

# SUSTAINABLE FARMING

## Quarterly



Vol. 2 No. 4 December 1990

### National Ag Library is a gold mine of sustainable information

The National Agricultural Library in Beltsville, Md., established the Alternative Farming Systems Information Center several years ago to provide hard-to-find information on sustainable farming options used all over the world.

The Center is continually broadening its resources, and has begun producing a series of oral history videotapes of leaders in sustainable agriculture, which are available on loan.

The Center also has a series of Quick Bibliographies on topics such as Integrated Pest Management, allelopathy, dryland farming, and legumes in crop rotations. These are available free of charge.

In addition, Center staff can help interested people access the extensive library holdings of agricultural information from around the world.

For more information, write Jayne MacLean, Alternative Farming Systems Information Center, National Agricultural Library, 10301 Baltimore Blvd., Beltsville, MD 20705, or call her at (301) 344-3719. ■

## Less fallow means more profit in Colorado study

By David Granatstein, project coordinator for the six-state Dryland Cereal/Legume Project.

Researchers from Colorado State University are finding it profitable to reduce the frequency of summer fallow in eastern Colorado dryland farming, where the traditional rotation has been winter wheat-summer fallow.

The study is being conducted at three sites in a 16-inch annual precipitation zone, but with different evapo-transpiration potentials. Test strips are field-length and each covers three landscape positions — summit, sideslope, and toeslope.

The conventional stubble mulch-wheat-fallow system is being compared with a series of more crop-intensive rotations, all managed with no-till. These include wheat-corn-fallow, wheat-corn-millet-fallow, flex-cropping, and perennial grass.

The nitrogen rate is determined from a six-foot soil nitrate test, and thus varies with the year, crop grown, and landscape position. Both nitrogen and water-use efficiencies are being followed in the study.

No-till has led to considerably more water storage and consequently increased grain pro-

duction. The combination of increased productivity and increased crop intensity significantly increased soil organic matter at all landscape positions, especially the sideslope, in only four years. An added bonus is the actual per-acre increase in wheat yields due to the extended rotations.

Projections for a 12-year production period predict that the three-year and four-year rotations will have double the grain output of the wheat-fallow system. Since precipitation is

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### Inside the SFQ

- Interest in green manures goes up along with petroleum prices.
- Sustainable ag movement loses one of its best leaders.
- Montana database connects farmers who have the same sustainable interests.
- Miranda yellow protein pea has Utah researchers, farmers excited.
- Some farm pests can be bugged to death.



# Persian Gulf crisis stimulates interest in green manures

From a Montana State University News Service report.

The Iraqi crisis is stimulating interest in the use of legume crops as alternatives to petrochemical fertilizers, reports Jim Sims, a Montana State University Agricultural Experiment Station agronomist.

Sims says phone calls to his Bozeman, Mont., office reflect a fear among farmers and ranchers that higher oil prices will mean higher production costs. Not only are growers caught by higher fuel bills, Sims said, but the cost of nitrogen fertilizer is expected to increase. Nitrogen fertilizer usually is derived from gas or oil, and requires a large amount of energy to produce.

Using legume crops to produce nitrogen is becoming more economically attractive. Sims cited a University of Idaho study that compared the cost of a fallow-grain rotation using commercial fertilizer to a legume-grain rotation where

the legume, the Austrian winter pea, supplies the nitrogen. "The costs were almost identical," Sims concluded. This study was described in more detail in the September issue of the *Sustainable Farming Quarterly*.

Legume crops have the added value of improving the soil and helping control saline seep in susceptible areas, he said. According to Sims, producers can expect 40 to 60 pounds of

nitrogen for every ton of dry matter a legume produces — enough for a good small-grain crop on non-irrigated fields.

1991 Farm Bill provisions are adding to the interest in legumes, Sims said. The set-aside provision now allows the production of alternative crops on the set-aside acres.

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not a variable, precipitation use efficiency is doubled as well. (See Table 1 below).

The increasingly diverse rotations also appear to use nitrogen more efficiently. For applied fertilizer nitrogen, the wheat-fallow system produces 2.3 lb grain/lb applied N/year compared to 4.6 lb grain in the wheat-corn-fallow system.

Gross income over a 12-year period was projected to be \$725, \$1,250, and \$1,575 per acre for the wheat-fallow, wheat-corn-fallow, and wheat-corn-millet-fallow systems, respectively. Net incomes were expected to follow the same trend. Increases in gross income were greatest for the toeslope position.

While these actual rotations will not fit the more northern dryland areas, the principles at work are important to consider. Both no-tillage and fallow replacement lead to greater water-use efficiency, the key constraint in dryland farming. This not only improves profitability, but reduces environmental problems such as saline seep and nitrate leaching. And the extended rotations reap rotation benefits for the primary cash crop, wheat.

More information on the Colorado study is available from the project leader, Dr. G.A. Peterson, Dept. of Agronomy, Colorado State University, Fort Collins, CO 80523.

**Table 1: Water use efficiency under different rotations**

	Pounds of grain per inch of <u>precipitation</u>	Nitrogen fertilizer over cycle <u>(lbs/acre)</u>
Wheat-fallow	65	60
Wheat-corn-fallow	133	135
Wheat-corn-millet-fallow	138	112

The *Sustainable Farming Quarterly* is a publication of the Dryland Cereal/Legume Project, a LISA project based at Washington State University, Pullman. The publisher is the Alternative Energy Resources Organization, 44 N. Last Chance Gulch, Helena MT. (406) 443-7272.

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Evaluative comments, ideas for articles and questions should be forwarded to AERO, 44 N. Last Chance Gulch, Helena, MT 59601. (406) 443-7272.



**LEGUMES, from page 2**

Under the triple-base option, farmers can raise alternative crops, including legumes such as peas, lentils, chickpeas and edible beans. "We do not recommend that growers initially plant a large acreage of legumes," cautions Sims. He recommends trying a legume crop on a large enough scale to have a valid trial, but not on so large a scale that a crop failure would mean a major financial loss.

The planting of a legume crop requires some different management steps than cereals, Sims explained. Seeds must be inoculated with the proper *Rhizobium* bacteria for optimum nitrogen fixation. Legumes need adequate calcium, sulphur and molybdenum, and are susceptible to certain diseases which don't affect cereals. Also, lining up markets ahead of time is essential for economic success.

The Austrian winter pea is the only legume that can be seeded in the fall in the intermountain region, according to Sims. Legumes that could be seeded in the spring include George black medic and other Australian medics, Indianhead lentils, faba beans, several spring peas or lentils, and both yellow sweet clover and berseem clover.

All of these species can be managed as green manure crops (tilled in for soil-building, instead of harvested) by limiting them to a predetermined amount of water, Sims said. They are allowed to grow until they have used the number of inches of water the producer thinks he or she has available. In some dryland areas of the West, that may

be only three or four inches of water.

Sims also pointed out that growers must be ready to change management strategies if an unusually dry or wet season develops.

Sims offered these rules of thumb for judging when to turn a green manure crop under in dryland growing areas:

- If seeded in the fall, Austrian winter peas are likely to have used three to four inches of water by mid - to late June. Spring-seeded Austrian winter peas probably would have used that much moisture by the time the first flowers bloom.
- Other spring-seeded dry peas could be managed like the spring-seeded Austrian winter peas.
- Indianhead lentils seeded by the last week in April or first week in May, in the drier areas, would have used three or four inches of water by the first week in July.
- In higher rainfall areas, Sims recommends letting the lentils use another inch of water, and he would expect them to be ready by the third week in July. That would be at flower-initiation to 10 percent bloom.
- Other spring-seeded lentils could be managed like the Indianhead lentils.
- Black medic is usually ready for tilling in by the third week in June to the first week of August, because medic uses a little less water than the other crops mentioned here.
- When yellow sweet clover is

spring solid-seeded as a green manure crop, it normally would be ready to incorporate about mid-July in the driest areas of Montana. By analyzing a sample of the crop before plow-down, Sims noted, a grower can know how much nitrogen is in the field. ■

### Sustainable agriculture loses a valued leader

*By David Granatstein, project coordinator for the six-state Dryland Cereal/Legume Project.*

The recent death of long-time sustainable agriculture advocate Robert Rodale means the loss of a visionary person who was not afraid to criticize modern agriculture and propose controversial alternatives.

Rodale was killed in a September car accident in the Soviet Union, where he was developing a Russian language counterpart to *New Farm* magazine, to provide farmers with sustainable agriculture information during the coming transition of farming in that country.

Rodale helped establish the Rodale Institute, which conducts research on more environmentally sound agriculture. He inspired the publication of *New Farm*, an important source of information on sustainable farming strategies.

His insights and leadership will be sorely missed. ■



## Sustainable ag questions? AERO database has answers

**180 farmers contributed real-life experiences to AERO computer network, and the information is free for the asking...**

By Nancy Matheson, sustainable agriculture project coordinator for the Alternative Energy Resources Organization in Helena, Mont.

One hundred eighty-eight farmers and ranchers in the Intermountain West, Northern Plains and Western Canada are the sources of some of the best and most accessible information on sustainable farm management in the region.

They are part of a network, established by the Alternative Energy Resources Organization (AERO) in 1988, of producers who are experimenting with or using well-established sustainable farming practices. Their knowledge and experience are available to anyone who wants to learn more about how cropping systems, livestock, and range can be managed for environmental quality and economic stability.

Information about each producer's operation, management practices, farming history and personal experience was compiled by AERO and entered into a computer database. Some of this information is published in *AERO's Guide to Sustainable Agriculture in the Northern Rockies and Plains*. (See ordering information at end of this article.) Both the book and the database provide

access to the names, addresses and phone numbers of these farmers and ranchers. But what the database offers that the book can't is the capability to search out just those producers in the network who have knowledge of a specific practice — or set of practices — and who have achieved a particular level of success.

For example, if a farmer wants to know about controlling weeds in wheat by seeding the rows closer together, he or she could page through the "small grains" and "small grains and livestock" sections of the book looking for people who have experience with "close-row cropping."

An easier and more precise way would be to request a search of the database for "wheat" and "close-row cropping." Additionally, the farmer could ask for information on those producers who have more than one year of experience with the practice, and who have had success with it.

Examples of questions the database has answered are:

- What are canola growers using to help control pests?
- Who can talk to me about alternative livestock pest control methods?
- Is anybody incorporating no-till practices into a sustainable cropping system?
- What kind of on-farm business enterprises are sustainable farmers and ranchers in Montana involved in?

The answer to this last ques-

tion included a list of 26 agriculture-related enterprises and six on-farm processing businesses. The answer to "Who has experience with Holistic Resource Management on irrigated pasture?" was a list of names, addresses and phone numbers of six producers from three states and one Canadian province.

Connecting people to others with the information they seek is the purpose of the AERO database.

AERO is a private, non-profit membership organization that strives to help people and their rural communities maintain their land and human and natural resources.

Call or write AERO with your questions about sustainable agriculture, its methods and practitioners. Be as specific with your question(s) as you can, and include a brief description of the type and setting of the situation your question relates to.

Include your name, address and phone number. There is no charge for your first two requests and up to five pages of information for subsequent requests will be free. For additional pages, printing, postage and handling costs will be charged. ■

To order AERO's Guide to *Sustainable Agriculture in the Northern Rockies and Plains*, (Matheson, Nancy, ed. 1989. 100 pp.), send \$7, or \$5.50 if you're an AERO member, to the Alternative Energy Resources Organization, 44 N. Last Chance Gulch, Helena, MT 59601. The phone number is (406) 443-7272.



# Utah researchers excited about alternative cash crop

## Miranda yellow protein pea could replace imported soybeans, boost local markets

By Dr. V. Philip Rasmussen, a Utah State University Extension soils specialist, and Dr. R.L. Newhall, an extension associate specialist in soil and water conservation at Utah State University.

Researchers striving to help Utah farmers find alternatives to small grains and alfalfa have discovered that the Miranda yellow protein pea has excellent potential as a locally-marketable substitute for thousands of tons of soybeans now imported as livestock feed.

The cool-season Miranda pea is attractive for Utah small-grain cropping rotations because it fixes nitrogen and reduces the need for purchased inputs. It also thrives under reduced tillage systems.

Utah State University turkey research specialists in Ephraim read Oregon reports indicating that the Miranda yellow protein pea, a newly-released variety, had been used successfully for three years in Pacific Northwest poultry feed trials to replace soybean meal.

It was determined that the Miranda protein pea would have an instant local market if it could be grown successfully in Utah, by eliminating the substantial rail costs for the imported soybeans. And the peas have potential in poultry feeding programs, as well as in swine, dairy, beef cattle, and sheep feed rations.

Miranda yellow protein peas have several reported advantages:

- The pea contains more than 22 percent crude protein and 1,293 kilocalories of metabolizable energy per pound.

- It produces a significant growth rate when supplemented with fat and fed to market-size birds.

- When fed Miranda yellow peas, market birds normally require fewer pounds of feed to produce a pound of live weight than when fed corn-soybean meal.

In Oregon trials, two pounds of corn-soybean meal was required to produce about one pound of turkey meat, while 1.98 pounds of Miranda peas produced about 1 pound of meat. This translates into about a half pound less feed to produce a 20-pound turkey.

- The peas are an excellent rotation crop in Utah's irrigated fields.

- They are a legume with the potential to fix 40 to 60 pounds of nitrogen per acre each year.

- The average Miranda pea yield is 3,400 pounds per acre, with yields as high as 4,200 pounds and as low as 2,500 pounds.

- They have a good potential for marketing.

In the spring of 1988, Utah State University, in conjunction with Moroni Seed & Feed Co., established a trial planting of Miranda yellow protein peas at the USU Greenville Experiment Farm in North Logan. One objective was to determine whether the peas would yield

enough to be economically viable in Utah.

Two planting systems were used — a modified conventional system and a no-till system. The latter was not tilled before seeding. The modified conventional system was roller-harrowed once before seeding.

The plots were planted with a no-till drill on April 1, 1988, with 200 pounds of seed per acre. The peas were grown without applying fertilizer. Sprinkler irrigation was used to keep the crop at 50 percent available water or higher. Weed control was accomplished manually. A grain plot combine was used for harvest in early August.

The peas were then taken to the Ephraim Field Station for a study of feed-ration alternatives with turkeys. Yield data for the first-year tests show that the conventional system produced slightly higher yields than the no-till system, although no statistical difference can be shown to exist.

However, the economic evaluation reveals a cost savings of about \$4.20 per acre (the cost of a cultipacker for seedbed preparation) using the no-till system. Other per-acre costs under the two systems were identical — \$4.95 for planting, \$48.64 for seed, and \$19.25 for grain combine.

In summary, these preliminary data provide confidence that Miranda yellow protein peas can be grown profitably in Utah. ■



## Bugging those crop pests to death

# Beneficial insects in cover-crop systems attract new attention

*Compiled from a research paper "Cover Crops and Control of Arthropod Pests of Agriculture," by Dr. Robert L. Bugg, information analyst for the Sustainable Agriculture Research and Education Program at the University of California, Davis.*

The use of beneficial insects in combination with cover crops to control insect "pests" has considerable potential in sustainable agricultural systems, but research to date is incomplete for California and nearly nonexistent for the inland Pacific Northwest.

Nonetheless, some broad general concepts are useful in stimulating important dialogue on the subject of insect management.

Cover crops certainly can harbor both pests and beneficial insects, but what is still unknown is just how to use those crops to minimize pest problems while maximizing beneficial insect activity.

### Discouraging insect pests

That arthropod pests will damage cover crops is rarely of concern. More important is the possibility that pests harbored by cover crops may disperse to adjoining economic crops.

One definition suggested for the term "weed" is "a plant out of place." An analogous definition that might serve for "insect pest" is "an insect out of place." In fact, some "pests" can actually be beneficial in some contexts, as they may attack and suppress other pests, or serve as prey to beneficial arthropods. In any event, potential

pests are not necessarily problems, so long as they are avoided during periods when cash crops are susceptible to attack. These "windows of vulnerability" may be wide or narrow, depending on the nature of the crop-pest relationship.

Various potential pests can disperse from cover to cash crops and cause damage. Often, such dispersal occurs because cover crops mature, die, or otherwise become unsuitable hosts due to normal seasonal changes. Drought stress or cultural practices such as mowing or tillage can also drive pests into associated cash crops. If cover crops are mowed, sprayed with herbicides, or disked during windows of vulnerability, the danger of pest movement and subsequent damage will be heightened.

Relatively few experiments have been conducted on the subject, but work in related areas suggests that it may be possible to manage insect movement by the following tactics:

- ✓ Select cover crops that sustain few pests of the associated cash crop.
- ✓ Select cover crops that are more attractive to pests than the cash crop while the latter is vulnerable.
- ✓ Select cover crops that mature before the associated cash crop becomes vulnerable.

- ✓ Mow or plow down a cover crop before it harbors significant densities of dispersive pests or before the cash crop becomes vulnerable.
- ✓ Postpone mowing or tilling under a cover crop until the associated cash crop is no longer vulnerable.
- ✓ Mow alternating strips so that remnant strips will continue to provide habitat and arrest pests.
- ✓ Time mowing or cultivating operations for when insect pests are in non-dispersive, immature stages when most of them can be destroyed.
- ✓ Irrigate cover crops to extend the period of attractiveness of the cover crop later into the season. Mowing plus irrigation can postpone maturation and lead to regrowth of many cover crops.

### Encouraging beneficial insects

Beneficial arthropods include pirate bugs, big-eyed bugs, lady beetles, predatory wasps, mites, and spiders. Predatory wasps include social species such as paper wasps and yellow jackets that attack many species of caterpillars. Solitary wasps collectively attack a wide range of insects, including caterpillars, crickets, and weevils.

Cover crops that attract many predatory wasps include buckwheat, cowpea, and both yellow and white sweet clovers.

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**BUGS, from page 6**

Some researchers believe cover crops may be useful in increasing spider densities. The two relevant studies to-date of this were unsuccessful in improving biological control of wheat pests with spiders.

Cover crops are usually managed intensively and can perform various functions – such as production of nitrogen or organic matter, or protection of soil from erosion.

Cultural methods are accordingly diverse and cover crops may require special attention if they are to serve as insectaries. Grown for nitrogen, cover crops are typically plowed down at or near peak flowering. Mowing or chopping may be included in a management scheme. When the goal is to supplement soil organic matter, non-leguminous species are typically emphasized. And when grown to present erosion, cover crops may be managed by a no-till or reduced-tillage method.

These varied cultural practices can have implications for arthropods. A farmer could select cover crops that harbor many beneficial insects, but relatively few insects likely to become pests on cash crops. Mowing prompts dispersal of many insects and tillage would probably do the same.

The following tactics may help to maintain beneficial insects in cover crops:

✓ When mowing a cover crop, use a sickle-bar mower, which appears to be a gentler alternative to flail mowing. If use of a sickle-bar mower is not feasible, set your flail or rotary mower higher to permit better survival of beneficial insects.

✓ The use of no-till may conserve beneficial insects better than does conventional tillage. Many predatory wasps are ground nesters, and tillage would probably interfere with on-going reproduction. On the other hand, ground-nesting predatory wasps often live in disturbed areas, and superficial tillage could make available new potential nesting sites.

✓ Adjust the timing of mowing or cultivating to allow maturation or dispersal of beneficial insects. Remnant strips of cover crops could provide habitat to beneficial insects, and arrest movement by dispersive pests.

For more information, order Bugg's report, "Cover Crops and Control of Arthropod Pests of Agriculture," University of California Sustainable Agriculture Research and Education Program, Davis, CA 95616. ■

## Calendar

### January

**16-18:** 11th Annual Ecological Farming Conference, Asilomar Conference Center, Pacific Grove, Calif. Sponsored by the Committee for Sustainable Agriculture, P.O. Box 1300, Colfax, CA 95713. (916) 346-2777.

**24:** Crop-Fallow Region Conference on Farming for Profit and Stewardship, Ritzville Theater, Ritzville, Washington. Learn to optimize weed control and soil water storage under conservation tillage. The first in a Dryland Conservation

Farming Conference Series sponsored by the Cooperative Extension Service and the agricultural research centers of Washington and Oregon State Universities and the University of Idaho.

### February

**14:** Annual Cropping Region Conference on Farming for Profit and Stewardship, Ramada Inn, Lewiston, Idaho. The second in the Dryland Conservation Farming Conference Series (see above). Focus on production and economic impacts of alternative crop rotation options under conservation tillage.

**TBA:** On-Farm Research Conference, Oregon location to be announced. The third in the Dryland Conservation Farming Conference Series (see above). Will focus on on-farm testing of new practices and products.

### March

**1-2:** Farming for Profit and Stewardship, Portland, Ore. Learn about alternative production practices using fewer chemicals. Topics include weed and pest management, soil fertility, and ideas for improving communications between farmers and non-farming consumers. Sponsored by the Directors of Research and Extension at Idaho, Washington, and Oregon State Universities. Write to Helene Murray at StAG 202, Corvallis, OR 97331, or call (503) 737-2441. ■



## RESOURCES

**Integrated Pest Management (IPM) Products and Services Directory.** Published by Common Sense Pest Control Quarterly, Bio-Integral Resource Center (BIRC), the directory is divided into four management sections -- insects, plant disease, vertebrates, and weeds. To order, write BIRC, Box 7414, Berkeley, CA 94707, or call (415) 534-2567.

**Least Toxic Pest Management Publications Catalogue.** Also published by the Bio-Integral Resource Center (BIRC). See address and phone number above. Includes educational materials and membership/subscription information.

**Protecting Groundwater from Agricultural Chemicals: Alternative Strategies for Northwest Producers.** Released by the Alternative Energy Resources Organization (AERO), this booklet is a guide to reducing threats to groundwater quality from agricultural activities. It was written for farmers and ranchers, researchers, extension agents, conservationists and pesticide applicators in the Northern Intermountain West. Authors Christine

Kaufmann and Nancy Matheson say that the most effective, long-term crop protection strategies, ones most protective of groundwater, rely on an understanding of the interactions among the physical, chemical, and biological resources of the production system. To order, send \$4 to AERO, 44 N. Last Chance Gulch, Helena, MT 59624.

**Farming for Profit and Stewardship Conference Proceedings.** This edited transcript of the 1989 conference in Post Falls, Idaho, is a 70-page book containing talks given by more than 30 growers, researchers, policy makers and industry representatives. The conference focused on issues related to dryland and irrigated farming in the Pacific Northwest. Send a check for \$4 to the Department of Agronomy and Soils, Washington State University, Pullman, WA 99164-6420.

**Fertile Soil: A Grower's Guide to Organic and Inorganic Fertilizers.** Due to be released Oct. 1 by agAccess, this book is useful to farmers, extension agents, and researchers. It contains hard-to-find information

about soil fertility, fertilizer composition and use, and crop nutrient requirements. *Fertile Soil* is a complete reference on using animal manures and organic materials such as straw, compost and cover crops, as well as many different types of fertilizers and soil amendments.

**Cover Crops Manual.** The 1989 Sustainable Agriculture Research and Education Program report was prepared by the University of California for the California State Water Resources Control Board. Applicable to the inland Pacific Northwest and Canada, the book explains the use of cover crops to retard soil erosion, improve till and water infiltration, furnish nutrients and provide habitat to beneficial insects. In many of these roles, cover crops can reduce the need for synthetic fertilizers and pesticides, thereby improving and protecting surface and ground water. Included is information on dozens of plant species for use as cover crops, green manures and living mulches. Write the University of California Sustainable Ag Research and Education Program, University of California, Davis, CA 95616, or call (916) 752-7557.

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