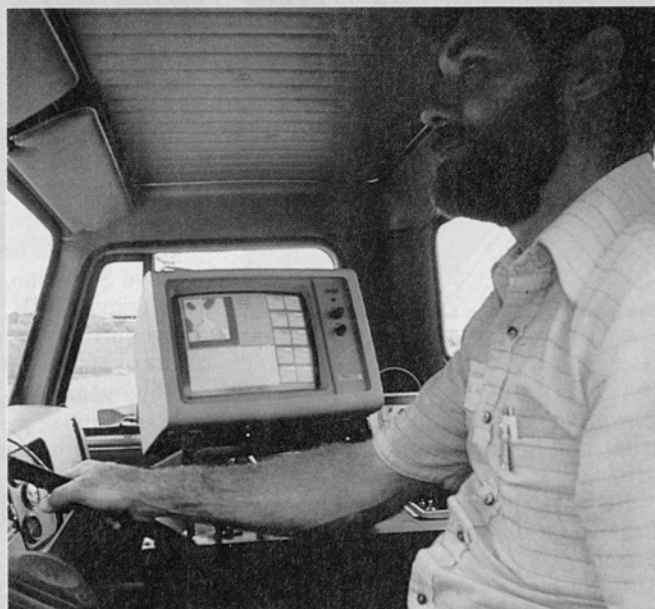
High-Tech Sustainable Agriculture has two components, or layers.

The foundation layer is soil and water conservation achieved through minimal soil disturbance — no-till and ridge-till, for example. By increasing the soil's infiltration potential, while leaving a maximum of surface residue intact, these conservation measures stop a prime source of groundwater pollution in its tracks — field runoff.

The second layer consists of precision chemical application technologies for fertilizer and chemicals — including the herbicides required to make no- and low-till methods work.

High-Tech Sustainable Agriculture challenges the notion that it's *always* a good idea to reduce chemical use, if doing so doesn't result in lower yields. It points out that mechanical weed control may achieve herbicide savings at the expense of soil structure, erosion control and field runoff curtailment.

In line with the main idea of High-Tech



A digital soil map drives this fertilizer spreader, which changes rates on the go as the spreader moves from one soil type to another across the field.

Sustainable Agriculture, next year's Operation S.A.V.E. will emphasize new developments in planting and tillage systems, plus residue management pointers. Also, look for articles dealing with new precision-rate technologies in weed control and fertility.

Starting early next winter, we hope you'll join us as a reader and contributor for another round of farmer ideas that can shape sustainable agriculture with voluntary, economical methods. □

The High-Tech Road to Sustainability



Researcher Dwayne Beck told Farmfest visitors that new technology can help the environment. Beck conducted a series of tours sponsored by THE FARMER/THE DAKOTA FARMER at the southern Minnesota show.

Technology can boost profits and protect the environment, this researcher argues.

A high-tech road to sustainable agriculture can help keep farming profitable, topsoil deep and groundwater clean.

That's the message from Dwayne Beck, a South Dakota State University researcher who prefers the tractor cab to the ivory tower.

"We can cut chemical use more by using technology to get more bang for the ounce than we can by trying get a

guy to leave half of his land organic," says Beck. "And we can keep our production up and our efficiency up, and not take land out of production."

It's an approach he calls High-Tech-Technology Sustainable Agriculture — HITSA for short.

Beck agrees with LISA (low-input sustainable agriculture) advocates on at least one point — the importance of crop rotation. He says that rotations are the key to making no-till work. And he considers no-till to be one of the prime high-technology solutions to environmental problems.

Beck has conducted most of his long-term tests of no-till and ridge-till at a Redfield, SD, experiment station. This year, he's shifted his operations to a new research farm near Pierre.

In developing a "high-tech, sustainable" farming system, Beck tries to:

- Substitute technology for tillage;
- Use precise applications of fertilizer and chemicals; and
- Design crop rotations to match a water budget and weed population.

His systems score high environmentally and economically, he says.

Beck has discovered that after four to five years of no-till, high populations of earthworms burrow through even tight soils. The topsoil turns into a sponge, and virtually stops field runoff, he says. Ridge-till results are less dramatic, but still significant.

Runoff curtailment is critical, says Beck, because runoff is by far the main ag source of water contamination. Plus, high infiltration rates result in efficient soil moisture storage, good aeration and less ponding in wet weather — all contribute to high yields.

Herbicide timing and precision application help Beck to get more weed control with less product — a trend he expects to continue as technology improves.

Early preplant treatments of Pursuit on soybeans, plus evening spraying of post-emergence herbicides like Banvel on small grain and corn, are two management methods he uses to cut rates.

A direct-injection system allows water and individual herbicides to remain in separate tanks until just before the spray hits the ground. It adds to minimum-rate accuracy by allowing for rate adjustment and product selection on the go.

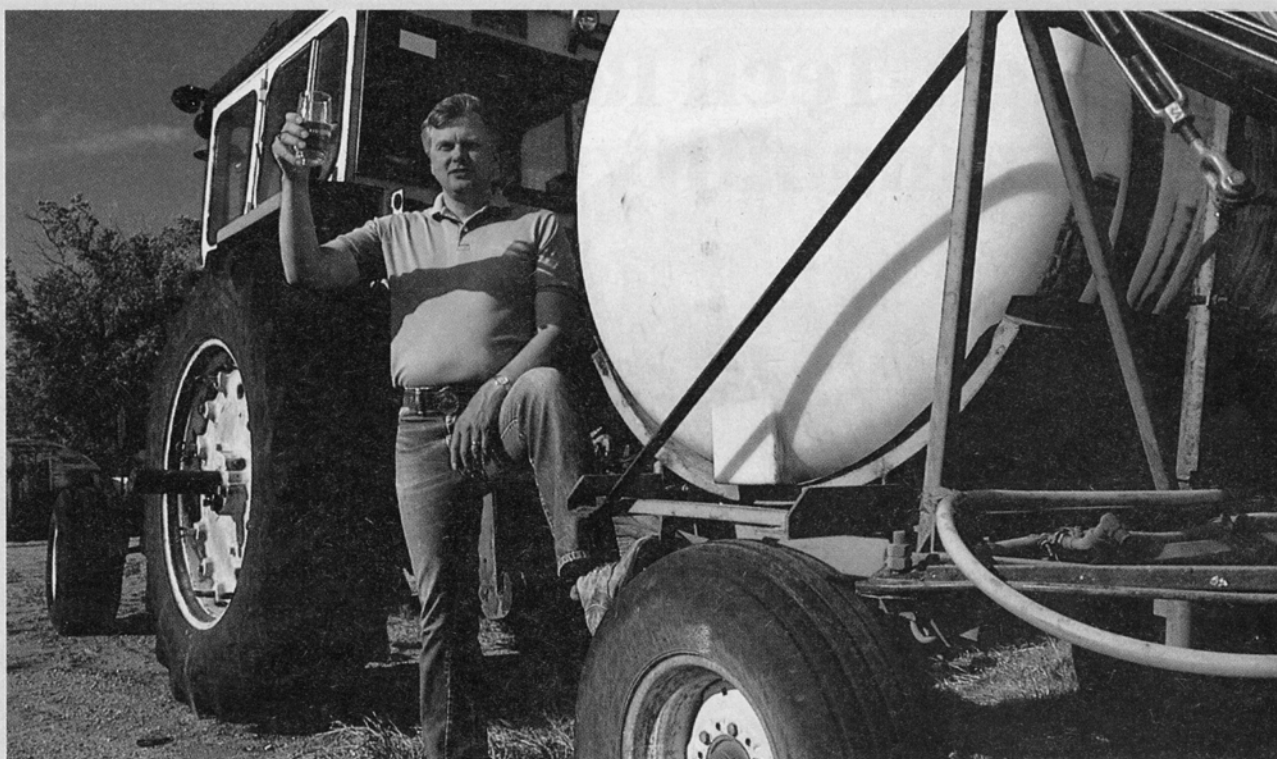
Plus, it improves safety because herbicides are mixed with water in the hose downstream from the spray pump.

A computer console changes herbicide injection rates in sync with ground speed variations. Eventually, he hopes his direct injection system will be able to read a computerized field grid showing where insects and weeds are located, and how soil type varies.

That type of technology already exists for fertilizer application, he points out. Fertilizer spreaders equipped with a Soil Teq system read digitized soil maps and change fertilizer rates according to what each part of the field requires.

"It's hard to do that with a manure spreader," says Beck. □

BY NORMAN SENJEM



Back to the Future

What is Atwater, MN, farmer John Williamson doing with a glass of cold, clear water next to his spray tank? Posing, obviously, for an exhibit poster we've used at farm shows and state fairs where we've asked farmers to fill in an "Environmental Farming Scorecard." Williamson, a member of the Minnesota Board of Water and Soil Resources, agreed to be the first farmer to complete the scorecard. With only a little prodding, he then raised a toast to clean farming!

We're running the photo here as a reminder of how far we've come a little more than a year later. It was the enthusiastic response of hundreds of farm show visitors who stopped to take their "E-Score," as we called it, that led to the launching of "Operation S.A.V.E."

Farmers like Williamson convinced us

that if innovative, concerned farmers pooled their knowledge, farmers collectively could shape and define sustainable agriculture along practical, economical lines. The quicker this happened, we reasoned, the greater would be the chances to avoid unnecessary regulation.

The first year of Operation S.A.V.E. confirms our first impression that farmers already are testing, refining and using a whole host of farming practices that fit most anybody's definition of what's sustainable. In coming months, we'll continue gathering and sharing farmer ideas through Operation S.A.V.E. in *THE FARMER/THE DAKOTA FARMER*. You can contribute by sending your farming tips to:

Operation S.A.V.E., *THE FARMER/THE DAKOTA FARMER*, 7900 International Drive, Minneapolis, MN 55425.

The Operation S.A.V.E. 1990 Farmer's Directory has been funded by the Environmental Agriculturalist Education Program through the Minnesota Board of Water and Soil Resources, a state government agency. It may be reprinted in whole or in part without payment or prior permission from The Farmer/The Dakota Farmer.



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DATE: October 18, 1990
TO: Board Members, Staff, and Advisors
FROM: Jim Birkholz, Executive Director
SUBJECT: Supplemental Information for
October 24th BWSR Meeting

Please note that this is supplemental information for the October 24th meeting. Please take time to read through the material and bring this information with you to the meeting. Thank you.

NOTICE

This is a supplemental mailing for the October 24th BWSR Meeting. Attached you will find the staff recommendation for funding of the 1990 RIM Reserve sign-ups. We make this recommendation based on the following:

1. highest priority to Sensitive Groundwater Area applications (required by legislation),
2. second priority was given to wetland restoration applications based on state emphasis on wetland areas and previous BWSR priority (1989). A change staff has made this year is including both wetlands with a cropping history and wetlands without a cropping history as second priority applications.
3. the remaining priority listing was based on the BWSR 1989 perpetual easement priorities for riparian lands, 3rd; marginal agricultural land, 4th; and pastured hillside, 5th.

Each of the categories were then ranked by size and SWCD priority. The staff recommendation is based on \$2,150,000 available to fund over \$4 million in applications. With these funds we would be able to fund all the sensitive groundwater, wetland restoration, and a few of the riparian applications.

We recommend the applications falling below the \$2,150,000 line be put on a pending list to be accepted, in order, as approved applications may be cancelled. The concept of developing a pending list is new this year, and is being suggested due to the fact that all applications are for perpetual easements. A pending list is also enclosed for your review. This list was ranked based on application category, size, and SWCD priority.

Please feel free to call Wayne Edgerton at 296-0880 if you have any questions prior to the meeting.

STAFF RECOMMENDATIONS
1990 EASEMENT ALLOTMENT REQUESTS FOR FUNDING
REVISED 10/16/90
PERPETUAL EASEMENTS ONLY - \$2,150,000 AVAILABLE FUNDING

COUNTY	EASEMENT NUMBER	LANDOWNER NAME	SWCD PRIO- RITY	BWSR FUNDING	WET. RESTOR.		SENSITIVE GRD WATER	RIPARIAN LAND	TOTAL EASMT ACRES	EASEMENT DOLLARS REQUESTED	PRACTICE DOLLARS REQUESTED	TOT. REQUEST INCL.\$200 TITLE WORK
					CROP	N/CROP						
					PERP	PERP	PERP	PERP				
					acres	acres	acres	acres				
BLUE EARTH	7 - 3 - 90 - 1	DUCA, STEPHEN	1	X			11.8		11.8	\$10,982.97	\$1,840.00	\$13,022.97
CLAY	14 - 3 - 90 - 1	HOUGH, JOSEPH	3	X			32.0		32.0	\$12,662.40	\$3,200.00	\$16,062.40
CLAY	14 - 4 - 90 - 1	ERDMAN, ARNOLD	4	X			12.4		12.4	\$7,103.84	\$1,240.00	\$8,543.84
COTTONWOOD	17 - 8 - 90 - 1	SAVAGE, NICHOLAS	3	X			40.0		40.0	\$31,541.60	\$4,000.00	\$35,741.60
COTTONWOOD	17 - 7 - 90 - 1	LOHMEYER	4	X			32.0		32.0	\$25,233.28	\$4,700.00	\$30,133.28
DAKOTA	19 - 1 - 90 - 1	SWOBODA, HARVEY	3	X			15.0		15.0	\$11,129.40	\$1,900.00	\$13,229.40
DAKOTA	19 - 4 - 90 - 1	KNUTSEN, ELMER	4	X			5.0		5.0	\$4,793.85	\$2,000.00	\$6,993.85
GOODHUE	25 - 8 - 90 - 1	STIEHL, JAMES	1	X			34.8		34.8	\$19,737.86	\$4,680.00	\$24,617.86
GOODHUE	25 - 6 - 90 - 1	WITGERT, JOHN	6	X			16.1		16.1	\$10,905.01	\$1,800.00	\$12,905.01
GRANT	26 - 1 - 90 - 1	HOFFMAN, JUDITH	1	X			13.0		13.0	\$8,110.96	\$1,300.00	\$9,610.96
ISANTI	30 - 2 - 90 - 1	BIRKLAND, A	2	X			16.3		16.3	\$7,440.95	\$1,630.00	\$9,270.95
JACKSON	32 - 6 - 90 - 1	TROUTH, GORDON	3	X			16.0		16.0	\$16,707.36	\$1,600.00	\$18,507.36
MEEKER	47 - 6 - 90 - 1	VENTURES LIMITED	4	X			56.0		56.0	\$36,559.60	\$5,600.00	\$42,359.60
MEEKER	47 - 1 - 90 - 1	PETERSON, B	5	X			24.2		24.2	\$16,934.68	\$2,420.00	\$19,554.68
MORRISON	49 - 6 - 90 - 1	STEINBRECHER, DERALD	1	X			51.0		51.0	\$15,363.75	\$7,800.00	\$23,363.75
POPE	61 - 15 - 90 - 1	GUSTAFSON, DAVID	4	X			13.5		13.5	\$5,554.31	\$3,350.00	\$9,104.31
POPE	61 - 10 - 90 - 1	BORRELL, GARY	5	X			27.0		27.0	\$9,502.92	\$2,700.00	\$12,402.92
POPE	61 - 18 - 90 - 1	JOST, RONALD	7	X			29.6		29.6	\$10,990.48	\$2,960.00	\$14,150.48
POPE	61 - 13 - 90 - 1	THORKELSON, DOUGLAS	8	X			69.0		69.0	\$24,285.24	\$8,900.00	\$33,385.24
POPE	61 - 4 - 90 - 1	SCHMITZ, AUGUST	9	X			7.6		7.6	\$3,395.53	\$760.00	\$4,355.53
REDWOOD	64 - 7 - 90 - 1	EWERT, B	4	X			18.7		18.7	\$17,484.50	\$1,870.00	\$19,554.50
REDWOOD	64 - 4 - 90 - 1	GEIS, D	6	X			35.8		35.8	\$33,473.00	\$4,480.00	\$38,153.00
SCOTT	70 - 2 - 90 - 1	CARLSON, RANDALL	2	X			5.0		5.0	\$4,068.25	\$800.00	\$5,068.25
SWIFT	76 - 9 - 90 - 1	STRUXNESS, DONALD	9	X			24.5		24.5	\$13,924.09	\$3,650.00	\$17,774.09
WABASHA	79 - 1 - 90 - 1	BREUER, RALPH	1	X			5.0		5.0	\$2,944.25	\$2,000.00	\$5,144.25
WRIGHT	86 - 3 - 90 - 1	WESTRUM, D	3	X			20.0		20.0	\$20,856.00	\$2,900.00	\$23,956.00
BIG STONE	6 - 3 - 90 - 1	ZIERKE, B(02-06)	1	X	3.5				3.5	\$9,550.98	\$2,300.00	\$12,050.98
CARVER	10 - 2 - 90 - 1	SIMON, FRANK	1	X			8.0		8.0	\$1,524.25	\$1,050.00	\$2,774.25
CHIPPEWA	12 - 2 - 90 - 1	SCHWAPEKO PROPERTIES	1	X			21.6		21.6	\$49,742.00	\$9,080.00	\$59,022.00
DAKOTA	19 - 2 - 90 - 1	MOORE, JAMES	2	X			28.0		28.0	\$6,944.05	\$830.00	\$7,974.05
DOUGLAS	21 - 1 - 90 - 1	RUSSELL, DANIEL	2	X			54.0		54.0	\$11,584.73	\$2,160.00	\$13,944.73
DOUGLAS	21 - 5 - 90 - 1	MRNAK, GARY	3	X			25.0		25.0	\$38,701.21	\$6,744.00	\$45,645.21
KANDIYOHI	34 - 1 - 90 - 1	RAU, ERWIN	1	X			7.3		7.3	\$7,124.96	\$2,400.00	\$9,724.96
KANDIYOHI	34 - 2 - 90 - 1	RAUENHORST, T (02-05)	2	X			65.0		65.0	\$20,085.84	\$11,290.00	\$31,575.84

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					CROP	N/CROP						
					PERP	PERP	PERP	PERP				
					acres	acres	acres	acres				
KANDIYOHI	34 - 4 - 90 - 1	RAUENHORST, G(02-05)	2	X	39.5				39.5	\$50,345.76	\$8,900.00	\$59,445.76
KANDIYOHI	34 - 5 - 90 - 1	BRYANT, D (02-05)	2	X	1.1				1.1	\$12,086.62	\$4,560.00	\$16,846.62
KANDIYOHI	34 - 3 - 90 - 1	RAUENHORST, R(02-05)	2	X	40.4				40.4	\$17,697.90	\$4,900.00	\$22,797.90
LE SUEUR	40 - 1 - 90 - 1	QUIRAM, WAYNE	1	X	47.0				47.0	\$30,798.38	\$8,200.00	\$39,198.38
LE SUEUR	40 - 2 - 90 - 1	WONDRA, LEONARD	2	X	28.3				28.3	\$22,935.13	\$5,330.00	\$28,465.13
LE SUEUR	40 - 3 - 90 - 1	MINES, CHARLES	3	X	47.0				47.0	\$22,386.24	\$21,100.00	\$43,686.24
LINCOLN	41 - 1 - 90 - 1	CHRISTENSEN, K	1	X	23.0				23.0	\$17,088.00	\$4,000.00	\$21,288.00
MARSHALL	45 - 1 - 90 - 1	HJELLE, CLAYTON	1	X	76.5				76.5	\$21,941.84	\$3,227.20	\$25,369.04
McLEOD	43 - 2 - 90 - 1	BALLARD, G (MEEKER)	1	X	41.0				41.0	\$27,286.39	\$3,200.00	\$30,686.39
McLEOD	43 - 6 - 90 - 1	WARNKE, ROBERT	6	X	5.8				5.8	\$12,119.73	\$6,990.00	\$19,309.73
MEEKER	47 - 2 - 90 - 1	ANDERSON, H	1	X	41.3				41.3	\$61,830.60	\$16,700.00	\$78,730.60
MEEKER	47 - 5 - 90 - 1	BALLARD, G (McLEOD)	2	X	18.8				18.8	\$1,044.70	\$330.00	\$1,574.70
NORMAN	54 - 2 - 90 - 1	SLININGER, BURTON	2	X	40.0				40.0	\$12,273.58	\$2,680.00	\$15,153.58
POPE	61 - 12 - 90 - 1	LINDOR, LESLIE	2	X	23.3				23.3	\$33,326.40	\$4,000.00	\$37,526.40
POPE	61 - 16 - 90 - 1	NOVAK, JAMES	11	X	40.0				40.0	\$38,430.10	\$11,320.00	\$49,950.10
REDWOOD	64 - 6 - 90 - 1	HILLESHEIM, C&B	1	X	53.2				53.2	\$37,573.90	\$11,850.00	\$49,623.90
RENVILLE	65 - 2 - 90 - 1	KRAMER, DELLA	2	X	40.0				40.0	\$6,648.16	\$3,240.00	\$10,088.16
RENVILLE	65 - 3 - 90 - 1	DILLON, JAMES	3	X	31.7				31.7	\$29,443.15	\$3,619.00	\$33,262.15
SIBLEY	72 - 4 - 90 - 1	ECKSTRAND, K.	1	X	53.0				53.0	\$8,529.25	\$5,000.00	\$13,729.25
SWIFT	76 - 6 - 90 - 1	HARSTE, LOREN	1	X	33.0				33.0	\$31,561.47	\$6,310.00	\$38,071.47
WRIGHT	86 - 4 - 90 - 1	DURDAHL, P	4	X	24.4				24.4	\$20,287.14	\$3,440.00	\$23,927.14
WRIGHT	86 - 6 - 90 - 1	FLANNERY, M	6	X	10.0				10.0	\$3,186.99	\$1,740.00	\$5,126.99
YELLOW MED	87 - 1 - 90 - 1	TIMM, RICHARD	1	X	14.0				14.0	\$4,555.03	\$580.00	\$5,335.03
YELLOW MED	87 - 2 - 90 - 1	DOOSE, DAROLD	3	X	10.8				10.8	\$7,957.90	\$2,000.00	\$10,157.90
YELLOW MED	87 - 5 - 90 - 1	GUBRUD, PATRICIA	4	X	5.8				5.8	\$17,871.20	\$6,080.00	\$24,151.20
BENTON	5 - 1 - 90 - 1	DONOVAN, JAMES	1	X	18.0	25.0			43.0	\$19,051.32	\$9,300.00	\$28,551.32
BIG STONE	6 - 4 - 90 - 1	HANSON, C(02-06)	1	X	3.4	1.9			5.3	\$2,018.55	\$930.00	\$3,148.55
BIG STONE	6 - 5 - 90 - 1	BOMSTAD, S(02-06)	1	X	10.5	1.5			12.0	\$4,993.37	\$2,100.00	\$7,293.37
BIG STONE	6 - 2 - 90 - 1	ZIERKE, B(02-06)	1	X	64.9	9.0			73.9	\$28,830.11	\$20,070.00	\$49,100.11
CARVER	10 - 1 - 90 - 1	HEDKE, CARL	2	X	6.1	1.0			7.1	\$6,108.27	\$910.00	\$7,218.27
DAKOTA	19 - 3 - 90 - 1	KNUTSEN, ELMER	1	X	8.0	11.1			19.1	\$13,964.48	\$2,900.00	\$17,064.48
DOUGLAS	21 - 2 - 90 - 1	UNDEM, DALE	3	X	29.6	10.4			40.0	\$16,329.63	\$14,960.00	\$31,489.63
DOUGLAS	21 - 3 - 90 - 1	NOELDNER, LARRY	4	X	13.9	15.5			29.4	\$9,939.01	\$6,040.00	\$16,179.01
FARIBAULT	22 - 7 - 90 - 1	MURPHY, RAYMOND(89)	2	X	3.0	12.0			15.0	\$12,298.68	\$2,900.00	\$15,398.68

STAFF RECOMMENDATIONS
1990 EASEMENT ALLOTMENT REQUESTS FOR FUNDING
REVISED 10/16/90
PERPETUAL EASEMENTS ONLY - \$2,150,000 AVAILABLE FUNDING

COUNTY	EASEMENT NUMBER	LANDOWNER NAME	SWCD PRIO- RITY	BWSR FUNDING	WET. RESTOR.		SENSITIVE	RIPARIAN	TOTAL EASMT ACRES	EASEMENT DOLLARS REQUESTED	PRACTICE DOLLARS REQUESTED	TOT. REQUEST INCL. \$200 TITLE WORK
					CROP	N/CROP	GRD WATER	LAND				
					PERP	PERP	PERP	PERP				
					acres	acres	acres	acres				
FARIBAULT	22 - 6 - 90 - 1	MURPHY, HAROLD(89)	3	X	5.3	0.0			5.3	\$4,720.18	\$1,500.00	\$6,420.18
LYON	42 - 1 - 90 - 1	WICHMANN, LEON(02-03)	1	X	45.0	7.0			52.0	\$22,671.90	\$15,400.00	\$38,271.90
LYON	42 - 2 - 90 - 1	WENDLAND, TROY(01-03)	2	X	1.2	2.8			4.0	\$1,521.55	\$1,000.00	\$2,721.55
NORMAN	54 - 3 - 90 - 1	JOHNSON, EDWIN	1	X	112.0	8.0			120.0	\$40,053.56	\$11,200.00	\$51,453.56
POPE	61 - 17 - 90 - 1	RONNIE, ARNOLD	1	X	8.0	4.1			12.1	\$5,240.14	\$2,030.00	\$7,470.14
RENVILLE	65 - 1 - 90 - 1	OLINGER, ELVIRA	1	X	43.5	60.7			104.2	\$45,363.90	\$11,800.00	\$57,363.90
RICE	66 - 2 - 90 - 1	BECHTUM, JUDITH(01-03)	1	X	10.9	1.1			12.0	\$8,114.47	\$3,600.00	\$11,914.47
SIBLEY	72 - 3 - 90 - 1	BUSSE/BRUESELOFF	2	X	2.0	5.0			7.0	\$4,213.40	\$1,900.00	\$6,313.40
STEELE	74 - 1 - 90 - 1	KAPLAN, GARY	1	X	40.5	10.5			51.0	\$35,761.12	\$7,100.00	\$43,061.12
WRIGHT	86 - 1 - 90 - 1	ADAMS, M (TCCP-1)	1	X	16.4	5.5			21.9	\$12,481.79	\$3,290.00	\$15,971.79
WRIGHT	86 - 5 - 90 - 1	DAVIS, R (TCCP-1)	5	X	12.5	21.5			34.0	\$15,040.39	\$7,380.00	\$22,620.39
YELLOW MED	87 - 3 - 90 - 1	OFTEDAHL, PERRY	2	X	22.7	6.1			28.8	\$19,369.91	\$7,710.00	\$27,279.91
BIG STONE	6 - 6 - 90 - 1	HANSON, G(02-06)	1	X		2.5			2.5	\$4,375.80	\$3,000.00	\$7,575.80
FARIBAULT	22 - 4 - 90 - 1	McCUE, VIOLA	1	X		7.5			7.5	\$8,602.10	\$7,800.00	\$16,602.10
FARIBAULT	22 - 5 - 90 - 1	PERRIZO, TIMOTHY	7	X		35.0			35.0	\$3,632.80	\$2,400.00	\$6,232.80
HENNEPIN	27 - 2 - 90 - 1	BRADLEY, ROBERT	1	X		15.0			15.0	\$707.70	\$750.00	\$1,657.70
HENNEPIN	27 - 3 - 90 - 1	GODE, THOMAS	2	X		9.0			9.0	\$1,589.35	\$1,050.00	\$2,839.35
ISANTI	30 - 1 - 90 - 1	LEAF, D	1	X		26.0			26.0	\$6,532.50	\$4,500.00	\$11,232.50
ISANTI	30 - 3 - 90 - 1	BECKLIN, D(07)	3	X		30.0			30.0	\$5,382.68	\$1,000.00	\$6,582.68
ISANTI	30 - 7 - 90 - 1	BECKLIN, Wm.(03)	3	X		22.0			22.0	\$6,030.00	\$2,700.00	\$8,930.00
ISANTI	30 - 4 - 90 - 1	BOETTCHER, R	4	X		21.0			21.0	\$7,237.23	\$4,290.00	\$11,727.23
ISANTI	30 - 5 - 90 - 1	LEWIS, G	5	X		3.0			3.0	\$12,608.73	\$15,300.00	\$28,108.73
LYON	42 - 3 - 90 - 1	WENDLAND, W.(01-02)	3	X		1.5			1.5	\$2,429.28	\$1,440.00	\$4,069.28
LYON	42 - 7 - 90 - 1	JOEGENSON, HAROLD	7	X		26.0			26.0	\$8,374.88	\$800.00	\$9,374.88
MEEKER	47 - 7 - 90 - 1	LUTHENS, D	3	X		17.0			17.0	\$9,925.50	\$9,000.00	\$19,125.50
MILLE LACS	48 - 3 - 90 - 1	HANENBURG, JEROME	1	X		10.0			10.0	\$6,435.22	\$6,600.00	\$13,235.22
MORRISON	49 - 5 - 90 - 1	BLONIGEN, ROBERT	2	X		51.0			51.0	\$491.24	\$150.00	\$841.24
MORRISON	49 - 3 - 90 - 1	JOHNSON, DENNIS	3	X		51.0			51.0	\$10,622.79	\$15,300.00	\$26,122.79
POPE	61 - 7 - 90 - 1	THORNBURGH, HERBERT	10	X		106.2			106.2	\$6,320.79	\$6,300.00	\$12,820.79
RICE	66 - 3 - 90 - 1	CHLAN, JOHN(01-02)	1	X		3.5			3.5	\$877.53	\$900.00	\$1,977.53
RICE	66 - 1 - 90 - 1	BLANCO, MANUEL(02-03)	1	X		8.0			8.0	\$25,119.15	\$10,500.00	\$35,819.15
RICE	66 - 4 - 90 - 1	SPITZACK, DAVID(05)	2	X		4.8			4.8	\$6,503.38	\$2,700.00	\$9,403.38
RICE	66 - 5 - 90 - 1	SPLITZACK, JEFFERY(04)	2	X		14.3			14.3	\$12,897.48	\$20,700.00	\$33,797.48
WRIGHT	86 - 2 - 90 - 1	DeGROSS, N (TCCP-1)	2	X				37.3	37.3	\$17,343.59	\$3,660.00	\$21,203.59

STAFF RECOMMENDATIONS
 1990 EASEMENT ALLOTMENT REQUESTS FOR FUNDING
 REVISED 10/16/90
 PERPETUAL EASEMENTS ONLY - \$2,150,000 AVAILABLE FUNDING

COUNTY	EASEMENT NUMBER	LANDOWNER NAME	SWCD PRIO- RITY	BWSR FUNDING	WET. RESTOR.		SENSITIVE	RIPARIAN	TOTAL EASMT ACRES	EASEMENT DOLLARS REQUESTED	PRACTICE DOLLARS REQUESTED	TOT. REQUEST INCL. \$200 TITLE WORK
					CROP	N/CROP	GRD WATER	LAND				
					PERP	PERP	PERP	PERP				
MURRAY SCOTT	51 - 1 - 90 - 1	KLEIN, THOMAS	1	X					29.2	\$21,614.72	\$2,920.00	\$24,734.72
	70 - 1 - 90 - 1	RENNE, WILLIAM	1	X					12.0	\$10,207.04	\$1,200.00	\$11,607.04
GRAND TOTALS				AC. NO.	1,478.7 75	684.0	631.3 26	78.5 3	2,872.5 104	\$1,600,096.87	\$524,210.20	\$2,145,107.07

STAFF RECOMMENDATIONS
1990 EASEMENTS REQUESTS FOR PENDING FUNDING STATUS
REVISED 10/16/90
PERPETUAL EASEMENTS ONLY TO BE FUNDED FROM CANCELLATIONS

COUNTY	EASEMENT NUMBER	LANDOWNER NAME	SWCD PRIO- RITY	PENDING BWSR FUNDING	MARGINAL	HILLSIDE	RIPARIAN	TOTAL EASMT ACRES	EASEMENT DOLLARS REQUESTED	PRACTICE DOLLARS REQUESTED	TOT. REQUEST INCL.\$200 TITLE WORK
					AG. LAND	PASTURE	LAND				
					PERP	PERP	PERP				
					acres	acres	acres				
JACKSON	32 - 3 - 90 - 1	KRUSE, LLOYD	1	1			36.0	36.0	\$33,146.64	\$4,200.00	\$37,546.64
BROWN	8 - 1 - 90 - 1	MUNSELL, WILLIAM	1	2			34.8	34.8	\$37,855.44	\$3,380.00	\$41,435.44
REDWOOD	64 - 3 - 90 - 1	ALCORN, C	2	3			26.8	26.8	\$19,699.61	\$2,680.00	\$22,579.61
JACKSON	32 - 1 - 90 - 1	HARTBERG, WILBUR	2	4			10.0	10.0	\$8,946.30	\$1,000.00	\$10,146.30
GOODHUE	25 - 12 - 90 - 1	FREDRICKSON, DUANE	2	5			4.8	4.8	\$3,793.82	\$680.00	\$4,673.82
REDWOOD	64 - 2 - 90 - 1	MUNSELL, W	3	6			70.0	70.0	\$62,498.80	\$7,000.00	\$69,698.80
McLEOD	43 - 4 - 90 - 1	ULRICH, TIMOTHY	3	7			11.5	11.5	\$9,142.39	\$2,300.00	\$11,642.39
LYON	42 - 4 - 90 - 1	JOEGENSON, HAROLD	4	8			16.6	16.6	\$24,728.02	\$3,200.00	\$28,128.02
RENVILLE	65 - 6 - 90 - 1	SIMMONS, ARTHUR	6	9			13.3	13.3	\$6,770.55	\$830.00	\$7,800.55
RENVILLE	65 - 8 - 90 - 1	AHRENS, GARY	8	10			6.0	6.0	\$4,023.75	\$500.00	\$4,723.75
WEST POLK	60 - 1 - 90 - 1WP	WEILAND, JOHN	1	11	137.0			137.0	\$52,714.86	\$17,700.00	\$70,614.86
DOUGLAS	21 - 4 - 90 - 1	PAULIN, DONALD	1	12	28.2			28.2	\$11,690.60	\$4,500.00	\$16,390.60
NICOLLET	52 - 1 - 90 - 1	FITZNER, MARLIN	1	13	21.4			21.4	\$19,337.89	\$2,140.00	\$21,677.89
TODD	77 - 1 - 90 - 1	KENT, MELVIN	1	14	19.0			19.0	\$7,215.44	\$4,750.00	\$12,165.44
CLAY	14 - 1 - 90 - 1	STRANDLIEN, MILFORD	1	15	10.6			10.6	\$3,706.18	\$620.00	\$4,526.18
WATONWAN	83 - 1 - 90 - 1	HIEBERT, GEORGE	1	16	9.6			9.6	\$9,950.21	\$3,840.00	\$13,990.21
E OTR TAIL	56 - 1 - 90 - 1EOT	ENGER, WAYNE	1	17	5.1			5.1	\$1,426.62	\$1,440.00	\$3,066.62
McLEOD	43 - 3 - 90 - 1	HORSTMANN, THOMAS	2	18	41.0			41.0	\$31,816.82	\$8,200.00	\$40,216.82
NICOLLET	52 - 2 - 90 - 1	BODE, FRANK	2	19	13.5			13.5	\$12,905.33	\$1,350.00	\$14,455.33
BENTON	5 - 2 - 90 - 1	TEFF, JEROME	2	20	9.2			9.2	\$4,039.90	\$2,760.00	\$6,999.90
E OTR TAIL	56 - 2 - 90 - 1EOT	PINE LK. FARMS	2	21	7.5			7.5	\$2,000.18	\$3,000.00	\$5,200.18
WABASHA	79 - 2 - 90 - 1	MEED, SCOTT	2	22	3.8			3.8	\$1,884.91	\$1,140.00	\$3,224.91
JACKSON	32 - 2 - 90 - 1	TROUTH, GORDON	3	23	44.7			44.7	\$46,678.18	\$5,370.00	\$52,248.18
POPE	61 - 8 - 90 - 1	NYBAKKE, KEITH	3	24	43.9			43.9	\$13,317.94	\$5,170.00	\$18,687.94
LINCOLN	41 - 2 - 90 - 1	DUUS, D	3	25	5.9			5.9	\$2,450.03	\$590.00	\$3,240.03
WINONA	85 - 7 - 90 - 1	GAPPA, RICHARD	3	26	3.3			3.3	\$1,598.16	\$530.00	\$2,328.16
RICE	66 - 6 - 90 - 1	WAGENBACH, GARY	3	27	2.3			2.3	\$1,871.28	\$230.00	\$2,301.28
FARIBAULT	22 - 1 - 90 - 1	LOVEALL, TOM	4	28	55.0			55.0	\$56,575.20	\$5,500.00	\$62,275.20
RENVILLE	65 - 4 - 90 - 1	LUDOWESE, NICHOLAS	4	29	37.2			37.2	\$21,495.59	\$2,360.00	\$24,055.59
GOODHUE	25 - 7 - 90 - 1	FROYUM, WALTER	4	30	16.2			16.2	\$12,169.28	\$2,660.00	\$15,029.28
McLEOD	43 - 5 - 90 - 1	REHMANN, IRVIN	4	31	11.8			11.8	\$9,157.04	\$1,180.00	\$10,537.04
JACKSON	32 - 5 - 90 - 1	COOK, STEVEN	4	32	5.0			5.0	\$4,847.50	\$500.00	\$5,547.50
REDWOOD	64 - 1 - 90 - 1	BEYER, M	5	33	25.0			25.0	\$23,375.00	\$2,500.00	\$26,075.00
McLEOD	43 - 1 - 90 - 1	VASKO, ROBERT	5	34	21.9			21.9	\$16,643.12	\$2,190.00	\$19,033.12

STAFF RECOMMENDATIONS
1990 EASEMENTS REQUESTS FOR PENDING FUNDING STATUS
REVISED 10/16/90
PERPETUAL EASEMENTS ONLY TO BE FUNDED FROM CANCELLATIONS

COUNTY	EASEMENT NUMBER	LANDOWNER NAME	SWCD PRIO- RITY	PENDING BWSR FUNDING	MARGINAL AG. LAND PERP	HILLSIDE PASTURE PERP	RIPARIAN LAND PERP	TOTAL EASMT ACRES	EASEMENT DOLLARS REQUESTED	PRACTICE DOLLARS REQUESTED	TOT. REQUEST INCL.\$200 TITLE WORK
					acres	acres	acres				
RENVILLE	65 - 5 - 90 - 1	LANNING, PAUL	5	35	18.3			18.3	\$14,489.21	\$1,830.00	\$16,519.21
GOODHUE	25 - 10 - 90 - 1	O'KANE, HUGH	5	36	14.9			14.9	\$11,776.66	\$2,100.00	\$14,076.66
COTTONWOOD	17 - 4 - 90 - 1	DUROE, C. R.	5	37	11.0			11.0	\$8,673.94	\$4,400.00	\$13,273.94
POPE	61 - 1 - 90 - 1	JACKSON, DARWIN	6	38	42.5			42.5	\$18,966.48	\$6,250.00	\$25,416.48
LYON	42 - 6 - 90 - 1	JOEGENSON, HAROLD	6	39	28.0			28.0	\$10,774.68	\$500.00	\$11,474.68
MURRAY	51 - 3 - 90 - 1	VAN DYKE, JOHN	6	40	16.0			16.0	\$13,597.76	\$1,600.00	\$15,397.76
ISANTI	30 - 6 - 90 - 1	BANELLO, D	6	41	8.1			8.1	\$4,122.90	\$810.00	\$5,132.90
WRIGHT	86 - 7 - 90 - 1	YURCZYK, P	7	42	26.0			26.0	\$20,677.29	\$9,600.00	\$30,477.29
RENVILLE	65 - 7 - 90 - 1	STEFFEL, ERNEST	7	43	14.0			14.0	\$14,417.62	\$1,400.00	\$16,017.62
GOODHUE	25 - 13 - 90 - 1	REISNER, DENNIS	7	44	4.8			4.8	\$3,434.54	\$680.00	\$4,314.54
WRIGHT	86 - 8 - 90 - 1	TESKE, T	8	45	12.2			12.2	\$10,024.01	\$3,050.00	\$13,274.01
GOODHUE	25 - 1 - 90 - 1	LUNDE, RUSSELL	14	46	35.8			35.8	\$26,042.71	\$4,180.00	\$30,422.71
COTTONWOOD	17 - 6 - 90 - 1	LARSON, DALLAS(05)	1	47	14.7			14.7	\$13,078.88	\$2,970.00	\$16,248.88
COTTONWOOD	17 - 5 - 90 - 1	LARSON, DALLAS(06)	1	48			17.1	17.1	\$9,889.27	\$0.00	\$10,089.27
FILLMORE	23 - 6 - 90 - 1	HORIHAN, FREDRICK	1	49			59.0	59.0	\$20,269.45	\$0.00	\$20,469.45
ROOT RIVER	28 - 6 - 90 - 1	DETERS, MERRILL	1	50			30.0	30.0	\$12,233.40	\$1,200.00	\$13,633.40
WINONA	85 - 6 - 90 - 1	GAPPA, RICHARD	1	51			20.8	20.8	\$6,547.63	\$380.00	\$7,127.63
STEARNS	73 - 1 - 90 - 1	WELLS, S	1	52			16.6	16.6	\$9,926.47	\$50.00	\$10,176.47
CLAY	14 - 1 - 90 - 1	STRANDLIEN, MILFORD	1	53			10.0	10.0	\$2,272.70	\$0.00	\$2,472.70
BIG STONE	6 - 1 - 90 - 1	GIBSON, JERALD	2	54			90.5	90.5	\$26,673.97	\$9,050.00	\$35,923.97
LINCOLN	41 - 3 - 90 - 1	TROUTMAN, L	2	55			76.0	76.0	\$19,607.24	\$7,600.00	\$27,407.24
SWIFT	76 - 7 - 90 - 1	MAHONEY, DAVID	2	56			67.7	67.7	\$24,681.22	\$6,920.00	\$31,801.22
FILLMORE	23 - 2 - 90 - 1	PAUS, RUSSEL	2	57			59.0	59.0	\$21,953.31	\$0.00	\$22,153.31
WINONA	85 - 2 - 90 - 1	BROWN, RICHARD	2	58			55.0	55.0	\$12,872.75	\$1,000.00	\$14,072.75
CLAY	14 - 2 - 90 - 1	STOUTENBURG, JAY	2	59			43.0	43.0	\$11,495.19	\$0.00	\$11,695.19
COTTONWOOD	17 - 9 - 90 - 1	WALKLIN, DARRELL	2	60			40.0	40.0	\$27,094.80	\$1,500.00	\$28,794.80
OLMSTED	55 - 2 - 90 - 1	COLLINS, MICHAEL	2	61			35.0	35.0	\$19,875.00	\$0.00	\$20,075.00
MURRAY	51 - 6 - 90 - 1	GEIS, DAVID	2	62			29.0	29.0	\$13,114.38	\$2,900.00	\$16,214.38
ROOT RIVER	28 - 1 - 90 - 1	KEEFE, KEVIN	2	63			26.0	26.0	\$9,359.74	\$750.00	\$10,309.74
CHIPPEWA	12 - 1 - 90 - 1	WILLIAMSON, LEROY	2	64			24.2	24.2	\$11,334.80	\$3,020.00	\$14,554.80
STEELE	74 - 2 - 90 - 1	JACOBSON, DARRELL	2	65			10.0	10.0	\$5,052.50	\$0.00	\$5,252.50
FILLMORE	23 - 1 - 90 - 1	BUSSMAN, LAWRENCE	3	66			59.0	59.0	\$22,328.55	\$1,800.00	\$24,328.55
ROOT RIVER	28 - 3 - 90 - 1	RAY, KEVIN	3	67			56.0	56.0	\$19,830.72	\$500.00	\$20,530.72
SWIFT	76 - 4 - 90 - 1	KOOSMANN, BERTHOD	3	68			47.7	47.7	\$17,005.06	\$0.00	\$17,205.06

STAFF RECOMMENDATIONS
1990 EASEMENTS REQUESTS FOR PENDING FUNDING STATUS
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COUNTY	EASEMENT NUMBER	LANDOWNER NAME	SWCD PRIO- RITY	PENDING BWSR FUNDING	MARGINAL AG. LAND PERP	HILLSIDE PASTURE PERP	RIPARIAN LAND PERP	TOTAL EASMT ACRES	EASEMENT DOLLARS REQUESTED	PRACTICE DOLLARS REQUESTED	TOT. REQUEST INCL.\$200 TITLE WORK
					acres	acres	acres				
MURRAY	51 - 2 - 90 - 1	VAN DYKE, JOHN	3	69		28.0		28.0	\$15,467.48	\$2,800.00	\$18,467.48
GOODHUE	25 - 2 - 90 - 1	COOPER, DOUGLAS	3	70		26.2		26.2	\$10,069.97	\$2,620.00	\$12,889.97
NICOLLET	52 - 3 - 90 - 1	BODE, FRANK	3	71		19.0		19.0	\$10,571.03	\$0.00	\$10,771.03
WABASHA	79 - 3 - 90 - 1	POST, DENNIS	3	72		15.0		15.0	\$4,861.95	\$2,500.00	\$7,561.95
OLMSTED	55 - 3 - 90 - 1	KOENIG, KENNETH	3	73		15.0		15.0	\$8,518.00	\$0.00	\$8,718.00
FILLMORE	23 - 4 - 90 - 1	VREEMAN, JOSEPH	4	74		59.0		59.0	\$20,168.55	\$1,200.00	\$21,568.55
ROOT RIVER	28 - 8 - 90 - 1	DENSTAD, LEE	4	75		35.0		35.0	\$13,982.85	\$0.00	\$14,182.85
SWIFT	76 - 8 - 90 - 1	RIEPPPEL, MARLIN	4	76		31.7		31.7	\$11,928.08	\$0.00	\$12,128.08
MURRAY	51 - 5 - 90 - 1	REHBORG, CALVIN	4	77		20.0		20.0	\$7,955.20	\$2,000.00	\$10,155.20
OLMSTED	55 - 4 - 90 - 1	McDOUGALL, HELEN	4	78		17.5		17.5	\$11,397.00	\$0.00	\$11,597.00
WABASHA	79 - 4 - 90 - 1	JUDGE, LESTER	4	79		15.0		15.0	\$5,545.95	\$0.00	\$5,745.95
JACKSON	32 - 4 - 90 - 1	GARBER, PETER	5	80		59.0		59.0	\$67,087.13	\$5,900.00	\$73,187.13
ROOT RIVER	28 - 11 - 90 - 1	DIERSEN, LAVAIINE	5	81		56.0		56.0	\$20,159.44	\$0.00	\$20,359.44
FILLMORE	23 - 3 - 90 - 1	HOLGER, MORRIS	5	82		46.0		46.0	\$16,594.96	\$0.00	\$16,794.96
WABASHA	79 - 5 - 90 - 1	MORATH, MICHAEL	5	83		45.0		45.0	\$23,431.50	\$3,000.00	\$26,631.50
LYON	42 - 5 - 90 - 1	HANSON, EVERETT	5	84		26.0		26.0	\$8,828.78	\$0.00	\$9,028.78
SWIFT	76 - 5 - 90 - 1	SCHLIEMAN, RODNEY	5	85		23.3		23.3	\$8,300.53	\$0.00	\$8,500.53
WABASHA	79 - 6 - 90 - 1	ROLSCH, WILLIS	6	86		54.0		54.0	\$17,503.02	\$1,500.00	\$19,203.02
MEEKER	47 - 3 - 90 - 1	JONES, E	6	87		52.0		52.0	\$20,662.20	\$0.00	\$20,862.20
FILLMORE	23 - 5 - 90 - 1	SHIPTON, GLENN	6	88		48.0		48.0	\$16,408.32	\$600.00	\$17,208.32
SWIFT	76 - 1 - 90 - 1	ARNOLD, MARK	6	89		25.8		25.8	\$8,544.19	\$0.00	\$8,744.19
ROOT RIVER	28 - 2 - 90 - 1	KINNEBERG, GLEN	6	90		9.0		9.0	\$3,670.02	\$0.00	\$3,870.02
ROOT RIVER	28 - 7 - 90 - 1	HORIHAN, FRED	7	91		40.0		40.0	\$15,448.00	\$0.00	\$15,648.00
SWIFT	76 - 2 - 90 - 1	LOKKEN, BARRY	7	92		10.0		10.0	\$2,788.70	\$1,080.00	\$4,068.70
WABASHA	79 - 7 - 90 - 1	BREUER, RALPH	7	93		2.0		2.0	\$765.50	\$400.00	\$1,365.50
ROOT RIVER	28 - 5 - 90 - 1	PETERSEN, JOHN	8	94		56.0		56.0	\$19,627.84	\$0.00	\$19,827.84
WABASHA	79 - 8 - 90 - 1	HEIL, GEORGE	8	95		54.0		54.0	\$17,410.68	\$0.00	\$17,610.68
GOODHUE	25 - 11 - 90 - 1	NORD, CRAIG	8	96		26.7		26.7	\$12,624.83	\$3,000.00	\$15,824.83
LYON	42 - 8 - 90 - 1	JOREGENSON, HAROLD	8	97		10.4		10.4	\$2,601.35	\$0.00	\$2,801.35
SWIFT	76 - 3 - 90 - 1	SCHLEIMAN, HAROLD	8	98		9.8		9.8	\$3,599.34	\$0.00	\$3,799.34
ROOT RIVER	28 - 12 - 90 - 1	McCORMICK, DOROTHY	9	99		50.0		50.0	\$18,179.50	\$0.00	\$18,379.50
WABASHA	79 - 9 - 90 - 1	McNALLAN, JOHN	9	100		46.0		46.0	\$17,590.86	\$0.00	\$17,790.86
GOODHUE	25 - 4 - 90 - 1	REISNER, DENNIS	9	101		30.4		30.4	\$14,138.74	\$3,000.00	\$17,338.74
WRIGHT	86 - 9 - 90 - 1	STOCKHAM, J	9	102		10.8		10.8	\$5,582.84	\$1,380.00	\$7,162.84

STAFF RECOMMENDATIONS
1990 EASEMENTS REQUESTS FOR PENDING FUNDING STATUS
REVISED 10/16/90
PERPETUAL EASEMENTS ONLY TO BE FUNDED FROM CANCELLATIONS

COUNTY	EASEMENT NUMBER	LANDOWNER NAME	SWCD PRIO- RITY	PENDING BWSR FUNDING	MARGINAL	HILLSIDE	RIPARIAN	TOTAL EASMT ACRES	EASEMENT DOLLARS REQUESTED	PRACTICE DOLLARS REQUESTED	TOT. REQUEST INCL.\$200 TITLE WORK
					AG. LAND	PASTURE	LAND				
					PERP	PERP	PERP				
					acres	acres	acres				
ROOT RIVER	28 - 4 - 90 - 1	PAUS, BROTHERS	10	103		56.0		56.0	\$21,627.20	\$0.00	\$21,827.20
WABASHA	79 - 10 - 90 - 1	LEE, LUCILLE	10	104		54.0		54.0	\$18,871.92	\$0.00	\$19,071.92
GOODHUE	25 - 9 - 90 - 1	CLEMENTSON, KEITH	10	105		35.5		35.5	\$16,510.70	\$3,550.00	\$20,260.70
WABASHA	79 - 11 - 90 - 1	NIHART, DAVID	11	106		54.0		54.0	\$12,944.34	\$0.00	\$13,144.34
ROOT RIVER	28 - 9 - 90 - 1	HARTLEY, JOSEPH	11	107		40.0		40.0	\$12,719.60	\$0.00	\$12,919.60
GOODHUE	25 - 5 - 90 - 1	PETERSON, OLAF	11	108		20.5		20.5	\$9,693.22	\$2,050.00	\$11,943.22
WABASHA	79 - 12 - 90 - 1	VOGT, ARTHUR	12	109		54.0		54.0	\$12,702.96	\$3,000.00	\$15,902.96
GOODHUE	25 - 14 - 90 - 1	STIEHL, JAMES	12	110		13.2		13.2	\$4,866.44	\$1,320.00	\$6,386.44
WABASHA	79 - 13 - 90 - 1	C & M FARMS	13	111		54.0		54.0	\$12,702.96	\$0.00	\$12,902.96
GOODHUE	25 - 3 - 90 - 1	LUNDE, RUSSELL	13	112		12.2		12.2	\$5,768.65	\$1,220.00	\$7,188.65
WABASHA	79 - 14 - 90 - 1	DYKES, CONNIE	14	113		54.0		54.0	\$16,937.10	\$1,500.00	\$18,637.10
WABASHA	79 - 15 - 90 - 1	McNALLAN, EDWARD	15	114		45.0		45.0	\$16,637.85	\$0.00	\$16,837.85
WABASHA	79 - 16 - 90 - 1	MOHLER, DARREL	16	115		13.1		13.1	\$4,246.10	\$0.00	\$4,446.10
GRAND				ACRES	824.4	2,448.7	229.8	3,502.9	\$1,701,210.78	\$225,650.00	\$1,949,860.78
TOTALS				NUMBER	37	68	10	115			