Alfalfa tops annual legumes for building soil

— By David Granatstein, coordinator of the Washington State University Center for Sustaining Agriculture and Natural Resources in Wenatchee —

Alfalfa is often called the “queen” of forages. But, based on the experiences of Montana grain farmer Bob Quinn, it may also deserve the title of king of the green manures.

Over the past decade, Quinn, who farms several thousand acres near Big Sandy, has experimented with various crop rotations that include green manures, with several goals in mind: to reduce the use of summer fallow, grow his own nitrogen, improve his soils, increase income, and maintain high protein levels in his organically grown wheat.

Bob Quinn

Quinn is research-oriented by nature. He earned a Ph.D. in plant biochemistry prior to returning to the farm in 1978. He has approached the green manure question in his own fashion, using consistent observation, careful record keeping, and a few quantitative measurements over a long period of time. While this approach can’t be evaluated statistically, Quinn believes the data he has collected is worth sharing with other growers.

His testing began in 1983 when he started a comparison of two adjacent fields, which had been managed similarly in past years. That year, he began using management that met the Montana organic certification requirements on one field, while continuing his typical conventional management on the other (see Table 1 on page 5).

Quinn monitored grain yields, grain protein, and soil nitrate for the next six years in his effort to determine whether the alfalfa green manure could supply adequate nitrogen for his grain, and for how many grain crops after the green manure was incorporated.

In the fall of 1986, both fields were planted to winter wheat after

Looking back, moving ahead: the SFQ says its goodbyes

— By David Granatstein —

In this final issue of the SFQ, I would like to reflect for a moment on the six years that have passed since the newsletter started. In 1988, the USDA initiated the Sustainable Agriculture Research and Education grant program (SARE, formerly LISA). The Northwest dryland cereal-legume project, which started the SFQ, was one of the original projects funded. The project cooperators from across the region sought to better understand the concept of sustainability in the dryland cropping system that covers so many acres in our six states.

Of course, the term “sustainability” and its implications has been widely discussed. Certain growers and researchers viewed it as an indictment of their past. Others saw it in strictly economic terms. And some used it as an opportunity to imagine significant change on the farm.

Regardless of one’s viewpoint (and the debate goes on today), a number of noteworthy positive changes have occurred over the past

MORE GOODBYES, PAGE 2

Inside the SFQ

- Support for sustainable agriculture blossoms. Page 2.
- Reducing herbicide label amounts can help you. Page 7.
- Farmer observations some of the best "research." Page 8.
- Feel the story your tractor can tell you. Page 9.
- Calendar of events. Back cover.
Support for sustainable agriculture has blossomed in SFQ's lifetime

— By Paul Reichert, coordinator of the Western Sustainable Agriculture Working Group (SAWG) for the Alternative Energy Resources Organization (AERO) —

The field of sustainable agriculture enjoys much more support than it did in 1989 when AERO began publishing the Sustainable Farming Quarterly. Since then, several new resources and organizations have cropped up to help producers work toward sustainable agriculture. AERO is fortunate to be part of this growing group of farmers and ranchers who are improving their operations in environmentally and economically sound ways.

With this last issue of the SFQ, we at AERO believe it’s important for you to know about some of the resources, materials and organizations that are provid-

MORE SUPPORT, PAGE 3

is on the increase among growers and researchers. The role of soil microbes is a popular point of discussion. Concern about the fallow system is leading growers to test annual crop or flex-crop systems in the drier areas. And some growers are finding options that work.

In Montana, Jim Sims of Montana State University has screened dozens of legumes to help diversify cereal crop rotations, and the acreage of commercial pulse crops in Montana has risen from nearly none to over 30,000 acres. Sims also has relentlessly pursued the ley farming system he first saw in Australia, which involves a cereal-legume-pasture rotation where the legume is grazed. Several growers in Montana are making this system work. Diversity is a plus biologically and economically. Several economic studies associated with the SARE project found that diversified crop rotations with legumes were equally or more profitable than the standard rotations in a region.

To me, all of this points to the need for more options, and more knowledge about those options in site-specific cropping systems. No silver bullet is coming from sustainable agriculture research. Individual growers are examining many promising and useful ideas and options. And one important tool they are using is grower-based on-farm testing. This problem-solving tool has been stressed by the dryland SARE project and the SARE program in general. It has led to new partnerships among researchers, industry, extension workers, and growers. It builds on the extensive informal testing already occurring on hundreds of farms.

Ultimately, I see sustainability being about people. Agriculture is a uniquely human activity. Agricultural problems are more about people than technology. Sustainable agriculture as a concept, a long term goal we may never fully achieve, recognizes this. I hope that the SFQ has provided both practical ideas for growers and optimism about the future of farming in our region.

Reference

AG OPTIONS NETWORK

This W.K. Kellogg Foundation-supported effort is expanding the use of AERO’s Farm Improvement Club model in Montana, Idaho and Washington. The network supports informal groups of farmers, ranchers, and other rural citizens organized to find practical answers to common problems related to farm and community resource sustainability. The network includes AERO, the Idaho Rural Council, the Palouse-Clearwater Environmental Institute, Cooperative Extension, Agriculture Experiment Stations, the Natural Resources Conservation Service, and other agencies.

WESTERN SAWG

The Western Sustainable Agriculture Working Group (SAWG) is a new regional network of sustainable agriculture organizations in the West.

The SAWG formed in 1993 to strengthen the support for groups and individuals actively working to promote sustainable agriculture. The SAWG works on farm policy, research, marketing and family farm issues and involves groups in the western U.S. and the three westernmost Canadian provinces. AERO and the Palouse-Clearwater Environmental Institute are co-founders of the SAWG network.

The SAWG network is considering publishing a new regional newsletter similar to the SFQ that would take a wider look at sustainable agriculture in the West. If you are interested in this idea call Paul Reichert at AERO (406) 443-7272.

SUSTAINABLE AGRICULTURE RESEARCH AND EDUCATION

The Western Sustainable Agriculture Research and Education program (SARE) funds research, on-farm projects, and publications supporting sustainable agriculture. The program has been instrumental in expanding public and private resources dedicated to creative problem-solving for our region’s agriculture.

One of the latest efforts is the professional training for the staffs of the Natural Resources Conservation Service and Cooperative Extension so they can provide more local support for sustainable agriculture to producers. AERO is one of five regional groups conducting these trainings for SARE. (See schedule at right.) To find out more about SARE resources and projects in the West, call Rhonda Miller at (801) 797-0351. For a complete list of publications, call Kristen Kelleher at (916) 752-5987.

NORTHWEST AREA FOUNDATION STUDY

The Foundation recently completed a six-year economic study of sustainable agriculture in a seven-state region. The report, titled A Better Row to Hoe, provides compelling information on the benefits and barriers producers face using sustainable agriculture practices. The study is also the basis of a new book that looks at the changes taking place in agriculture to make it more sustainable—Planting the Future: Developing an Agriculture that Sustains Land and Community. To receive a free copy of the report contact the NWAF at (612) 224-9635. To order a copy of the book ($14.95 +SH) contact the Iowa State University Press at (800) 862-6657.

We at AERO are happy to have been part of the SFQ’s success and a growing list of groups that are meeting the needs of our region’s agriculture. We thank our editors, Sally K. Hiland er and David Granatstein. We hope you take advantage of the growing resources supporting sustainable agriculture. For more information about the organizations, projects, or other resources listed above, call AERO at (406) 443-7272.

SARE offers training for ag professionals

In-service training workshops for agricultural professionals are scheduled throughout summer and fall under the auspices of the Western Region Sustainable Agriculture Research and Education (SARE) Program.

The following is a calendar of Western SARE Chapter 3 trainings and related events:

July 10-14: Fundamentals of Management Intensive Grazing: A “Trainer-Training” Program Spokane, Wash. (In conjunction with the Pacific Northwest Forage Workers Group Agent Training Session), Peter J. Ballerstedt, Ballerstedt Consulting, Inc., P.O. Box 1646, Philomath, OR 97370; 503/929-4600, email ballersp@css.orst.edu

Summary: Introduction and discussion of the philosophy and principles of grass farming. Sponsored by PNW Sustainable Ag Systems In-Service Education Competitive Small Grants Program.

July 17: Sheridan Legume Club Farm Tour, Plentywood, Mont. Contact: Jeanna Romo, (406) 765-1801. Legumes in small grains rotations (AERO Farm & Ranch Improvement Club event).

July 18: Judith Basin Range Tour-Tom Nickolson, Leon Olson, and Gayle Huber Ranches, Judith Basin County, Mont. Contact: Jim Moore, (406) 566-2210. Intensive grazing management, range plant identification, and forest management (AERO Farm & Ranch Improvement Club event).
CALENDAR, FROM PAGE 3
Ranch Improvement Club event).


July 25: Agricultural Systems Assessment: Field Evaluation of Efficiency and Long-Term Productivity of Irrigated, Livestock, and Dryland Systems, WSU TriCities Campus, Richland, Wash. Contact: Colette DePhelps, Center for Sustaining Agriculture and Natural Resources, WSU, Wenatchee, WA 99164-6240; (509) 335-2887, dephelps@wsu.edu. In-field assessment of water, soil, and pest management practices and short- and long-term economic viability of farm/ ranch operations, and three field tours. Co-sponsored by OSU/WSU PNW Sustainable Agriculture Systems In-Service Education Program.


Note: Dates were uncertain at SPQ press time for those events marked with an ❮.

❯ July: Training Program on Cultural Management of Green Manure Crops. Two or three locations in southern Idaho. Contact: Mike Thornton, University of Idaho, Parma Research and Extension Center, 29603 U of I Lane, Parma, ID 83660; (208) 722-6701, email parma@iui.uidaho.edu. In-field CE and consultant training at two southern Idaho on-farm test sites. Participants receive management guides and slides sets to duplicate training. Sponsored by PNW Sustainable Ag Systems In-Service Education Competitive Small Grants Program.

❯ July: Alternative Lending Mechanisms for Sustainable Agriculture, Southern Idaho. Contact: Karen Murphy, Northwest Coalition for Alternatives to Pesticides, P.O. Box 1393, Eugene, OR 97440, (503) 344-5044, email NCAP@JGC.APC.ORG Present information on alternative mechanisms for obtaining financing to support a transition to sustainable agriculture to CE, NRCS, farmers, consumers, lenders, religious institutions. Sponsored by PNW Sustainable Agriculture Systems In-Service Education Competitive Small Grants Program.

Aug. 26: Helen Athow Farm Tour, Stevensville, Mont. Contact: Helen Athowe, (406) 777-3723. Produce crops, season extension techniques, legume living mulches, cropping systems, local marketing strategies. For producers, researchers, extension agents, resource conservationists (AERO Farm & Ranch Improvement Club event).

❯ August: Commodity-Specific Training and Review of On-going Sustainable Agriculture Projects/ Farms, Big Island and/or Kauai. Contact Kathleen Delate, (808) 322-2718.

Sept. 21-22: SAFS Fall Management Workshop, UC, Davis, Calif. Contact: Julie McNamara, Department of Agronomy and Range Science, UC Davis, Davis, CA 95616; (916) 752-8940; fax (916) 752-4361; e-mail jrmcnamara@ucdavis.edu. For NRCS officers and UC Cooperative Extension farm advisors and specialists. An intensive hands-on workshop on harvest sampling methods, fall crop selection and marketing and economics.

❯ Late September, October, or November (date and location not set):

Chapter 3 Training Wrap-Up Retreat. Contact: Nancy Matheson, AERO, (406) 443-7272. Review participants' projects, program evaluation, next steps.

❯ Late Summer/Early Fall 1995: Sustaining Communities, Western Washington. Contact: Colette DePhelps, Center for Sustaining Agriculture and Natural Resources, Washington State University, 99164-6240, (509) 335-2887, dephelps@wsu.edu. Sponsored by PNW Sustainable Agriculture Systems In-Service Education Program.

❯ September: Decision Cases for Agricultural Professional Development, WSU Campus, Pullman, Wash. Contact: Colette DePhelps (same as above). Workshop to enhance the problem-solving and decision making skills of PNW agricultural professionals through the development and use of decision cases. Sponsored by PNW Sustainable Agriculture Systems In-Service Education.

Oct. 25: Sustainability of Dryland Agriculture in Eastern Washington to 2020 and Beyond: A Symposium for Agricultural Professionals and Producers, Richland, Wash. (tentative). Contact: Tom Platt, WSU Cooperative Extension, Box 399, Davenport, WA 99112, (509) 725-4171, platt@coopext.cahe.wsu.edu. To develop understanding of and foster communication about changing agriculture in eastern Washington, for CE, researchers, producers, consumers, and agribusiness members and women. Sponsored in part by PNW Sustainable Agriculture Systems In-Service Education Competitive Small Grants Program.

❯ October or November: Land Ethics and Commercial Agriculture WSU TriCities Campus, Richland, Wash. Contact: Bill Dean, WSU TriCities, 100 Sprout Road, Richland, WA 99352, (509) 375-9274. Explore how individuals' ethical frameworks or land ethics influence their day-to-day land management practices. For CE, NRCS, researchers, industry reps, government agencies, environmental groups, other interested persons. Sponsored by PNW Sustainable Agriculture Systems In-Service Education Competitive Small Grants Program.
Table 1. Bob Quinn’s first organic field experiment

<table>
<thead>
<tr>
<th>Year</th>
<th>Organic</th>
<th>Conventional</th>
</tr>
</thead>
<tbody>
<tr>
<td>1983</td>
<td>Alfalfa seeded</td>
<td>Winter wheat</td>
</tr>
<tr>
<td>1984</td>
<td>Alfalfa hayed</td>
<td>SF</td>
</tr>
<tr>
<td>1985</td>
<td>Alfalfa hayed</td>
<td>Barley</td>
</tr>
<tr>
<td>1986</td>
<td>SF N=96 lb</td>
<td>SF N + 40 lb + 56 lb N (urea)</td>
</tr>
<tr>
<td>1987</td>
<td>Winter wheat</td>
<td>Winter wheat</td>
</tr>
<tr>
<td></td>
<td>33 bu/acre</td>
<td>34 bu/acre</td>
</tr>
<tr>
<td></td>
<td>15.3% protein</td>
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<tr>
<td>1988</td>
<td>Durum 4 bu/acre</td>
<td>Durum 0 bu/acre (drought)</td>
</tr>
<tr>
<td>1989</td>
<td>Kamut 23 bu/acre</td>
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<tr>
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<td>15.5% protein</td>
<td>13.4% protein</td>
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<tr>
<td>1990</td>
<td>Durum underseeded with alfalfa, cut together</td>
<td>22 bu/acre 13.5% protein</td>
</tr>
</tbody>
</table>

**QUINN, FROM PAGE 1**

summer fallow. The organic field had what Quinn considered adequate soil test nitrogen for the grain crop (due to the alfalfa green manure), and he added enough urea fertilizer to the conventional field, which tested lower, to make the two fields comparable.

Quinn grew four consecutive grain crops on each field to watch how yields, protein, and soil nitrate would change. The alfalfa green manure maintained soil nitrate above the conventional for the first two years (see Figure 1 on page 6). This trend continued during the third and fourth years, but to a lesser degree. Crop yields were close to his 35-bushel yield goal in 1987, and were near zero during the drought of the following year.

In 1989, the kamut wheat in the organic field yielded a typical 23 bushels, while the conventional yield was 28 bushels. But protein on the organic kamut was 15.5 percent compared to 13.4 percent on the conventional. By 1990, Quinn saw no visible difference between the fields and harvested them together. Yields and protein were down, indicating that the system was running out of nitrogen.

Based on this initial experience, Quinn has tested various green manure crops in more recent years. He wanted one that would help keep his grain protein above the 14.5 percent minimum he needs for his markets. He has done comparisons of alfalfa, sweet clover, peas, lentils, and buckwheat. Based on his observations, he believes alfalfa performs best in his system. He typically sees higher soil test nitrogen following alfalfa compared to clover and other green manures. And the wheat after alfalfa has always had higher grain protein than after the other green manures (see Figure 2 on page 6).

Alfalfa green manure appears able to support good yields for two subsequent grain crops on Quinn’s farm. And he senses that it takes less nitrogen to grow a bushel of grain with green manure than with commercial fertilizer. He speculates that this may be due to the slow release of nitrogen from the alfalfa, which may reduce leaching losses. Also, the alfalfa in rotation appears to be an excellent nitrate scavenger. Residual soil nitrate levels run 15 to 20 pounds per acre with the alfalfa compared to 30 to 40 pounds per acre with his conventional system.

Another benefit of the alfalfa is weed control. Quinn planted alfalfa in a field infested with wild oats. By the second year, there were none in the hay crop. And then when the field returned to grain three years after planting, he had no wild oat problem for the next three crops. He did see the weed encroaching in the waterways where new seed was washed in. But he wonders whether the alfalfa rotation somehow reduced the viable wild oat seed in the soil. A Montana State University researcher is cooperating with him on this research question this year.

Alfalfa has a long history on irrigated land in Montana, where it is usually grown for a number of years as a hay crop. But there may be an expanded role for it as a short-term rotation crop in dryland cereal cropping beyond its proven value to combat saline seep.

Quinn suspects that the perennial nature of alfalfa, and the large root biomass it produces, may be why it performs better than the annual green manures he compared it to. But the roots pose a challenge for terminating the crop, as Quinn does not use herbicides in his system. He relies on several spring tillage operations, using sweeps in April followed by successive cultivations.

Quinn also is testing a fall tillage option, but is concerned about overwinter erosion. He may also examine alfalfas with differing degrees of dormancy to find a variety that still performs well but is easier to take out.

Farmers like Bob Quinn are

MORE QUINN, PAGE 6
QUINN, FROM PAGE 5
continually moving agriculture forward as they conduct their own on-farm testing and share the results with others. Their innovation on topics such as green manure will be increasingly important as public funds for agricultural research shrink and private companies find little incentive to pursue these management questions.

Figure 1. Change in soil nitrate levels over time without additional fertilizer

- Organic (Alfalfa) + Conventional (Urea)

Figure 2. Grain protein content in wheat after various green manures

- Alfalfa
- Lentils
- Clover
- Buckwheat
- Peas
- Summer fallow

Flea beetles launch attack on Montana leafy spurge

— By Stephanie Rittmann, sustainable agriculture program associate for the Alternative Energy Resources Organization (AERO) —

A rancher in central Montana has found that flea beetles of the *Aphthona nigriscutis* species, in conjunction with sheep, are effectively controlling leafy spurge. The insects have done so well on the N Bar Ranch near Grass Range, in fact, that owner Tom Elliott staged a "flea beetle round-up" in June to capture viable populations for sale to other landowners, as a fund-raiser for the Alternative Energy Resources Organization.

Leafy spurge is an aggressive, persistent, deep-rooted perennial that grows to a height of one meter or more. It is native to Eurasia and has no natural predators in the U.S. Its ability to maintain high root reserves enables the plant to recover quickly from most pesticide and physical damage. As a result, "the area that leafy spurge inhabits is doubling every 10 years," according to Norm Rees, an entomologist with the USDA-Agricultural Research Service (ARS) Rangeland Weeds Laboratory at Montana State University, who is conducting flea beetle research at the N Bar.

Over several years in habitat that favors their survival, flea beetles reduce leafy spurge populations by destroying the plant's lateral and tap roots and weakening the plant by consuming its foliage. The larvae feed on the root hairs and yearling roots, impairing their ability to take up moisture and nutrients, thus stunting plant growth and retarding flowering. The adults feed on the foliage, depleting the plant's ability to photosynthesize and adding to the stress.

"We prevent the spread of leafy spurge and feed between four and five thousand sheep each year by grazing sheep on spurge before it sets seed," Elliott explained. "Meanwhile, the flea beetles do their own work on the roots and leaves."

*Aphthona nigriscutis* was first released at the N Bar Ranch in 1990. Several releases have followed. "After the first year we saw a three-yard-by-three-yard depression in the leafy spurge. After the second year the flea beetles eliminated spurge in an 18-by-20-yard area. After the third year that area increased to 53-by-60 yards. Today, the flea beetles have eliminated leafy spurge in one area on the ranch measuring 2.25 miles in diameter," Rees said.

*Aphthona nigriscutis* thrives on direct sunlight in dry habitats with well drained sandy soils, such as are found on hill and knoll tops. It prefers needle, thread and porcupine grass ecosystems and flowering spurge stems — less than 70 centimeters tall with fewer than 60 stems per square meter.

Call Stephanie Rittmann at AERO, (406) 443-7272, to find out if this species can survive in your area.
Reduce your herbicide bill with variable application

— By Research Associate Kathleen Painter and Prof. Douglas Young of the Department of Agricultural Economics at Washington State University, and Chris Boerboom, an assistant professor at the University of Wisconsin Department of Agronomy —

Considerable research has focused on potential cost savings and environmental benefits of variable fertilizer application. Cost savings achieved in some of these studies were relatively small compared to the costs of soil testing, yield testing, mapping application areas, and calibrating application rates. Variable herbicide application, however, has greater potential for cost savings, due to a higher relative cost. Reducing herbicide use also can reduce the risks of crop injury from herbicides, carryover problems, and groundwater contamination.

The most profitable level of herbicide use can vary by landscape position, recent research has shown (Boerboom, Young, and Ogg). High, moderate and minimum levels of herbicide use (90 percent, 75 percent, and 60 percent of full label rate) were tested on three landscape positions. On a north foot slope and a south foot slope, returns were maximized using the maximum level of weed management. On the summit, a moderate level of herbicide use generally resulted in the highest returns. Even though this summit was not highly eroded, reduced herbicide use was still most cost-effective. Researchers ob-

More Herbicides, Page 8

<table>
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<th>Crop</th>
<th>Chemical</th>
<th>Unit</th>
<th>Cost ($/unit)</th>
<th>Full rate (units/acre)</th>
<th>75% rate (units/acre)</th>
<th>50% rate (units/acre)</th>
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</table>

*Fargo does not perform well at reduced rates, so a full rate was used in all scenarios.

NOTE: Trade names have been used to simplify information. Neither the authors nor the SFQ endorse or criticize any named products.
**Teamwork leads to shared discovery**

Valuable farmers' observations are quantified with the aid of researchers

— By David Granatstein, coordinator of the Washington State University Center for Sustaining Agriculture and Natural Resources in Wenatchee —

Growers are constantly observing what happens on their farms, especially as they test new ideas, practices, and machinery, but few have done so in a systematic manner. With the recent upsurge of interest in grower-based, field-scale on-farm testing, however, farmers are teaming up with researchers to try to better quantify observations they have made and get a better handle on whether a management change is benefiting their farm, the land, and their pocketbooks.

In 1991, Bob Klicker, a grower from Walla Walla, Wash., worked with Dave Bezdicek, a soil microbiologist from Washington State University, to begin testing a tillage system Klicker and others had been using for several years.

Klicker had purchased a Lenz subsoil-ridger tool from Iowa to help combat soil erosion on the sloping wheat fields. He used the tool in conjunction with a soil fertility program that stressed cation balancing and addition of lime where needed, an unusual practice in the region. Klicker and other growers observed reduced erosion, increased microbial action, improved soil physical conditions, and higher yields.

Klicker and Bezdicek solicited the involvement of several growers and Steve Reinertsen, an agronomist with the McGregor Company, a regional agricultural supply business. Their goal was to test the subsoil-ridge till system on a field scale with replicated comparisons.

Two replicated sites were studied at Pullman, Wash., and Genesee, Idaho. In addition, six non-replicated on-farm sites were established across the region, representing a rainfall gradient from 16 to 28 inches annual precipitation. On these sites, the farmer's normal operations were compared side by side with the subsoil system.

The subsoiling was done in the fall after grain harvest. The implement left a corrugated pattern of ridges and troughs on the surface. These ridges are thought to help stop runoff, improve infiltration, and act as "mini compost piles" to help the residue break down. Measurements were taken at the replicated sites over the next two crop seasons and included yield, soil microbial status, infiltration, soil erosion, and residue cover. The non-replicated sites were sampled less intensively.

*More sharing, Page 9*

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**HERBICIDES, FROM PAGE 7**

served some herbicide injury on the summit plots, despite an organic matter content of 2.6 percent.

Underlying principles can explain these varying results by landscape position. Higher weed pressure on more fertile bottom land and side slopes increases herbicide needs to protect the high yield potential. Higher levels of soil-active herbicides are required in soils with high organic matter because some herbicides bind to the organic matter, leaving less to control weeds. Herbicides are less likely to leach in soils with higher organic matter for the same reason. Herbicides are more available for plant uptake in low organic matter soils, so marginally-tolerant crops may be injured in areas of the field with low organic matter (clay knobs) from herbicides used at rates appropriate for the rest of the field.

When herbicide label rates are reduced, other variables become more important: how easily weeds are controlled by the herbicide, for instance. Post-emergence applications must be timed to treat weeds at an early stage, and success depends upon favorable environmental conditions. Labels for soil-active herbicides may also provide information on adjusting herbicide rates based on organic matter levels. Reduced herbicide rates in low organic matter areas would be cost-effective. Using herbicides at 75 percent of label rates can save $3.02 to $10.62 per acre. At 50 percent of label rates, savings are doubled.

Since soil areas with low organic matter also are low-yielding, research shows that reducing herbicide levels would be an appropriate management decision given these research results. Many farmers already use less than standard label rates or the lower range of recommended rates, especially for some of the more expensive chemicals.

Variable herbicide applications, like variable fertilizer applications, create additional production costs. Equipment with the capability of varying rates is needed, or different landscape zones must be measured and sprayed separately. Additional scouting and weed mapping is necessary. Reduced herbicide rates may not always give enough weed control, and could result in yield losses.

More information on economic thresholds of different weed species for various crops is needed in order to fine-tune reduced herbicide use. Farmers' experiments with reduced rates are a valuable source of information in this area.
SHARING, FROM PAGE 8

At the Pullman site, several microbial tests were higher in the subsoil plots and the limed plots the first spring after the tillage, compared to the grower practice. The effect due to subsoiling disappeared by that fall, while the effect due to liming persisted through the second spring.

Many soils in the region are becoming more acidic due to long-term use of ammonium-based fertilizers. As soil pH dips below 6.0, various microbial groups begin to be suppressed. A similar response of the soil microbes to lime was measured at Genesee, where the subsoiling had no effect.

At both sites, the subsoiling plots had greater surface residue cover, indicating more protection against erosion. This is no surprise where the subsoiling was compared to a moldboard plow. However, one interesting result was the dramatic increase in surface residue on the subsoil plots at Pullman going from the first fall to the second spring. The amount of residue nearly doubled over winter, while it declined on the conventional plots. The researchers estimated relative erosion of about 0.5 tons per acre on the subsoil plots at the second spring compared to 3.7 tons per acre on the plowed plots. While both rates are below the T (tolerable annual soil loss), the elutin method used typically underestimates the actual soil loss. The elutin method is based on the measurement of the cross-sectional area of the erosion rills.

At Pullman, pea yields were significantly increased by subsoiling in year 1, and wheat yields in year 2. Liming had no significant effect on yield, a result similar to that from past research. At Genesee, only wheat with subsoiling had a significant yield increase. On the non-replicated farms, no statistical differences were noted for microbial or crop yield due to the subsoil or lime treatments. This points out the need for some form of replication when trying to detect what might be subtle changes in the soil due to different management systems. Soil moisture storage for the first spring was greater with the subsoiling at one farm only.

The partnership of growers, researchers, and private industry made it possible to conduct a real-world evaluation of a new practice being tried by growers. Subsoiling is known to help prevent erosion under certain weather conditions, especially frozen soil beneath a thawed surface. The ridging effect of the Lenz subsoiler was new, and most measurements of liming have focused on yield, not the microbial status of the soil. Based on the results from this study, the subsoil/ridging has the potential to favorably impact crop yields and soil conservation, while the liming did enhance the microbial life.

"There may be some real benefits to keeping crop residues in the top several inches of soil where they effectively enhance microbial activity which contributes to adequate decomposition, increased water infiltration, and general improvement in soil quality," Bezdicek said in summary. "This is in addition to the erosion control value of residues on the soil surface."

Thus, the combination of practices shows promise for helping growers lose less soil and gain income, steps that will sustain farms into the future.

Listen up: Your tractor tells a story

— By David Gronatstein, coordinator of the Washington State University Center for Sustaining Agriculture and Natural Resources in Wenatchee

Growers who have been on the same land for many years often remark how they can feel a difference during primary tillage operations when they cross a boundary from what was a former field, for example, one that had been in alfalfa for many years. Often this difference is noticed for years after the consolidation of a field.

Dale Wilkins and Paul Rasmussen, researchers at Pendleton, Ore., noticed this same phenomenon on the long-term plots that have been in place now for 60 years. They decided to see if their "feel" measured up to a real difference.

The researchers mounted a load cell between the tractor hitch and the tongue of a moldboard plow. The load cell accurately measures the resistance of the soil to the plow, termed the specific draft. The specific draft was consistently lowest in the plots that had received organic residue in the form of manure or pea vines added every other year in the wheat-fallow system. There was one exception in 1992, where the fall burn plots had the lowest specific draft, probably due to the drier soil conditions under this treatment.

Specific draft may be another useful indicator of soil quality, as it integrates several factors and reflects a property that can be easily interpreted as desirable for a grower. With large differences, there could be economic benefits from lower draft, including lower fuel consumption, less wear on a tractor, and the ability to utilize smaller horsepower tractors.

Reference

CALENDAR OF EVENTS

JULY

14: Lethbridge Research Centre field day, in conjunction with the AERO and SCCA annual meeting. See sustainable ag-related research, including cover crops, green and animal manure comparisons, comparative productivity of different soils, perennials in rotation with small grains, and biocontrol of Russian wheat aphids. Contact: AERO, (406) 443-7272.

SEPTEMBER
Date not set: Six-day Holistic Resource Management course at a ranch in Montana (to be determined). Contact: Roland Kroos, (406) 388-1003. For producers, researchers, extension agents, resource conservationists, other land managers.

NOVEMBER
2-3: Alternative Weed Management Conference, Holiday Inn, Great Falls. Contact: Stephanie Rittmann at AERO, (406) 443-7272. The event will include lectures and hands-on exercises in alternative weed management strategies. The program is intended for producers, resource conservationists, researchers, extension agents, aerial applicators, other land managers. (Joint AERO and Montana State University event.)


DECEMBER
8-9: Farm & Ranch Improvement Club Program Annual Meeting, Ursuline Center, Great Falls, Mont. Contact: Stephanie Rittmann, AERO, (406) 443-7272. Members of 25 Farm & Ranch Improvement Clubs gather to share with each other the results, challenges, and successes related to their clubs’ projects.