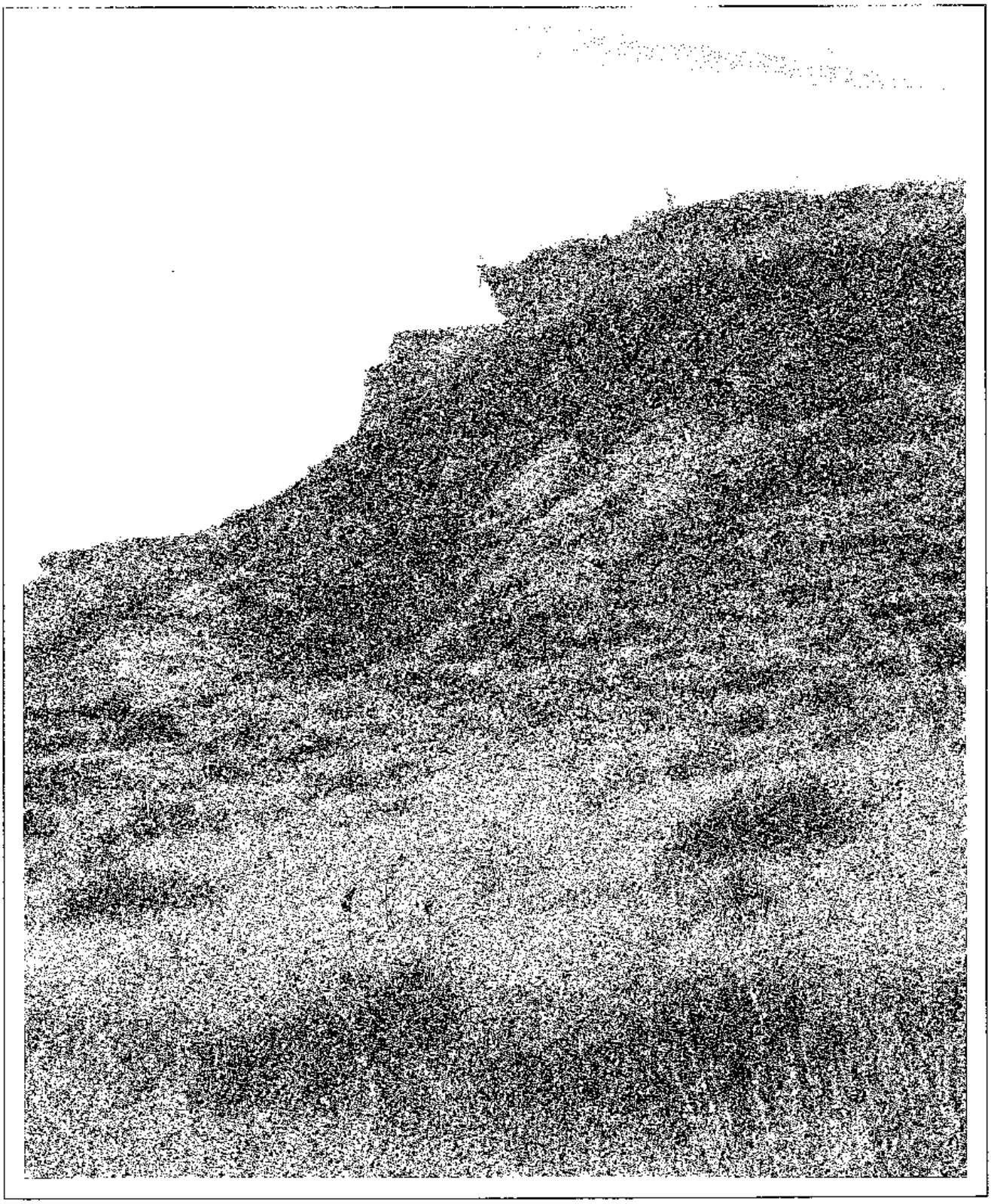

THE LAND REPORT

Fall 1991 Number 42

Contents

Number 42 Fall 1991

Photographs for this issue by Tim Coppinger, Teresa Jones, Doug Romig, Laura Sayre, Jake Vail, and Volker Wittig. Photo on p. 12 by Jim Colando. Most of the darkroom work was done by Laura.

On the Cover

The Land Institute sits on a bluff, so this shouldn't seem so odd. Jake Vail and Adam Davis face east (and into a fierce wind) atop Castle Rocks, in Gove County, Kansas.

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In This Issue

As this *Land Report* goes to press the 1991 interns near the end of their 10-month term. The intern program at The Land Institute brings recent college graduates to help us in our research of a sustainable agriculture that uses nature—the prairie—as its model. Agriculture stands on the two legs of nature and culture, and in addition to overseeing an agroecological experiment, each intern spends a great deal of time mulling over considerations for a sustainable society. Grist is provided by classes, visitors, trips, and activities such as gardening and prairie walks.

The foundation for the work of The Land Institute was laid by Wes Jackson's *New Roots for Agriculture*. Staff ecologists Judy Soule and Jon Piper have recently built upon this with an important new book, *Farming in Nature's Image: An Ecological Approach to Agriculture*. It is reviewed by Chuck Francis on p. 8.

Sarah Williamson writes of some agricultural and cultural lessons learned from two Swedish visitors on p. 14, followed by an exploration by Doug Romig of some closer-to-home lessons we have yet to learn.

The Sunshine Farm, eating the sun, GAIT, shelter, objectivity, and a review of a teacher's guide to sustainable agriculture round out *Land Report* 42.

May the new year find you healthy and hopeful.

--JV

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2440 E. Water Well Road
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Editor: Jake Vail
Editorial Assistance:
Teresa Jones, Laura Sayre
Arts Associate: Terry Evans
Circulation Manager: Sharon Thelander
Printed by Arrow Printing Company

Contributing to #42: Marty Bender, Orville Bidwell, Tim Coppinger, Adam Davis, Harley Elliott, Chuck Francis, Beth Gibans, Dave Griffin, Mike Hamm, Kelly Kindscher, Tom Mulhern, Doug Romig, Jake Vail, Sarah Williamson

At The Land

The Fruits of Fall

Jake Vail

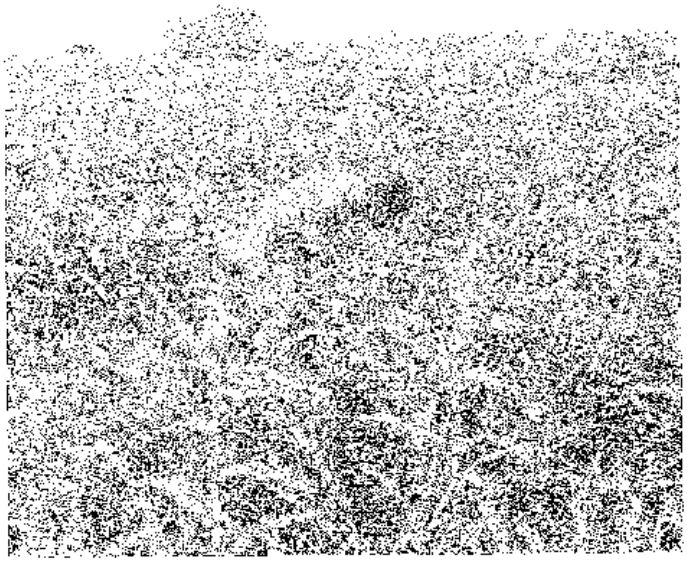
During summer months at The Land Institute we suspend our morning classes and the interns spend long days in the research plots. But all is not sweat and toil. This year the pace of the field work was broken by several field trips and a number of visitors.

In the previous *Land Report*, Laura Sayre wrote of our June trip to the Flint Hills. Since then we have also journeyed to the sand prairie south of Salina, the shortgrass prairie of western Kansas, and the Konza Prairie Research Natural Area. Long-time Friend of The Land and ex-board member Dwight Platt showed us the prairie planting he has overseen at the Kaufman Museum in North Newton, and took us on a walk through the sand prairie north and west of there. A few weeks later we made our way to the high plains of western Kansas, visiting the distinctly un-Kansan Castle Rock and Monument Rocks, the "Cathedral of the Plains" in Victoria, S.P. Dinsmore's Garden of Eden, and the Big Barn of Rooks County (see *Land Report* #40). In September, Gary Merrill, associate coordinator of the Konza Prairie, took us over the back roads of Konza, explained the natural and cultural history of the Konza Prairie, and regaled us with tales of bison genealogy.

Ulrich Nitsch came all the way from the Swedish University of Agricultural Sciences to spend a few days discussing his work in agricultural extension. A few months later his friend and co-worker Lennart Salomonsson of the university's division of ecological agriculture also visited. Sarah Williamson describes Ulrich and Lennart's visits and work on page 14.

Ray and Lorna Coppinger visited in August. Ray, a zoologist and professor at Hampshire College in Massachusetts, presented a lecture and slide show on animals and agriculture, arguing that in traditional farming systems animals were an even more important part of farming than crops. Later, a farming family more familiar with animals than most of us are stopped at The Land on a trip west. David and Elsie Kline farm in Ohio, and with their kids were on their way to see the mountains before one of

Jon Piper, Charlie Pedersen, Volker Wittig, Tim Coppinger, Sarah Williamson, Laura Sayre, Jake Vail, and Dave Griffin take a break from a walk on The Land Institute's prairie.



Charlie Pedersen studies the perennial sorghum breeding project.

their daughters was to get married. *Land Report* readers may know of the Klines from David's book, *Great Possessions*.

Marty Bender, Ray Dean, and John Craft presented some of the results of the work they've been doing on The Sunshine Farm Project to interns and staff at several seminars this summer and fall. The Sunshine Farm, currently a feasibility study, is examining an energy-economy-based agriculture. See Marty's article on page 19 for some preliminary and unexpected results on research he has been doing on nitrogen fixation by legumes.

Ron Kroese, on the staff of Minnesota's Land Stewardship Project, surprised us one day with a lunchtime visit. Pete Ferrell, a Friend of The Land and rancher from Beaumont, KS, also popped in unexpectedly one noon.

After Labor Day we resumed our schedule of warm-up discussions and classes in the mornings and work in the afternoons, and the interns soon found themselves busy with data analysis, research report writing, and preparations for their November presentations to our Research Advisory Group at the University of Kansas. Under the part of our curriculum called "Considerations for a Sustainable Society," classes explored such subjects as conservation biology and farming, water use issues, the urban-rural split, Marty Strange's *Family Farming,* and Willa Cather's *O Pioneers!* But the visitors and seminars didn't let up. First was Ulrik Tornoe, Denmark's assistant minister of agriculture, who visited The Land on a State Department-sponsored tour of alternative American agriculture.

In early September, author and horticulturalist Rosalind Creasy, best known for *The Complete Book of Edible Landscaping*, spent a couple days at The Land. Beth Gibans writes of her visit and public presentation on page 7.

Vern Stevens and the Salina Peace Coalition arranged for author and activist Norie Huddle to spend an evening with staff and interns. Norie, director of the Center for New National Security, has organized peace demonstrations from New England to Japan, bicycled across the United States, written several books, and is now working on new designs for global economic and social systems.

Norie presented a hopeful and bright scenario for the future; a trip to Kansas State University showed us a somewhat darker present. Mark Ritchie, executive director of the Institute for Agriculture and Trade Policy, spoke at Kansas State Unviersity's Lou Douglas Lecture Series on agriculture and the General Agreements on Tarriffs and Trade (GATT).

We also journeyed to Lawrence, KS, to attend a panel discussion on state water use. Our development director, Tom Mulhern, participated, and KU historian and Land Institute board member Donald Worster acted as moderator. Few people understand the complex ecological and social issues surrounding water use in the American West as well as Dr. Worster, who has written two books on the subject, *Dust Bowl* and *Rivers of Empire*. In November, Salina's Smoky Hill Museum invited Dr. Worster to speak on "The Dirty Thirties" in conjunction with the museum's exhibit on Kansas in the 1930s. Earlier that day he came out to The Land to talk with staff and interns.

Water and water use was also the theme of an exhibit at The Salina Art Center this fall. Photographer and Land Institute arts associate Terry Evans is a member of the Water in the West Project (see *Land Report* #40), and arranged for all of the Water in the West photographers to come to Salina for an Arts Center program and a tour of The Land Institute. Seated in one of our largest warm-up circles ever, we spent a large part of a morning discussing art, aesthetics, and sustainability. The next day, interns and artists crossed paths in Cottonwood Falls, where author William Least Heat-Moon was celebrating his new book, *PrairyErth*. Described as a "deep map," *PrairyErth* is a close look at Chase County, Kansas, and includes a chapter of Wes Jackson describing the work of The Land Institute and the state of modern agriculture.

On October 13th we hosted our annual Fall Visitors' Day at The Land Institute. To help celebrate our 15th birthday, Beth Gibans arranged an afternoon chock full of activites, including, after intro-

continued on p. 6

Fall Visitors' Day 1991

Stan Amick and John Jilka lead visitors on a beekeeping workshop and a tour of our hives.

Above, Michelle Mack (barely visible on the left) leads a prairie ecology walk for kids. Below, the staff of Lakewood Park and the Salina Art Center show kids how to make bird nests out of gathered grasses and sticks.

continued from p. 4

ductory remarks by Wes, prairie walks, tours of our research plots and of The Land Institute, activities and music for kids, a display in our gallery by Joyce Fent, and workshops on appropriate landscaping, woodlots, the natural history of this region, beekeeping, golden eagle reintroduction, bread baking, and prairie restoration.

Jerry Jost of the Kansas Rural Center came for class one morning soon after we had heard Mark Ritchie's lecture on GATT, to discuss the work of the Rural Center, the Kansas farm situation, and, with some enlightening props, the increasing centralization of wealth and power in global agribusiness.

Rodale Institute researcher and soil scientist Marianne Sarrantonio visited in October and presented a slide show of her work studying legumes and nitrogen cycling. She also told us what she knows of the mysterious Solstice Effect.

The following week, Land Institute plant breeder Peter Kulakow, research fellow Doug Romig, and intern Charlie Pedersen travelled to Denver for the 83rd meeting of the American Society of Agronomy, the Crop Science Society, and the Soil Science Society. Peter and Charlie presented a paper describing our breeding work with eastern gamagrass, a warm-season perennial bunch grass, and Doug presented a poster on our work with Illinois bundleflower, a nitrogen-fixing perennial legume.

Tom Mulhern and intern Sarah Williamson went from the Smoky Hill River to the smoky hills of California in October. As fires raged near Oakland, the two of them travelled up and down the coast, visiting with college students and Friends of The Land. Arranged by Tom and Land board member George Comstock, Tom and Sarah's travels took them to Steve Gleissman's agroecology program at the University of California at Santa Cruz, a lively discussion with a group of long-time Friends at Dan & Mirian Luten's house, a visit to the synergy house at Stanford with 1979 Land Institute student Alissa Guyer, a talk with Arnold Schultz's ecology class at Berkeley, and a seminar about our intern program at Davis.

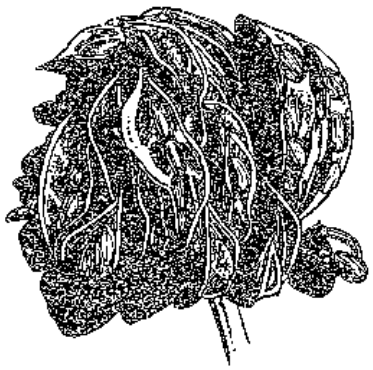
As the interns polished their research presentations, local geologist and prairie aficionado Nick Fent came out to give us a lesson on local geology. Nick passed around pyrite crystals, sharks' teeth, and fossils ranging from sassafras leaves to a mastodon tusk.

In mid-November, Marty Strange came down from the Center for Rural Affairs, in Walthill, Nebraska. Author of *Family Farming: A New Economic Vision*, Marty talked to us about agriculture and academia, social change in the Biblical model, and the latest work of the Center for Rural Affairs.

Michelle Mack

Research Fellow Chosen

1991 intern Michelle Mack has been chosen to be The Land Institute's research fellow in 1992. Michelle is from Seattle, Washington, and has degrees in Ecology and Literature from the Evergreen State College. Michelle worked with Volker Wittig on the establishment of our first large-scale perennial polyculture this past year. Her duties as research fellow next year will include helping to orient the new interns to The Land Institute and assisting with their experiments, working with the research staff, seed room and greenhouse work, and data analysis.



The Revolution in the Vegetable Garden

Beth Gibans

Rosalind Creasy is a rebel, with revolutions in the vegetable garden as her cause. Changing how people garden has been Rosalind's mission for the last two decades. A renowned landscape designer and author of the bestseller, *The Complete Book of Edible Landscaping*, Rosalind visited The Land Institute September 16 and 17.

Rosalind met with interns and staff Monday morning to talk about her pioneering work in edible landscaping and her current book effort investigating the environmental effects of different gardening techniques and resources. From her discussion, it was clear that she is a garden crusader. Confident and candid, she energetically seeks new and challenging ways to excite more people about landscaping appropriately for bounty as well as beauty.

Rosalind first presented the concept of edible landscaping as a landscape design student at Foot Hills Community College in Los Altos, California. Her ideas were strongly resisted by her professors. The idea of incorporating edible plants in home and commercial landscaping plans went contrary to all conventional notions about landscaping in the United States. This frustrated Rosalind but did not discourage her. She knew that gardeners in other parts of the world have planted vegetables, herbs, fruit and nut trees around the house for centuries—it just made sense. She pursued her ideas further, and eventually gained the acceptance of her professors with an exemplary edible landscape design.

Since that first project Rosalind has gained wide repute for her ideas on edible and appropriate landscaping. She shares her creative ideas on gardening and cooking nationwide as a writer and lecturer. She has written four books, including her latest book *Cooking from the Garden*, which won the prestigious Award of Excellence from the Garden Writers of America as the best garden book of 1989. She is also a syndicated columnist for *The Los Angeles Times*, covering garden cuisine for cooks. She is an accomplished photographer.

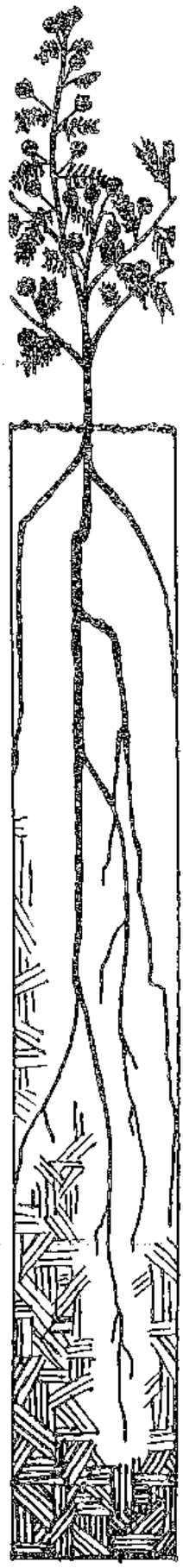
Following our morning seminar at The Land, we treated Rosalind to a potluck lunch. Thankfully, the potluck was the day before she revealed to us the extent of her cooking abilities in her slide presentation of scrumptious-looking, artfully displayed dishes prepared from special theme gardens. These slides were part of a public lecture on "The Revolution in the Vegetable Garden," which she gave Tuesday evening to about fifty people at The Land Institute.

In her talk, Rosalind described the theme gardens that were created for her most recent book, *Cooking from the Garden*. For that project, she collaborated with first-rate chefs and gardeners across the country to create seventeen special gardens, as varied as a Native American garden, a baked bean garden, an heirloom garden, and an edible flower garden. The chefs indicated fresh ingredients they needed to prepare specialty dishes, and the gardeners then grew the specific varieties of vegetables, herbs, and edible flowers to suit the theme cuisine. *Cooking from the Garden* includes gorgeous photos of the gardens, interviews with the chefs and gardeners, information on how to grow the special varieties and where to get seed, and recipes to try. The slides and the book looked delicious; unfortunately, there were no samplers that evening.

Rosalind emphasized the vast diversity of foods that can be grown but are rarely considered by the average gardener. She lamented the limited selection of garden seeds commonly available today, but was encouraged by the growing number of small seed companies (usually run by women, she noted) that are offering the less usual, heirloom, and otherwise noteworthy but less popular varieties not available through most stores or seed catalogs. Rosalind also stressed the importance of growing foods for which there is a notable difference between homegrown and storebought. To illustrate her point, she passed around a jar of fresh paprika for the audience to sniff. Many noses flared and sniffled from the piquant pepper — the fresh difference was clearly noticeable.

Inspired, I left her lecture excitedly brewing my plans for next year's garden, imagining clusters of wheat waving behind beautiful bouquets of edible flowers. And though Rosalind was soon on her way, the seeds for a revolution had been planted in Salina, and I was an eager rebel.

Teresa Jones and Rosalind Creasy



New Roots for Agriculture

Farming in Nature's Image: An Ecological Approach to Agriculture

Judith D. Soule and Jon K. Piper,
foreword by Wes Jackson

Island Press, 1991, 320 pp.
Cloth, $34.95, paper, $19.95.

Reviewed by *Chuck Francis*

Are there ecologically and economically viable alternatives to our current conventional agriculture? Can we convert an industry highly dependent on external, non-renewable resources such as fossil fuels and their derivatives to an agriculture that depends on renewable resources and enhances soil productivity? Are there systems that, in the words of Wendell Berry, degrade neither the land nor its people? Where do we look for models to follow in the design of these systems?

Judith Soule and Jon Piper, ecologists long associated with The Land Institute, suggest that nature provides both an image and the guidelines to answer these questions, as well as a model for the design of a more sustainable agriculture. Following the tradition established in *New Roots for Agriculture*,[1] the authors pursue the theme of integrating ecological principles with the practices of agriculture, using "nature as standard," and learning from natural ecosystems. They explore how some of the major biological integrations such as nutrient cycling and water capture, storage, and use are accomplished in nature. Mixtures of species such as those found in nature are suggested as an alternative to monocultures in our quest to meet human needs while preserving the environment.

As one practical application of these principles, the authors outline the activities at The Land Institute in using the prairie ecosystem as a model for the design of future agricultural systems for the Great Plains. They pull examples from more than a decade of research by Land Institute staff and interns on the components of native prairie and the potential for emulating this system through plant breeding and ecological/agronomical pattern design. As staff ecologists at The Land, they have worked intimately with these systems. In *Farming in Nature's Image*, Judy Soule and Jon Piper provide a practical application of ecological principles that are most often described only in theory and in reference to nature.

The first women who selected seeds for the cooking pot, and later planted those species nearby for convenience, most certainly "farmed" in a way that emulated the natural mixture of species they observed around them. The Greeks described by Virgil recognized the uniqueness of place, and the need to understand its ecology. In the foreword to *Farming in Nature's Image*, Wes Jackson quotes the historical perspective:

It is well to be informed about the winds,
About the variations in the sky,
The native traits and habits of the place,
What each locale permits, and what denies.
(Virgil, *The Georgics*, 36-29 B.C.)

Indigenous technologies in some parts of the world still emulate the natural ecosystems, and farmers consciously mix many species and carefully locate plants in micro-sites where they will do well. This tradition is not lost on today's ecologists, and the authors credit the sustainable agriculture curriculum of The Land Insti-

tute as providing the ideas and foundation for their current book. Soule and Piper describe their views of current problems of agriculture, farms, and rural communities, and lead the reader to potential solutions based on a serious application of ecological principles. In the end, they provide a blueprint for change based on prairie ecosystems. It's a profound statement, and a logical series of arguments.

Jon Piper and Tim Coppinger measure our measure: the native prairie ecosystem.

In a departure from classical ecology, the authors examine the total environment including humans, their economic successes and failures, and the impacts of their activities on nature. They describe structural changes in U.S. agriculture, the difficulties of young farmers, and the loss of mid-sized family farms over the past two decades. The economic crisis on many farms has led to crises in rural communities, loss of jobs, further concentration of land ownership, and deterioration of rural infrastructure. Soule and Piper maintain that these economic crises spawn ecological consequences, as highly stressed farmers must abandon good stewardship to survive.

In chapter one, the authors describe the ecological crises of conventional agriculture in terms of "pollution, depletion, degradation, erosion, contamination, poisoning... terms usually associated with heavy industry." They point to a declining resource base, loss of genetic diversity, and reduced fossil energy supplies and water sources. Soil is being lost at a rate of several tons more per acre than it is being replaced on much of our cropland; twenty percent of U.S. cropland is subject to serious erosion, and one-third is classified officially as "highly erodible land." Current conventional accounting considers variable costs of inputs and labor and fixed costs of machinery and land, but ignores the long-term costs of soil erosion, both on and off the farm.

Loss of genetic diversity is described as a long-term consequence of specialization and concentration on a few improved varieties or hybrids. The current dependence of agriculture on energy-intensive production inputs is described: in the U.S., an average of two units of fossil fuel energy is used to produce one unit of energy in food. When processing, packaging, and distribution are added, there are *ten* units of energy used to put one unit on the table. The mining of "fossil water" from deep aquifers for irrigation is also a non-sustainable practice that characterizes high input agriculture in some areas. Inappropriate or excessive application of nitrogen and some pesticides have brought those chemicals into our streams, aquifers, and water supplies. The authors summarize health impacts of pesticides, as well as policies that allow export of some materials banned in the U.S. and the importation of crops with toxic residues. Finally, Soule and Piper describe the nature of genetic resistance in pests to agricultural chemicals, and how the problems of pests have actually become worse through selection toward chemical resistance in pest species. In general, the authors describe an agriculture that works against nature, rather than one that can "work with the complexity nature provides."

In the second chapter, the roots of today's crises are described as a consequence of industrialization. The components are mechanization, extensive use of chemicals, uniform crops through breeding, and a general move toward domination of the natural environment. The authors outline the pressures of private business to promote this industrialized agriculture, and the narrow focus of agricultural universities on a single strategy for producing more food, feed, and fiber. They illustrate well the inertia and resistance to new ideas in the area of agricultural science, a reluctance to change that probably mirrors society at large.

Basic values or assumptions such as reductionism, simplification, quantification, and objectivity are seen as ways to understand and then to "conquer nature" in farming. Conventional thinking in agricultural economics also depends on prevailing assumptions such as unlimited increases in productivity, short-term profits, and agriculture viewed as an industry.

In contrast, an ecological approach or perspective is viewed as more complex, cyclical rather than linear, holistic, with "fuzzy boundaries" between the organic and inorganic components of the total environment. Design of sustainable agriculture is thus seen as depending more on ecological principles and cycles, holism, interactions, and a long time frame. The perspective is a difficult one for scientists trained

in a conventional, reductionist research paradigm.

The next two chapters explore the ecological basis for sustainability and the potential agricultural applications of specific ecological processes. Natural ecosystems are characterized by a high degree of dynamic interaction among species components as well as the many cyclical processes that lend a degree of stability to systems. These include nutrient cycling, soil building through accumulation of organic matter, energy flow, water use, and successional and population changes in species mix over time. Such processes as nutrient and energy flow are especially important since these are large and costly inputs in conventional agricultural production systems. We commonly think of crop rotations and nitrogen fixations by legumes as the main forms of enhancing fertility, yet there is a wide range of other biotic activities in the soil that contribute to the complex and dynamic process of nutrient cycling. This is but one example used to illustrate the need for study of natural ecosystems to better understand biological processes and their potential for agriculture. Beyond the specific cycles and processes in soil, there are further levels of complexity in plant interactions, changes in crops and mixtures over time, and the structure of ecosystems that hold even more lessons for agriculture.

Soule and Piper next present a documented case for ecological agriculture, citing a number of specific instances where lessons from ecology have already made an impact. These include integrated pest management, conservation tillage that conserves soil and moisture, and intercropping of two or more species to diversify the cropping landscape. Such practices are still only components of the system, and the authors clearly make a case for further exploration on natural ecosystems and how they can be used as models for farming. They present examples from the desert, temperate forests, and tropical forests that show how study of native plants and communities can provide guidance for agriculture. Finally, they reach the prairie, the Great Plains of North America.

In chapter five, the authors describe the research at The Land Institute as involving "a synthesis among plant breeding, ecology, and plant pathology by staff scientists and formal and informal collaborations with agronomists, plant breeders, soil scientists, and entomologists at universities." They describe The Land Institute's research as involving four primary questions related to the potentials of perennial polycultures:

- Can an herbaceous perennial seed crop yield as well as an annual crop?

- Can a polyculture of perennial seed crops outyield the same crops grown in a monoculture?

- Can a perennial polyculture provide much of its own fertility?

- Can a perennial mixture successfully manage weeds, harmful insects, and plant pathogens with little or no human intervention?

These questions have been stated several times in *The Land Report*, but here Judy Soule and Jon Piper explore the topics in depth, bringing together data from a decade of research at The Land. It is their conclusion that much work needs to be done in these areas, but that research so far is promising. They believe that a long-term sustainability of agriculture will depend on seeking answers to these and many other questions, will require creative teams of scientists from many disciplines, and will need to seek a balance between land productivity and preserving areas for habitat and other uses.

In a sweeping final chapter, the authors explore the conditions for change, and the important human dimensions of actually implementing feasible and economically viable systems of perennials in polyculture. They quote the Asilomar Declaration for Sustainable Agriculture, which calls for farming that "will require and support a sustainable society. Our challenge is to meet human needs without denying our descendants' birthright to the natural inheritance of this planet." In a thoughtful evaluation of prevailing cultural paradigms, the authors examine the economic, social, political, and institutional challenges that will face anyone who advocates changes in agriculture. In a tribute to deep ecology, they suggest that humility is "one last essential ingredient in the development of sustainable agriculture. This is the humility that realizes that humans are part of nature, not above it. This humility is expressed as a willingness to listen—scientists listening to farmers, and to one another." And by a willingness by everyone to listen to nature.

This book by Judy Soule and Jon Piper is a

Doug Romig, Teresa Jones, Tim Coppinger, Charlie Pedersen, Adam Davis, and Michelle Mack, with Molly and Bobbins on guard and a watermelon for a snack, clip growth on the prairie to measure changes over time and space. What we learn will help us design successful perennial polycultures.

"must read" for anyone interested in the work of The Land Institute and in the future. It is difficult to improve on the words of the authors. They state: "After all, nature works. It is the ultimate template, the ultimate pattern that works. Humanity need not fear that as a species we will ever wipe out nature, but we can easily wipe out ourselves. Nature persists, but civilizations are ephemeral. The most essential challenge for humanity is to learn to eat from nature's bounty without destroying it in the process, to find our appropriate niche within nature." *Farming in Nature's Image* is highly recommended reading.

References

1. Wes Jackson, 1980. *New Roots for Agriculture*, University of Nebraska Press, Lincoln.

Chuck Francis is an extension agronomist at The University of Nebraska, and editor of *Multiple Cropping Systems* and *Sustainable Agriculture for Temperate Zones.*

1990 Research Report Available

The Land Institute Research Report #7, edited by Jon Piper, is available for $2.00, ppd. The report presents the results of the research in perennial polycultures carried out by The Land's 1990 interns and research staff.

Discussed are vegetation patterns on four prairie sites; variability in *Leymus racemosus* (wild rye), *Desmanthus illinoensis* (Illinois bundleflower), and *Tripsacum dactyloides* (eastern gamagrass); overwintering in perennial sorghum crosses; cropping system studies with perennials; and a comparative study of disease levels in native and cultivated stands of eastern gamagrass.

Results of the 1991 field season will be available mid-1992.

Collaborating in Nature's Image

Tom Mulhern

Farming in Nature's Image: An Ecological Approach to Agriculture is a new book by Judy Soule and Jon Piper, published by Island Press. Jon Piper has been staff ecologist at The Land Institute since late 1985. Judy Soule preceded him as ecologist at The Land in 1984 and 1985, and now lives in Michigan where she works with The Nature Conservancy. Jon and Judy worked together at The Land Institute for four months in 1985, but their book collaboration didn't develop until 1988.

According to Jon, *Farming in Nature's Image* is an attempt to bring together a number of agricultural problems such as environmental destruction, disintegration of rural communities, and fossil fuel dependence, and to present the ecological and social underpinnings of these problems. "Soil erosion is an ecological result of till agriculture," says Jon. "In our book we look at what ecology has to teach us about a different way of doing agriculture, an agriculture that is grounded in ecology."

Judy describes the book as both an extended argument and a strategy for a new approach to agriculture. She says the critical solution offered in the book is that of "modelling agriculture on local natural ecosystems, systems that are already in place and working in a permanent way."

Those familiar with the work of The Land Institute will recognize this as the idea that underlies our perennial polyculture research program, where we have been working since the early 1980s on a long-term program to model agriculture on the prairie ecosystem. However, Judy and Jon have produced a book with a much broader focus than The Land Institute.

"We make the case that using nature as the standard for agriculture is a general principle," says Judy, "and we give examples from several different ecosystems where agriculture has worked that way — not only the prairie ecosystem, but also forest and desert ecosystems." Jon states that "The Land Institute gets an entire chapter because it is the most comprehensive example of an alternative ecological approach, but we also describe other research that relates to various aspects of this approach."

As co-authors, they divided the writing by chapters — she wrote chapters 1, 2, and 6, while he wrote chapters 3, 4, and 5. Then they edited each others' work several times, working to develop a common theme and a unified voice. They acknowledge that editing to achieve reasonable consistency without altering their individual voices was hard work, but essential to their purpose.

Judy Soule

Jon points out that there have been several recent books on agroecology, but most have been multi-author collections without a specific common thread throughout. He feels that other agroecological books tend to fall into one of two categories: either they are descriptions of agricultural practices that reflect ecological principles, such as crop rotations or integrated pest management, or they present ecological studies of agriculture that describe agricultural processes in ecological terms, but do not offer ecological solutions. "Ours is a unique approach and focus," he says. "We're advocating the application of ecological systems thinking to agricultural problems."

Coming up with the idea for the book seems to have been a collaborative effort by Judy Soule, Land Institute co-founder Wes Jackson, and Danielle Carré, a former Land Institute student and staff member. Judy and Danielle put together the outline in 1985 and submitted it to Cambridge University Press. The publisher wanted something different and suggested substantial changes, leading the would-be authors to put the outline on the shelf. It stayed there for nearly three years.

By 1988, Judy was considering getting involved with research in the ecology of agricultural systems taking place at Michigan State University. She was frustrated with what she found and felt that it was a

backward approach to simply study how things worked in agriculture without trying to improve them. When she called up Wes to bemoan this situation, he told her that he had just been talking with Barbara Dean of Island Press about a book possibility. Judy was still interested, Jon Piper was well-established at The Land Institute by that time and was persuaded to join as co-author, and the book outline came off the shelf and the writing began in earnest.

Both Judy and Jon are ecologists and scientific researchers—her Ph.D. in plant ecology is from Michigan State University, his in botany is from Washington State University. Part of their editorial challenge was weeding out scientific jargon to make the book more readable, without sacrificing scientific rigor. "We're walking a tightrope in targeting our audience," admits Judy. "The book will be particularly appealing to graduate students who are interested in exploring an alternative path, but we've worked for a popular writing style so that anyone interested in sustainable agriculture can read and understand the book."

Jon thinks that professional ecologists and agronomists will also find it of interest. "For many scientists, it will be a new and different treatment of topics they deal with every day. We bring a lot of information together that hasn't been brought together before, and we provide an extensive bibliography."

Although they grew up 3,000 miles apart in New Hampshire and Washington state, Jon and Judy credit their interest in ecology to similar early childhood influences. "I probably picked up an environmental ethic from my dad," says Jon. "Being outdoors was a priority for him. We'd take lots of walks in rural areas near our home, and he imparted to me a sense of the history of the land and its beauty. I still remember how it saddened me to see the woods I used to walk by on my way to school turn into a housing development."

Judy says "I think I was born an ecologist. When other kids were slapping mosquitoes, I told them to leave them alone because they were an important part of the food chain." Her father was a forester and they too took a lot of walks in natural areas. Growing up in the Palouse region of eastern Washington, she saw some of the most severe agriculture-related soil erosion in the United States. "It seems like I've always had a worldview that sees that everything is connected," she says.

Although Judy and Jon each have published several scientific papers, this is the first book for both co-authors. They're curious and mildly apprehensive about the public response. "I'm a little uncomfortable talking about the book and promoting it" says Jon. Judy describes how she froze at one point in the writing process. She was getting nowhere and wondered if the book would ever get done. A friend asking her "What's your worst fear if you do finish the book?" helped her realize that she feared that she'd have to promote it. Once she recognized that she just had to write the book she was able to get back on track.

Judy and Jon each have three children at home, and their lives center on their families. Judy likes to quilt, is a music lover, gardens a lot, and says that "bicycle riding is my favorite thing in all the world." Jon enjoys reading, playing guitar, supports his wife Beth in home schooling their children, gardens, and bicycles five miles to The Land Institute. He's gained a particular appreciation for the tendency of the Kansas wind to change direction during the day so that he can bike into the wind both coming to work in the morning and going home at night.

Each at thirtysomething years of age, Judy Soule and Jon Piper represent an emerging generation of scientists who have come of age during a period of unprecedented environmental destruction and growing environmental consciousness. They propose an ecological approach to agriculture that goes beyond the conventional reductionist strategies of either agronomy or ecology.

Jon Piper

Routes to Sustainable Agriculture

Lessons from Sweden

Sarah Williamson

This fall we were lucky enough to receive two distinguished visitors from Sweden: Ulrich Nitsch and Lennart Salomonsson. Both men are faculty members at the Swedish University of Agricultural Sciences in Uppsala. Each came on separate visits, during which they told us about their work in Sweden and helped us with our work in Kansas.

Ulrich is a professor and head of the Department of Agricultural Extension Education. Besides telling us about agriculture in Sweden and his work in extension, he participated fully in life at The Land Institute. He entertained us with a refreshing perspective and sense of humor while attending student seminars, touring research plots, and helping with Illinois bundleflower harvest.

Ulrich's work in Sweden examines extension's role in changing farming practices, and how these changes affect farmers' lives. He grew up on a farm, but since it was not inheritable he was unable to remain a farmer. He decided to go into extension to assist and inform farmers. Ulrich spent a lot of time working with individual farmers, and felt that the job was rewarding and useful. However, he gradually became aware that his work was pushing farmers to intensify their production, essentially outcompeting each other. In the long run, Ulrich concluded, by encouraging farmers to adopt new technologies, he was hurting some of the farmers he was trying to help. Farmers, too, realized that they needed to adopt new technologies to increase production, but that this increase was hazardous to their livelihood. "Farmers asked me, 'Why should we do what you say? In the long run, prices will go down, and there will be fewer farmers.' They wanted to know what they or I could do as individuals about market pressures which in the long run might drive them out of farming. This bothered me more and more."

Doug Romig and Ulrich Nitsch

Ulrich decided to examine farmers' needs in a new light. Agricultural extension has traditionally encouraged farmers to raise production by adopting new technologies. Although increased production was an economic necessity due to the markets involved in food production, Ulrich wanted to investigate all of the other aspects of agriculture that make farmers want to stay on the farm. He "wanted to see where farmers were with respect to environmental issues, to get at what they actually believed in." To this end, Ulrich questioned farmers about their personal goals, aspirations, and values in relation to farming. The questions related to their daily concerns and activities. From an assessment of these goals and values, Ulrich then wanted to establish their "derived needs," or ways that extension could help them achieve their goals without undermining their values. He concluded, "Our studies show that Swedish farmers dearly value the content of their work, that is, working outdoors, working with living plants and animals, being close to nature, and the freedom and independence of being their own boss. The presence of a family on the farm is also highly valued. If there is no family with which to share the worries, concerns, and achievements in daily work, farming turns into a very lonely experience."[1]

Ulrich found that Swedish farmers were very concerned about the impact of farming on the health of the environment. Over 80 percent of the respondents agreed with the statement, "We must now reconsider our farm practices to keep farming in better harmony with the laws of nature."[2] A very strong tension between the economic need for survival and the strong belief in maintaining environmental integrity emerged from these surveys. He found that farmers need to make enough money to remain in farming, but profit is not an end in itself. Swedish farmers are caught in an ironic trap, adopting practices which will increase production enough to allow them to stay on the farm, but undermining the way of life they are struggling to preserve. "If the

agricultural extension service is to meet farmers' 'derived' needs, it will therefore have to acknowledge not only their desire to stay in farming, but also their desire to operate their farms in compliance with their values and aspirations, i.e., in compliance with an organic orientation in farming."[3]

Farming in Sweden is still predominantly small-scale. The average farm has 27 hectares of arable land, and the average dairy herd has 17 cows. Agriculture contributes only two percent of the country's gross domestic product, and there are only 100,000 farms, employing 120,000 people. These farms are able to feed Sweden, and in fact produce a surplus. Twenty percent of their grain must be exported to the world market at prices that do not meet costs of production. Therefore Sweden is interested in reducing agricultural production.

To eliminate the surplus, Sweden is now reducing productive farm holdings by twenty percent, to 500,000 hectares. During this five-year phase, farmers are given subsidies for not growing crops. The goal is to decrease total productive acreage, while maintaining the intensity of production per hectare. Ulrich thinks that this is a terrible mistake. He believes that Sweden, given its unique history, farming systems, and climate, could be a leader in ecological agriculture. The farmland currently in production could be maintained as active farmland, leaving room for a twenty percent decrease in productivity while farmers adopt environmentally friendly farming techniques. Because the history of chemical use in Sweden is fairly short, because farming takes place on small scattered fields, and because of Sweden's cold winters, conditions lend themselves to organic methods of agriculture.

Ulrich believes that both farmers and the consuming public need a broader and deeper education about agriculture. We need to better understand farming's impact on the environment, and even more importantly, the impact of the market on agricultual practices. Only when consumers understand their own powerful role in agriculture will farming become environmentally sound.

This is where Lennart Salomonsson's work comes into the picture. Lennart is a professor in the Department of Crop Production Science and research director at the university's experimental farm. The farm covers 25 hectares in a rural area outside of Uppsala, and is a collaboration between the university and a private foundation that pays operating expenses and salaries. The university donated the land and is responsible for research.

One of the main foci of the experimental farm is the integration of the consumer into the farm-community system. The surrounding community consists of around 20,000 people, in small villages. Right now the farm is establishing connections with this community, targeting ten to twenty families to enlist into the farming system. The families would be involved by buying the farm produce, at cheaper than grocery store prices, and bringing organic wastes back to the farm. The families would have to make some sacrifices in convenience to enter this relationship. They would sort garbage so that organic matter can be composted on the farm. There is a possiblity of returning sewage to the farm, which would mean eliminating certain cleaning products. And they would have to process more of the food obtained directly from the farm. For instance, they might buy a half a pig which they would be responsible for cutting up and storing. Or they might buy a sack of wheat that they would then grind into flour for baking. Swedish consumers already process a lot more food than we do in the United States, so they might not be changing habits much. The experimental farm's goal is to provide incentives for changing consumption and disposal patterns.

Besides access to cheaper food, another incentive is to feel like a participant in the farm itself. Lennart hopes to provide access to the farm, set up in such a way that the participating families feel like part-owners rather than guests. He envisions families coming out for picnics, being able to see the animals and the crops, and feeling that they actually belong to them. All this is an attempt to begin to change the difficult agricultural situation pointed out by Ulrich, and bring farmers and consumers together to a common ground.

References

1. Ulrich Nitsch, 1988. The Legitimacy of the Agricultural Extension Service. *Agriculture and Human Values*, fall, p. 53.
2. Nitsch, p. 53.
3. Nitsch, p. 54.

Sarah Williamson

Why Aren't More Farmers Environmentalists? (And Vice-Versa)

Doug Romig

Only three percent of the original tallgrass prairie remains. Most of it lies unbroken in the Flint Hills because the soils there, underlain by Permian rock, are too shallow for cultivation. The tallgrass prairie is the only major North American ecosystem which is not represented in the National Park System. For thirty years it has been a priority of the Park Service and environmentalists to acquire land for a Prairie National park, preserve, or monument. Previous proposals were met with protest and failed because they depended on the condemnation of private land for park property. The Park Service and National Audubon Society's current consideration, the 11,000-acre Spring Hill (Z-bar) ranch in Chase County, Kansas, is causing a similar ruckus because of potential condemnation. But this round is different. The property can be purchased from a willing seller. Within a bill now before Congress, a provision prohibits any future growth of the proposed monument by eminent domain.

Some residents of Chase County remain wary, feeling threatened by government acquisition, and stand by the slogan, "Private Lands in Private Hands." The protest over the monument has moved beyond the threat of forced acquisition to the question of who takes better care of the land: those who live on and work it, or a professional conservation organization, whether public or private. The debate unnecessarily pits environmentalists against the ranching community. At ground level, it appears that each group is out to undermine the intentions of the other. But from the perspective of a prairie raptor above the Z-bar ranch, it becomes clear that the views of environmentalists and agriculturalists are not so diametrically opposed. I submit that at this level, an examination of the issues would lead to an understanding of the larger system that works against the intentions of both.

FUEL FOR DICHOTOMY

In late August, the National Parks and Public Lands subcommittee held a hearing in Emporia, Kansas, to discuss the Prairie National Monument proposal. As I listened to the testimony, it became clear that farmers and environmentalists have many misconceptions about each other. Understanding takes more effort when fuel for misconceptions can be so easily found.

The National Audubon Society provides perfect kindling for inflammation. Appealing to direct mailers, Audubon advertises its membership as an "affluent, upscale audience that will really pay for you to reach." Audubon goes on to explain that 65% of its members are college graduates, and 46% are professionals with an average yearly income of $62,790. Proudly they proclaim that 33% have liquid assets over $75,000![1] This attitude is audacious, but that is how Audubon wants to be and is perceived.

Hot-headed Ed Abbey indicts ranchers as "welfare parasites." A more tempered Marty Strange of the Center for Rural Affairs articulates that "some environmentalists consider farmers to be little more than petty land abusers and are inclined to discount any social concern over their economic future."[2] Farmers and ranchers frequently appear shortsighted by resisting environmental regulations, perceiving conservation measures as impingements on personal property rights.

The president of the Humane Society, John Hoyt, spoke to the California Farm Bureau: "Misunderstanding is the biggest obstacle to the path of meaningful dialogue" between agriculturalists and environmentalists. The conflict, he said, is "nurtured by certain industry leaders whose interests are best served by polarizing"[3] the groups. There is danger in using such stereotypes. All environmentalists are not arrogant city folk and all farmers are not ignorant country bumpkins destroying the land despite themselves. Not only do generalizations breed disrespect, but they play into the hands of those who want myths to remain unexamined and stifle any potential dialogue.

HAULING FROGS

Lou Ann Kling, a Minnesota farm advocate and farmer, has said that "organizing farmers is like trying to haul frogs in a wheelbarrow."[4] If it is difficult to organize farmers to speak with a united voice, then who speaks for their interests? In 1990, when the Farm Bill was on Capitol Hill, the National Association of Wheat Growers, the American Soybean Association, and the National Cotton Council represented farmers.[5] These commodity groups receive money (checkoffs) for each production unit sold. It is in their interest to sell as many bushels of grain or bales of cotton as possible. The intentions of commodity groups, one would assume, would be to develop policies that enhance the sale of products they represent. Yet, higher production levels are followed by lower prices, and many farmers already have trouble meeting production costs with the prices they receive.

On her recent trip to Eastern Europe to develop markets, Kansas governor Joan Finney took a representative from the Kansas Farmers' Union instead of one from the Farm Bureau. She said, "I believe the Farmers' Union truly represents the Kansas family farmers." Of the Farm Bureau, she said it is "basically an insurance company."[6] The

Farm Bureau, an active opponent of the Prairie National Monument, lobbies for farm issues, considering themselves "the voice of agriculture in Kansas and across the country."[7] But the Farm Bureau failed to speak for ranchers in Chase County when Kansas Power and Light, with whom the Bureau holds stock, condemned 12,000 Flint Hills acres.[8] The question remains: who speaks for farmers?

Another question: who speaks for the environment? In 1985, many farmland conservation programs, backed by "environmentalists," were established in the Farm Bill. The Conservation Reserve Program, "sodbuster," and "swampbuster" provisions took erodible soil and wetlands out of crop production. But it is frequently unclear which environmental organization is behind a conservation program. Only the National Resource Defense Council and the National Wildlife Federation were identified as proponents of the swampbuster provision.[9]

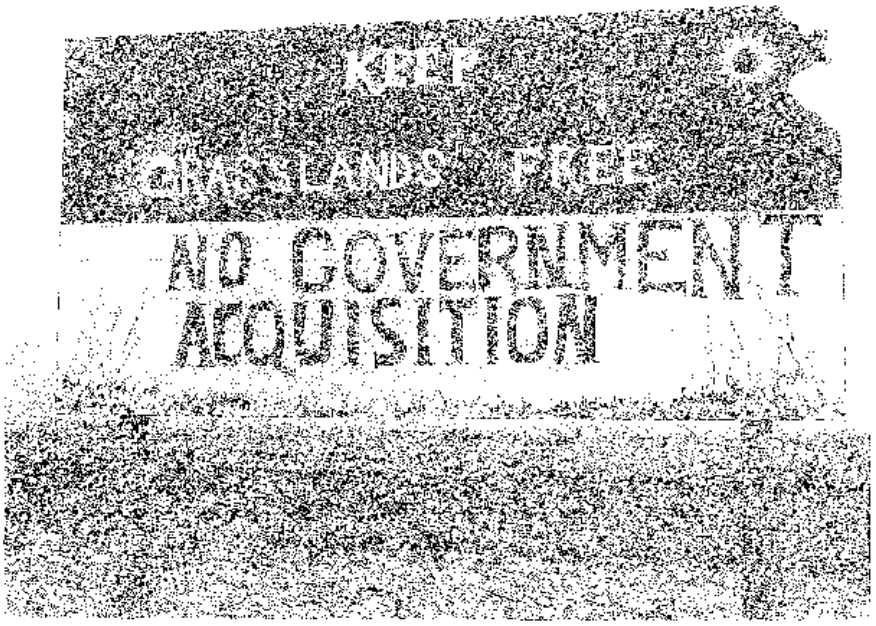
The problem is rooted in the nebulous term "environmentalist." It comes to represent such diametrically opposed groups as Ducks Unlimited and People for the Ethical Treatment of Animals. Earth First! activists might chain themselves to bulldozers to save an ancient grove from a Forest Service sale and harvest, while the National Audubon Society proposed that the Park Service manage tallgrass prairie. Some "environmentalists" want wilderness without any human management. Others purchase conservation easements to stop further development. Still others buy and manage the land privately. "Environmentalists" have no cohesive solution for better land management and protection, yet anyone with a concern for the environment receives the label. Be it farmer or environmentalist, none will stay in an open barrow.

PERCEPTION & POISON

Ironically, many environmentalists seem to be distant from the "natural" environment. My experience has been that those who identify themselves as environmentalists are frequently more urban. Their concerns are not better or worse than the agriculturalist, they are just different. Environmentalists make contact with the land in various ways, but their very sustenance does not come from a particular patch. They are more often drawn to large expanses, ecosystems, or special places they have visited. As a result, their activism is directed at larger issues such as tropical deforestation, animal rights, or overgrazing. This broad vision is useful in addressing the need for stewardship and articulating where society might go, but tends to miss the particulars.

Chase County rancher Jane Koger reflects on her intimate experience of place: "It's hard to care about what you don't see... If anyone anywhere should be environmentalists, all of us here should. If we lose the land's productivity, we've lost our hope of living on here."[10] Since farmers depend on nature's bounty, one hopes that they recognize the limits of the land they work. Despite Koger's cogitations, many farmers behave in a manner that would be inconsistent with one who is concerned with the environment. When they use chemical fertilizers and pesticides, they spread poison that pollutes soil, plants, and water.

This inconsistency perfectly characterizes the farmers' dilemma. Farmers don't wholly consider farming as an "economic activity aimed at the efficient production of food." Farming is understood as the "caring of family, animals and



nature...stewardship and a way of life."[11] But to pursue a farming lifestyle, an economic enterprise must be run. Within the current economic vision, there is no room to consider farming as a way of life. Marty Strange puts it succinctly: "Both environmentalists and farmers are wrong to pose the issue as farmer versus the environment. The most serious environmental problems in agriculture are those caused by technologies that make large-scale farming possible, and that sever the rewards of farming from the rewards of stewardship and husbandry."[12]

RUSTLING INC.

The Bass brothers of Texas, also known as National Farms Inc., came to the Kansas Flint Hills and bought property equivalent in size to that of the proposed monument. Their current intention is to ship cattle in on semis, graze the cows for a month or two at double or triple densities, then rustle them to another pasture perhaps hundreds of miles away. The land, left vacant for much of the year, could suffer greater damage as a result of this type of grazing management. Land that formerly supported two families now will support only one part-time corporate employee. Only hushed words of outrage are spoken in the coffee house. Yet environmentalists, when proposing a similar purchase, are attacked relentlessly. Why are the Bass brothers, outsiders who care little about the area, met with such passivity and the government proposal with such uproar? Is National Farms any more legitimate than the National Park Service? At least a citizen can protest the government's expansion; corporate expansion is called "business as usual." Somehow the penetration of *capital* is more acceptable than the penetration of *capitol*. Yet both have detrimental effects on land and communities.

John Berger, in *Pig Earth*, writes of the demise of traditional peasant culture. "Monopoly capital, through its multinational corporations, has created the highly profitable structure of agribusiness whereby it controls, not necessarily production, but the market for agricultural inputs and outputs and the processing, packaging and selling of every kind of foodstuffs. In developed countries, the conversion has been more or less planned and more catastrophic in underdeveloped nations."[13]

Testimony to Berger's assertion is the cadre of government representatives and multinational executives negotiating the General Agreement on Tariffs and Trade (GATT). President Bush, backed by multinational agribusiness, is pushing to remove all trade barriers through negotiations such as the North American Free Trade Agreement and the GATT. The consequences of such agreements could decimate farmers here and abroad. But that is not all. Environmental regulations, which took years to legislate, could be circumvented by "harmonizing" standards to the lowest common denominator (see related article, p. 25). It is no surprise that the ranks of negotiators hold no farmer or environmental representatives.

Environmental and agricultural communities need to recognize that they both are being marginalized by an economic system that exploits land in the name of progress. With the fabricated dichotomy exposed, dialogue between the camps can begin to address the common concern: sustaining all life and livelihoods. It is time to build stiles to cross fences and begin to reward stewardship, whether it is done by a farmer or an environmental activist.

References

1. "How Green is Your Junk Mail?" *Harper's*, Aug. 1991. p. 20.
2. Marty Strange, 1988. *Family Farming*. University of Nebraska Press. Lincoln, NE. pp. 205-6.
3. John Hoyt, "Tilling a Common Ground." Speech to the California Farm Bureau, Sacramento, CA. Dec. 2, 1990.
4. Dianna Hunter, 1990. *Breaking Hard Ground*. Holy Cow! Press, Duluth, MN. p. 51.
5. David Cloud, 1990. "Environmentalists, Farmers Square Off on Farm Bill." *Congressional Quarterly* 48, p. 830.
6. *The Emporia Gazette*, Oct. 1, 1991. p. 14.
7. *The Emporia Gazette*, Oct. 1, 1991. p. 14.
8. National Audubon Society, Audubon News Release. Aug. 23, 1991.
9. Cloud, p. 831.
10. William Least Heat-Moon, 1991. *PrairyErth (A Deep Map)*. Houghton Mifflin Co. Boston, MA. p. 193.
11. Ulrich Nitsch, The Cultural Confrontation between Farmers and the Agricultural Advisory Service. SIC 10, p. 47.
12. Strange, p. 206.
13. John Berger, 1979. *Pig Earth*. Pantheon. New York, NY. pp. 210-11. Berger's concern is with peasant culture, but I do not mean to imply that American farmers are peasants. Berger identifies the destructive forces that are operating against traditional peasant cultures as well as family farms in America.

Traction and Fixation on the Sunshine Farm

Marty Bender

John Craft, Ray Dean, and I initiated a one-year feasibility analysis in July to determine the most promising renewable energy technologies and farming methods that The Land Institute could put into practice in a proposed ten-year Sunshine Farm study. From the scientific literature, we have been calculating the balance and turnover for energy and nutrients, and the crop and livestock productivity that can be maintained by energy which is directly or indirectly renewable solar energy. A unique aspect of this proposed farm is that measurement of these energy and nutrient quantities during the ten years would provide a data base by which improved analyses could be made for converting other farms to such practices and technologies.

Traction (field operations and farm-related transportation) accounts for over six-tenths of the direct, on-farm energy use in U.S. agriculture. Vegetable oil is more promising as a fuel than dry ethanol from corn grain, for which an energy balance does not break even. This means that for every Btu of ethanol produced, more than a Btu of refined petroleum or natural gas is consumed. This conclusion assumes the best available technology for large-scale ethanol production; a low farm energy input for growing corn; an energy credit for the dry animal feed by-product that is equal to the energy saved by not having to grow an equivalent amount of soybean protein; and an energy credit for the octane-boosting properties of ethanol, which allows oil refineries to produce a lower grade of gasoline.

Of nine crops analyzed for vegetable oil fuel production, peanuts, soybeans, and sunflowers give the most positive energy balances. Brief calculations show that roughly 20% of the cropland on a grain farm would need to be in soybeans to fuel traction, and for sunflowers, roughly 30%. The balances assume that the oil (not degummed) is obtained on-farm by screw-press extraction, and that the remaining meal is given an energy credit for not having to grow an equivalent amount of soybean protein. We will also investigate energy balances for other traction fuels such as ethanol and methanol from fermentation of wood and cellulosic crops, methanol from gasification, and methane from anaerobic digestion.

Use of commercial nitrogen fertilizer accounts for just under six-tenths of the indirect, on-farm energy use in U.S. agriculture. On the Sunshine Farm, nitrogen (N) will be obtained from symbiotic fixation by legumes. To prevent long-term mining of soil N, a cumulative N balance must be computed for each field as well as the entire farm.

For one field, consider the following common four-year crop rotation with average yields: corn (100 bushels/acre); wheat (40 bushels/acre); alfalfa (3.5 tons/acre); and alfalfa (4.5 tons/acre). During the four years, the total amount of N removed from this field by these yields is 612 lbs N/acre. Alfalfa has been shown to fix as much as 200 lbs N/acre annually, which gives for this rotation a net deficit of 212 lbs N/acre at the end of four years.

This is a large debt, given that this is the amount of N removed in four years by continuous corn at 70 bushels/acre annually. Although alfalfa fixes more N than most legumes, so much N is removed by the hay that alfalfa contributes a net deficit of 12 and 71 lbs N/acre, in the third and fourth years of this rotation, respectively.

Only part of the four-year N deficit is eliminated by small N sources such as precipitation, atmospheric deposition, asymbiotic nitrogen fixation, and fixed N lost from alfalfa prior to measurement of N fixation (for example, root exudates and turnover of roots and nodules). Moreover, these N sources tend to be offset by N lost from the soil through leaching, denitrification, and ammonia volatilization.

Rotating only nonlegume crops can benefit yield as much as rotating legumes and nonlegumes. Thus, the above crop rotation may succeed for a while because the nonlegume yield response is due in part to this "rotation effect." Hypothesized rotation effects include changes in soil properties, reduction of toxic substances in crop residues, and reduction of disease.

As with alfalfa, harvested soybeans result in net N deficits. This does not contradict the rule of thumb that soybeans leave 1 lb N/acre for the next crop for each bushel/acre yield of soybeans. This is because the rule of thumb is due to the rotation effect and the fact that legume residues leave readily available N (but with a larger decrease in the soil N of the resistant fraction of the soil organic matter, which results in the observed net deficit). Thus, soybeans leave some available N (at the expense of soil N) and only appear to leave the remaining N.

The rotation effect does not eliminate the large N deficit. Unless fertilizer (paid for by renewable energy) or manure is added, after many decades the cumulative N deficit would result in greatly decreased soil N. Crop yields would decline to a level that is in equilibrium with whatever net input of N there is.

Moreover, the use of manure requires that there is no long-term cumulative N deficit on each field of the farm. This necessitates the use of legumes, or the use of off-farm manure or animal feed (which organic farms often rely on). Also, use of

imported manure or feed assumes that the N in the export farm is balanced.

Given the restrictions on manure use and assuming that not much commercial fertilizer N will be available in a post-fossil fuel future, crop productivity will be heavily dependent on legume-fixed N. So, to balance N in our unfertilized crop rotation example, in the fourth year of the rotation only 1 ton of alfalfa/acre (one cut) may be harvested (the alfalfa harvest in the third year of the rotation is still 3.5 tons/acre). The remaining growth is then plowed under as a green manure so that the four-year N balance sums to zero instead of a deficit.

Although we have balanced the N budget in this example, it is not guaranteed that crop productivity will remain at the yields we gave at the beginning of the example. This is because these yields are based on liberal use of commercial fertilizer by most farmers, which has resulted in cumulative net excess N on most farms. Although average organic yields have been shown to be equal to or slightly below yields of non-organic farms, we suspect that the organic yields are due in part to imported N and the rotation effect, rather than solely rotations with balanced N budgets as we have proposed here.

Researchers have estimated that N fixation by properly managed legumes (like one-cut alfalfa) may replace only half or less of the N needed for current non-organic yields. We will examine the literature on long-term crop rotation experiments (fertilized and unfertilized) that have been done in the Great Plains and in the Midwest, to determine the equilibrium levels of crop yields and of soil nitrogen and carbon contents. We may also investigate simulation models of long-term nitrogen and carbon (soil organic matter) dynamics to determine how much crop residue must be recycled to achieve or maintain the soil fertility needed for desired equilibrium crop yields.

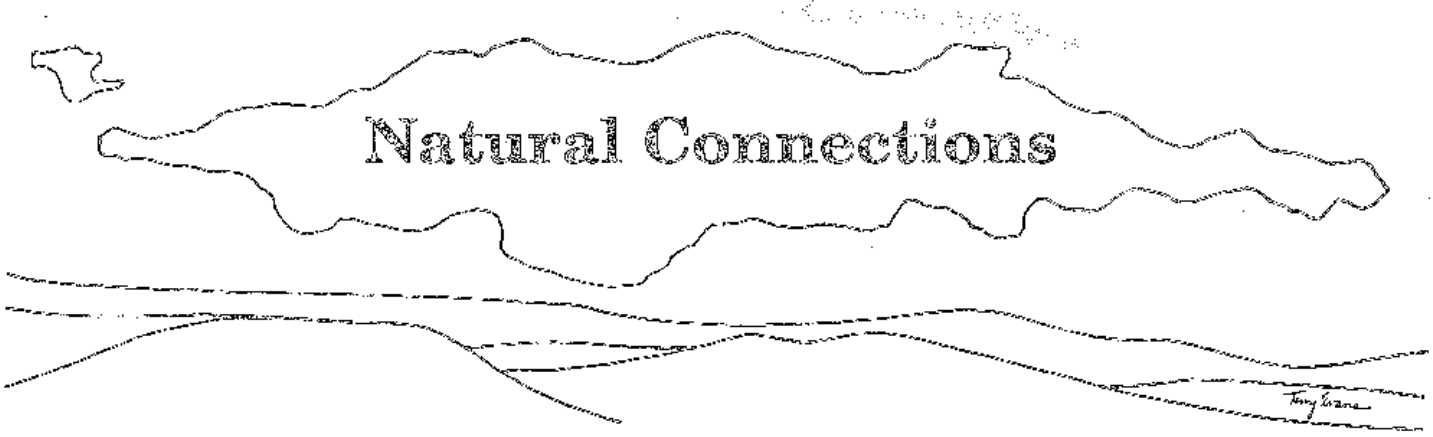
The Kansas Land Trust

Kelly Kindscher

The Kansas Land Trust is a new organization that has been established to promote the preservation of the natural, recreational, scenic, and agricultural values of the Kansas landscape. We are speaking for and working to implement a new vision for the landscape where the integrity of land is protected by a variety of methods. Specifically, we want to protect land with showy prairie wildflowers, woodlands with large trees, river corridors, and scenic vistas. We will work with private owners to aid them in protection of their land through the use of conservation easements; we will work with governmental bodies to develop new programs for protection of natural areas; we will work with individuals interested in purchasing land to protect it; and when the other methods are insufficient, we will work to protect land through acquisition.

In addition to working on land protection initiatives, we will continue to work on the passage of a conservation easement bill through the Kansas legislature. The bill that was introduced last session was passed by the House of Representatives, but still needs to be passed by the Senate. This law will allow private landowners to protect their land by donating their developmental rights to an organization such as the Kansas Land Trust, in exchange for a potential reduction in their federal tax.

For more information on becoming a charter member of the Kansas Land Trust, or on the conservation easement bill, please contact the Kansas Land Trust, Rt. 2, Box 394A, Lawrence, KS 66046.



Eating the Sun in Kansas

Dave Griffin

Any story about gardening is also a story about the sun, but in Kansas this is particularly true. In New England, where I come from, the sun is there, above my garden, almost every day. It's about the size of a quarter. If you were to draw it, you might give it a smile and some amused-looking fair-weather clouds for friends.

In Kansas there is also a sun. Astronomers claim that it is the same sun that shines so benevolently over New England. I will not dispute such claims, but suffice it to say that the dominant daytime celestial body over Kansas behaves as an altogether different creature. I prefer to liken it to a blind force rather than any animate being. In this way, I can remain unemotional and avoid such charged adjectives as "brutal," "ruthless," and "diabolical."

As an indirect consequence of the sun's immeasurable power, we have weather, or so the meteorologists tell us. Therefore, we can also blame, or rather attribute, some of our other Kansas peculiarities to the sun. These would include searing hot winds, crop-shattering hail, and, of course, tornadoes.

Now that we've established what the sun seems to be about in Kansas, we can ponder what it means to garden under it—that is, to put fragile little green seedlings between it and the earth in hopes that these might turn solar energy into broccoli energy and spinach energy. I was fortunate enough to participate in such an undertaking this year at The Land Institute.

Enter The Land Garden, not just soil and plants but a personality, an individual. Garden has had a great deal of impact on me and, I would venture to say, has been a major if sometimes indirect player in the shaping of each intern's experiences here. The greatest compliment I can pay to Garden is a sort of biographical sketch. I'd prefer to leave Garden genderless, but as our language has no pronoun for an androgynous being, other than a demeaning "it," I'll opt for "she."

Garden was conceived sometime last March as greenhouse flats were sown to various solanaceous and cole crops, manure was cast on the soil, and the juices of dormant fall-planted spinach and established rhubarb were stirred by the warming sun. As the weeks progressed Garden emerged; in this formative period her essential being was defined.

Garden's chief creator and nanny was Dana Jackson. Without Dana many of her organs and limbs would have atrophied and she would have undoubtedly finished with a closer resemblance to a bizarre scientific experiment than to the integrated individual she has become. Dana persistently goaded us to allot more time to Garden. She delineated chores and set deadlines. Under her instruction we trucked manure, filled and seeded greenhouse flats, rototilled beds, and fixed water lines. We planted

Laura Sayre and Tim Coppinger rope off Garden so she doesn't get trampled during Visitors' Day.

potatoes, beets, carrots, chard, leeks, and onions. We planted marigolds, poppies, four o'clocks, snapdragons, and cleome. We planted lettuce, parsnips, peppers, eggplant, and okra.

This is not to say that Garden wasn't carefully planned. Leonardo Da Vinci may have painted with exuberance, but he didn't simply drop Peters and Pauls onto the canvas whenever the inspiration struck him. Likewise, Dana observed the protocols of rotation, esthetic balance, produce demand, and regional growability when designing Garden. And like a foresighted city planner creating streets and avenues, Dana appreciated the potential of the very small to become the very large. When she admonished us to allow five feet between caged tomato plants, it was with the knowledge that tomatoes in Kansas grow in a matter of months from insignificant herbs to impenetrable green pillars, more awesome in breadth and stature than ten-year-old oak saplings.

It was Dana's attention to specifics that pulled our fledgling Garden through the blast-furnace winds and herbivorous garden-pest hordes of Kansas. She had us dig our transplanting holes four times too deep and fill them twice with water. She had us put cut-out tin cans over all our broccoli and cabbage and put straw mulch over every square inch of exposed soil. She had us spread rotenone and dipel against unwanted pests and blood meal against unwanted rabbits. But most importantly for me, a New Englander, she emphasized the importance of watering, the wisdom of which can be encapsulated in two rules of thumb: 1. When watering, apply twice the water to your Kansan garden as your New England good sense tells you the plants require. 2. Water again in half the amount of time you would reasonably expect this first watering to last.

Dana's solicitousness towards Garden could not help but be contagious, and by the time she left in June we interns were like school children with a new puppy. Though theoretically each of us was responsible for a different part of Garden, in practice our care was less specialized. Not uncommonly the melon person would send the potato beetle alert and the potato person would water the Swiss chard. Thus did our reductionist scheme of maintenance disolve into more holistic health care.

By June Garden's personality was well formed. After rain and when the sun wasn't too hot she'd put forth profuse foliage and manic floral displays. Later, heat stress and outbreaks of grasshoppers, cucumber beetles, and blister beetles would define periods of fatigue and depression. She did respond well to care and attention. She particularly liked a thorough watering, but any act of kindness was taken in good spirit. One of her chief attributes was magnetism; she would draw visitors and interns alike to walk amongst her beds and bask in her photosynthetic vitality. Finally and foremostly, Garden's quintessence was described by her generosity. One could hardly get from the Krehbiel House to the classroom without being offered a cantaloupe or a tomato.

Beyond these general character traits Garden sported particular strong points, some of which remained intact through most of her life. Others bloomed, came to fruition, and faded during particular seasons. Her infancy was characterized by bright, leafy salad greens with capricious outbursts of radishes, strawberries, baby carrots, and asparagus. Childhood introduced larger root crops, onions, and garlic, and adolescence brought a flush of new potatoes, beans, broccoli, cabbage, cucumbers, and summer squash. Maturity ensconced her in a steady but generally undramatic outpouring of tomatoes, eggplant, and peppers, firmly establishing her as a career supporter of the solanaceous family. Garden's other big endurance hitters included okra, basil, Swiss chard and the melon tribe. Perhaps her greatest drawing point, however, at least from an aesthetic point of view, was her core triangle of flower and herb beds. These remained a lush oasis of fragrance and color even as the surrounding prairie desiccated and faded. Sweet corn, unfortunately, was not extremely prolific. Perhaps the seeds we planted were old, or maybe Garden simply held a constitutional aversion to grasses.

As produce began to pile in it became clear that our photosynthetic friend had created amongst us a dilemma. We all wanted to eat the wonderful vegetables, not just for supper but for lunch. However, limited kitchen space in the classroom building made for chaos if everyone tried to get in on the cooking. We therefore set up a rotational cooking schedule and collective kitchen-supplies fund, which permitted one person to break early each day and cook for everyone else. Needless to say, this was a great boost for collective spirit, and a tremendous boon for gastronomic satisfaction.

Around mid-summer, we interns began thinking of fall crops for Garden, not only to extend her life but to establish a root and tuber retirement fund to keep our lunch project supplied beyond the killing frost. Unfortunately, Garden's perennial grasshopper population, the searing wind, and the broiling Kansas sun made seedling establishment problematic. Finally, employing white mesh (for insects), shade cloth, wet potato sacks (for germination), and thin straw mulches, we successfully established beds or rows of beets, turnips, carrots, and lettuce. In Garden's cold frame, our second attempt at Chinese cabbage and kale survived. However, her spring-harvested potatoes for the most part failed to sprout when planted, spinach germinated to a limited extent, and cabbage, cauliflower, and broccoli were,

continued on p. 24

Old Man Walking Stick

When he saw the silver maple
growing out over water
the walking stick pulled the eye
and the eye pulled the hand.
Then he praised the tree going up

came down with the branch.
In the cream colored wood
dark grain swirls
a bird narrows into sight

so while wrestling with a knife
splashed with the sweat of his nose
a man will think
of the birds in his life.

The end to know the ground
is claimed by snakes;
scales and feathers spiral down
to cross his hand with sky
and walk him through

beneath these clouds
a momentary rush of fields.

Sleeping By The River

Alone with dark
the skull of the field mouse
might suddenly say
Fast Runner was my kin

and fade back slowly into bone.
Words fly away in the
static of cottonwoods.

Shoulderblades to dirt
things made by hand have been shaping
your life like that Chinese puzzle of
coathangers you wrestled one day.
These knock on the
edge of your dreams.
You sign treaties all night.

Between your nose and the stars
one long breath goes by:
that secret roar
we call the wind.

The Mourning Cloak Academy

Staring like the mourning cloak
floating at the mountain rim
lost in enchilada afterglow
this shirt feels just right
as I note it is in the mechanics
of the mourning dove

to dive backward
to rise.
Fifteen years later the
mourning cloak makes her jagged approach
saying never mind all that
and cleaves my skull these
two wings with a glance.

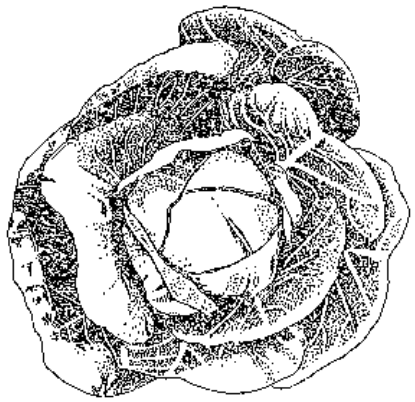
I awake to my assignment:
learning all the names
and laughing them off.

Harley Elliott is a Salina artist and poet.
These poems are from his forthcoming collection,
The Mourning Cloak Academy.

continued from p. 22

with rare exception, mowed down by ravenous grasshoppers. A mid-summer planting of summer squash and cucumbers made a brave stand only to succumb, plant by plant, to stem borers.

As we moved into fall we approached that inevitable night when Jack Frost idled into Salina on the north wind and Garden, to a large extent, perished. Though we had anticipated with sorrow the demise of her mighty tomato trees and the blackening of her basil, we had looked forward to the unearthing of sweet potatoes, parsnips, and leeks. We had rested confident in a continued supply of Swiss chard and root vegetables from her beds, and had waited patiently on the maturation of cole greens in the cold frame. Indeed, as fall progressed we continued to appreciate summer Garden through put-up tomato sauce, sun-dried tomatoes and peppers, and frozen basil pesto and eggplant baba ganoush. But these, too, eventually will be gone, and we will be left with only the memories of Garden and eating the sun in Kansas.



The Land Institute is looking for works of art to display in our gallery during the 1992 Prairie Festival, May 30-31.

Applicants should keep in mind that the Prairie Festival is a yearly celebration of the prairie ecosystem and prairie folk.

Please send ten to twenty slides of your paintings, drawings, photographs, sculptures, or works in other mediums to our arts associate for consideration.

Terry Evans
808 S. Highland
Salina, KS 67401
(913) 825-5314

Soil as Art

Orville Bidwell

"The ultimate filth, a room full of dirt" is how *Wall Street Journal* writer Meg Cox described a 3,600-square-foot soil display in a lower Manhattan art gallery. The work of artist Walter De Maria consists of a two-foot-deep, long, narrow, lumpy carpet of rich black pungent soil that a caretaker rakes weekly and keeps moist and free of mushrooms and weeds.

Nearly 200 people showed up on the eve of 1990's Earth Day to view the "Earth Room" that has drawn more than 70,000 visitors in the past ten years. Owned and operated by the Dia Art Foundation, the display originally was backed entirely by the oil-rich de Menil family, but now also is supported by private and public contributions.

Questions most often asked by museum visitors are "Why?" "What does it mean?" and "Is it really art?" Critics' opinions differ widely. Hilton Kramer, editor of the *New Criterion*, says, "It has absolutely no artistic merit and is a waste of time." Lawyer John Cartafalsa's reaction is that "Art is supposed to be uplifting, and this does nothing for me."

In contrast, Kenneth Baker, author of *Minimalism: Art of Circumstance*, says, "It's a major piece. When you spend some time there, your whole idea of what's inside and outside and up and down are completely shaken." Hans Jenny, a University of California soil scientist internationally known for professing that a natural soil body is one of Nature's supreme works of art, doubtless would look kindly on this distinctive display.

Located in New York City, the display often receives international visitors, many of whom stand in rapt attention. One Japanese businessman was observed clutching a scrap of paper that listed the museum as one of the "best things to do in New York City." During his month in New York City he visited the art gallery several times. A Japanese film crew once featured the exhibit in a movie. Visiting German art students were cautioned by their instructor not to miss it.

This ongoing display in the heart of Gotham is but another example of how an object's dearth tends to generate curiosity, awe, even reverence, and possibly explains why Kansans, in general, take for granted their remarkable prairie soils.

Orville Bidwell is emeritus professor of soil science at Kansas State University, and in 1990 spearheaded a successful effort to designate Harney Silt Loam as Kansas's State Soil.

Considerations for a Sustainable Society

Farmageddon

Jake Vail

The General Agreement on Tariffs and Trade, or GATT, was set up in the wake of World War II to regulate international trade, and keep it out of grasping governmental hands and invisible Smithian hands. It is an imperfect institution, as anything attempting to be both general and global must be. The potential impacts of the current round of negotiations must be considered, for they are far broader and deeper than they at first seem. Two things are particularly irksome about these GATT talks: the effects current proposals will have on the earth and those who live closest to it (farmers), and the way President Bush is using GATT to circumvent a Democratic Congress and the Constitution to impose his New World Order.

GATT is a Gordian knot of numbers that ignores its own effects. It assumes that free trade is better and more natural than Mom and apple pie, and it rests on a shaky foundation of classical economics that paradoxically ignores supply and demand. Agriculture is but one of fourteen areas of the GATT negotiations, but one whose importance has increased. As the talks now stand, the powers that be are urging several items of direct import to anybody who grows or eats food. The so-called Double Zero Plan proposes to phase out farm programs that support domestic prices above world prices, make domestic supply management programs illegal or unworkable, and abolish import controls.

Mark Ritchie of the Institute for Agriculture and Trade Policy explains some of the ramifications of these proposals.[1] Phasing out price supports would lead to "dumping" of crops where there exists a surplus on the world market. Consequent lower prices would only hurt farmers and help global corporations. Outlawing domestic supply management programs would force farmers to plow up more land to grow more crops, which would increase soil erosion and fertilizer and pesticide use—more money for the big guys—and harm the environment. Abolishing import controls would also lead to dumping and lower prices, and make it impossible for small farmers to sell at a profit in their own domestic markets. As Angus Wright forcefully points out in *The Death of Ramón González*, this leads to buy-outs by the rich-getting-richer, more suffering and injustice, and more environmental degradation.

"Free" means both without cost and without responsibilities. That there is no such thing as a free lunch is agreed upon by economists, ecologists, and ethicists. Similarly, whether speaking economically, ecologically, or ethically, there is no such thing as free trade. The conventional tunnel-visioned economic approach can only continue at a tremendous cost to human lives and the health of the planet.

There is another part of the GATT proposals using hollow language to woo the unsuspecting and greedy, innocuously called harmonization. This so-called harmonization can only result in an anguished cacophony. Behind closed doors, GATT negotiators are proposing to apply global pesticide standards to imported foods. The standards would be set by an oligarchy of government officials and corporate heads called the Codex Alimentarius. Countries with stricter regulations than those set by the Codex would have to lower them or face GATT-sanctioned trade retaliation. (Levels of DDT—outlawed in the U.S. but commonly used in other countries—allowed by the Codex on imports are 50 times higher than those set by the U.S..) The health effects of this are obvious, and there is more. If Codex standards become a ceiling on imported goods' regulations, farmers in countries with stricter standards will have to compete with cheaper foods flooding their markets. These farmers would demand more lax domestic regulations, and hopes for a more sustainable agriculture that has the support of farmers and environmentalists would be dashed.[2]

The proposals of the Uruguay round of GATT are much more complex than this. There is, however, an aspect of GATT that is easier to understand: it is manifestly undemocratic, and the process being pushed by President Bush is unconstitutional. The U.S. trade representative is a presidential appointee. Negotiations go on behind closed doors. The proposal, when completed, will be presented to Congress via the "fast track:" no amendments may be made, debate is limited to twenty hours, the vote is yes/no and passes with a simple majority. But the Constitution mandates Congress, not the executive branch, to be responsible for trade policy. Fast track, however, technically is a rule, not a law, and congress can suspend it. Keep your eyes peeled for the latest on GATT, and urge your representatives to suspend fast track.

References

1. Mark Ritchie, Nov. 1990. "Trading Away the Family Farm." *Multinational Monitor*.
2. Mark Ritchie, 1990. "GATT, Agriculture and the Environment." *The Ecologist*, v. 20, #6.

The Importance of Balance

Dave Griffin

This year, we have received several visits from monks of the spiritually-based social service organization, Ananda Marga. Though our approaches differ, Ananda Marga and The Land Institute have somewhat similar missions. Both are working towards a future in which humanity strikes a balance, within itself and with the natural world.

In addressing the possibility of a sustainable future, The Land Institute has proposed an agricultural system based on perennial polycultures. Though this might seem to concern only matters of technique in food production, the adoption of such techniques would carry many societal implications. Imagine an agriculture powered almost exclusively by sunshine, an agriculture in which the need for inputs is greatly reduced and necessary amendments are derived largely from farm outputs. Plant nutrients in feed and food products would be returned to the land via animal and human waste composts, and traction would be furnished by either draft animals or machinery run on biofuels produced on the farm.

Imagine the society in which such an agriculture could exist. Could the current industry domination in U.S. farm production persist if agricultural inputs such as pesticides and herbicides became obsolete, and fertilizer and traction fuel were produced by the farmers themselves? What kind of society would support an agriculture that is not umbilically attached to multi-billion dollar agricultural industries? Given the clout of agricultural industries and a long history of U.S. government policy favoring high-capital, high-input agriculture over small, low-overhead operations, it seems unlikely that something as radical as the elimination of purchased inputs in farming could take hold without a concomitant restructuring of society.

Ananda Marga philosophy offers one vision of a society in which the balance of nature and the common welfare of humankind take precedence over the narrow interests of capital gain. Such a society would be structured after the concepts of what is called The Progressive Utilization Theory (Prout), proposed in 1959 by the founder of Ananda Marga, P.R. Sakar.

The fundamentals of Prout rest on neohumanism. In brief, neohumanism expands on humanism by including plants, animals, and the inanimate world as entities possessing intrinsic worth and deserving respectful treatment. Neohumanism recognizes, however, that humans are more rare in creation than entities and organisms of less highly evolved consciousness. It is the primary duty of the neohumanist to see that no human being is needlessly caused to suffer or is stifled in his or her physical, mental, or spiritual development.

To delineate how humanity could move towards a society grounded in neohumanism, Sakar proposed five fundamental factors of Prout:

1) No individual should be allowed to accumulate any physical wealth without the clear permission or approval of the collective body.

According to Sakar, human beings possess a "thirst for limitlessness," and in the mental and spiritual spheres there is limitless scope for expansion. The physical sphere, however, is finite. If an individual or group of individuals seeks to accumulate limitless quantities of physical wealth, some segment of human society or the natural world will be left wanting. For this reason, limits must be set on individual accumulation of wealth. A community must attempt to minimize the difference in purchasing power between its poorest and richest members.

2) There should be optimal use and rational distribution of all material, supramundane, and spiritual potentialities of the universe.

Everything is used for something. Even wildlands are used for the unfolding of millions of plant and animal lives and countless metamorphoses of inanimate objects. It will not do for human beings to ship California broccoli half-way around the world, or for the sun's rays to beat on the roof of a peasant farmer's house by day while the inhabitants freeze by night. Materials in the service of humanity, be they gallons of oil or solar rays, must yield the greatest benefit possible. Likewise, supramundane wealth (ideas manifestable in the physical world) should be properly distributed. For instance, the farmer should have the technology and resources available to install a solar heating system.

3) There should be maximum use of the physical, metaphysical, and spiritual potentialities of the individual and collective bodies of human society.

According to P.R. Sakar there is potential for development in three spheres: physical, mental (metaphysical), and spiritual. It must be the duty of society to permit the maximum opportunity for an individual's growth in these areas.

So that all may properly take care of their bodies, food, clothing, and housing should be guaranteed. To ensure opportunities in the mental sphere, basic schooling should be provided to all, and higher education to those with the desire and ability. Through cooperatively owned and operated industries, crafts, and farms, workers may continually apply innovation to reduce their working hours, and free up time for family and more subtle pursuits.

4) There should be a proper adjustment among these physical, metaphysical, material, supramundane, and spiritual uses.

Many social theories have focused exclusively on one aspect of human existence. Communism, for example, focuses extensively on the production and allocation of material goods, while culture is either not fostered or actively suppressed. Prout seeks to establish a social structure in which a harmonious balance of physical

necessities and intellectual and artistic concerns is struck. The physical world cannot be ignored; we must use it properly and with compassion. But humans, being essentially mental and spiritual beings, cannot forever direct their energies toward their material requirements. As much as possible we must be free to expand our mental and spiritual horizons in art, literature, music, and the pursuit of truth.

5) Methods of use should vary in accordance with changes in time, space, and person.

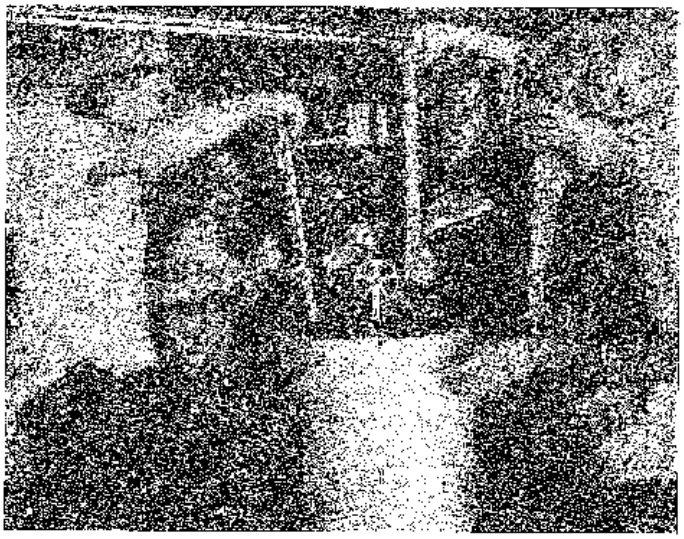
Humanity is not stagnant. Our methods of existence and uses of Earth have changed greatly and will undoubtedly continue to change into the future. It would behoove us to work with change, to steer ourselves in positive directions rather than cling to outmoded social structures and material uses.

Upon examining the principles of Prout in light of The Land's vision of a sustainable agriculture, I am struck by the compatibility of their respective proposals. In contemporary society it is hard to imagine that a low-input, low-capital agriculture that assumes responsibility for the long-term health of humans and the environment will be widely adopted. Obstructing radical change is the involvement of big business in agricultural inputs, the essentially unwavering government support of high-capital agriculture, and the ability of an individual or corporation to escape the externalized costs, both to the environment and to human beings, of industrialized agriculture. In a Proutist economy, real demand rather than profit would motivate production, and accountability for externalities would be par for the course.

Currently, the profit motive directs our economy and necessitates an ever-expanding market for commodities. In agriculture, a steadily expanding market in farm inputs has increased the status of industries and the production of pesticides, herbicides, and fertilizers. Historically, government policy has favored agriculture that replaces human labor with industrial commodities. Such policy has increased corporate profits but has had damaging effects on ground and surface water, soils, and, of course, agricultural communities. Active market expansion on the part of industry is compelled by the desire to maximize profit. By restricting wealth accumulation by individuals, the motivating force behind unnecessary production would be removed. This appears restrictive of the individual's economic freedom, but weighed against the societal and environmental degradation that unrestrained pursuit of personal profit has rendered, it seems a small price to pay.

To uphold principle two, which calls for the optimal use of materials, profit restriction would not be enough. Policy must insist that short-term production be balanced against long-term sustainability. To achieve optimal use of agricultural soil it must not be sacrificed to erosion in the interest of high immediate yields. Likewise, to preserve ground and surface water for human and non-human life, an agriculture must be designed that does not bleed toxic chemicals into rivers and water tables.

Prout recognizes that farmers could not shoulder the economic burden of environmental responsibility without their real costs of production being reflected in the prices that they would receive for their produce. By the establishment of farmer cooperatives that would market produce directly to consumer cooperatives and cooperatives involved in secondary handling of the crop (such as bakeries), farmers would secure a just income for their work. Emphasis on regional self-sufficiency would tighten the links between farmers, processors, and consumers, and reduce the possibility of profiteering and exploitation.

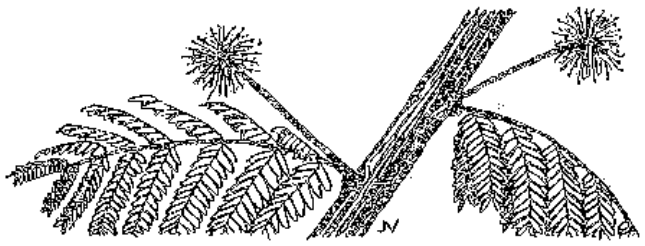


In the greenhouse, Stan Amick, Mary Handley and Elliot, Jake Vail, and Dave Griffin extract honey from hive frames. We had a dry year, but a record honey harvest.

A perennial polyculture, complete unto itself in resource use and ecologically stable, would, in my opinion, fit nicely into the Proutist model of a sustainable society. The perennial polyculture envisioned by The Land considers the long-term ability of a system to produce food. It would draw neither on depletable petroleum resources nor fossil water. Nor would the polyculture chip away at the biosphere's heritage of unpolluted water and deep topsoils. Furthermore, and in the spirit of neohumanism, perennial polyculture stems from a basic faith in the order of nature. Rather than practicing our agriculture to the exclusion of nature, The Land suggests we model our farms on natural ecosystems. By thus engulfing ourselves in the natural world, "our" domain and the domain of nature would lose their distinctiveness, and we would gradually come to see the earth as the

common property of all living beings.

Prout recognizes the importance of balance within and among the physical, mental, and spiritual spheres. Contemporary society has become obsessed with material wealth, which has led to over-exploitation of the material world. By restoring balance in society, a more complete expression of higher human potentials will be realized, enabling us to exist more harmoniously on the planet. As we move towards a more integrative, less exploitative relationship with the earth, we will have to adopt new technologies and systems to secure our physical requirements. Perennial polycultures present one clear notion of how an integrative agricultural system could come about.



For more information on Prout contact: Prout Publications, 4246 Duncaster Drive, Madison, WI, 53711.

Sheetrock and Linoleum are the Answer! (But what was the Question?)

Tim Coppinger

In classes early this year we discussed many of the issues surrounding energy consumption in the United States. John Craft led several discussions on the subject, and we read articles that tried to resolve some of the problems of U.S. energy consumption. Through my internship at The Land I have been exposed to many alternative energy sources and designs that reduce, reuse, and recycle energy. The purpose of this article is to share my encounters, propose some solutions, and stimulate and inspire renewed thought on the ever important issue of energy use.

The Land Institute has two wind generators, an old Aermotor water pumping windmill, and a windmill that interns built several years ago that generated electricity. We discussed their uses and problems, and discussed other alternatives to energy production. One of the articles we read focused on U.S. oil consumption. The article, called "Oilwells

Dave Griffin, Teresa Jones, Doug Romig (on the porch), Michelle Mack, Volker Wittig, and Charlie Pedersen, awestruck at the Garden of Eden.

and Battleships are the Answer! (But What was the Question?)"[1] was written by Amory and Hunter Lovins, who started the Rocky Mountain Institute (RMI) in Snowmass, Colorado, in 1987. Several RMI staff, including 1989 Land intern Colin Laird, visited the Land Institute during Prairie Festival this year, and invited any of us who wanted to learn more about RMI to visit. Doug, Volker, and I visited during the 4th of July weekend.

RMI devotes much of its time to reducing the amount of energy consumed by the common household. They are researching new technologies and acting as energy outreach educators to surrounding towns. They are studying technologies that reduce water use, such as low-flush toilets and shower heads and faucets that reduce water flow. According to Amory and Hunter, if the U.S was as efficient as Japan and Western Europe with energy use we could save $200 billion a year. This is equivalent to the federal budget deficit. RMI is also promoting improved housing insulation, including new super-insulated windows, and improving our use of energy sources other than oil. Oil, as we all know, lends itself to dependency on countries such as Kuwait and Iraq, which have proven to be a less than stable supply and led us to war.

During our visit to The Rocky Mountain Institute, Colin gave us a tour of the RMI facility, which is a working example of resource efficiency and renewable energy. Some of its major features are an earth-integrated north wall and super-insulated walls that heat the building by storing and releasing heat gathered from the sun, people, lights, and appliances. The house also includes windows that insulate twice as well as triple glazing, toilets that use up to 90% less water than normal flush toilets, super-efficient lighting, a passive solar clothes dryer, and a greenhouse for growing edible plants, fish, and adding solar gain to the building. On the roof are photovoltaic panels that supply the building with electricity. The building supports office space, a communal kitchen, a library, and a visitors' center. Colin mentioned that they may also install a methane digester. A methane digester is an airtight container that can convert kitchen waste into methane, a gas similar to propane used for cooking or heating.

Colin also mentioned that early in RMI's history they talked with regional utility companies to educate them about alternative energy. Instead of utilities developing more sources of energy from hydropower or nuclear power, RMI suggested they channel their time and money into reducing the consumption of energy. Now utility companies from around the world contact RMI for more information regarding energy and its use. This is a marvelous facility where research, education, and outreach take place to "foster the efficient and sustainable use of resources as a path to global security."[2]

After our trip to RMI my interest in renewable energy was rekindled. During much of my time in college I was interested in the work done by the New Alchemy Institute on Cape Cod in Massachusetts. The greenhouse at RMI reminded me of the Ark at New Alchemy. The Ark is a solar-based structure that has "integrated architectural, ecological, agricultural, and aquacultural knowledge with solar and wind technologies to create nonfossil fuel-dependent climatic envelopes for growing food."[3] The building was so efficient at capturing and storing heat from the sun that no backup heating was needed, even during the middle of winter in New England (one of the cloudiest and coldest regions in the continental United States).

The designs that the Rocky Mountain Institute and New Alchemy Institute have proposed are intriguing and exciting when we start to think about reducing energy consumption. Although I realize that these are prototypes for educational and experimental purposes, I am concerned about the cost of building such structures. These were both expensive and complicated structures to build. A solar architect, builder, ecologist, and agriculturalist would be required if anyone was interested in building either of the facilities. How could one incorporate many of the wonderful solar designs and food production systems seen in the above examples into a house that was simpler in design, concept, and structure? Another field trip led to part of the answer.

During a warm-up in the spring, Jake mentioned that Miner Seymour, a Friend of The Land, was building a tire house at Bethel College for his senior art project. This prompted a trip to visit and help Miner with his house.

At the start of the summer we traveled fifty miles south to Bethel College, where we met Miner and his project: a small earth-integrated tire house. He got the idea from a friend in Albuquerque, New Mexico, who has built an entire house out of tires. We worked with Miner that afternoon putting a roof on the circle of stacked tires. He showed us how to make an adobe "schluck" (clay, soil, sand, straw, and water), and how to put it on the tires. After our work was complete he showed us a book entitled *Earthship*, written by Michael Reynolds.[4] Mr. Reynolds, who lives in Taos, New Mexico, has been building tire houses for twenty years. In his book he describes how to build your own tire house, and includes floor plans of many of the houses he and others have built. The basic features of these houses are south-facing glass, earth integration, and tires which are packed hard with earth and stacked like bricks into U-shaped outer walls. The roof is made of log poles that are supported by the tires and have roofing insulation and earth on top of them. The earth-packed tires are

a good thermal mass for holding solar radiation. (Thermal mass is any mass of materials that holds heat gained by solar radiation.) These features keep the house warm when temperatures reach -10 degrees F, and cool when the temperature is 100 degrees, without additional heating or cooling.

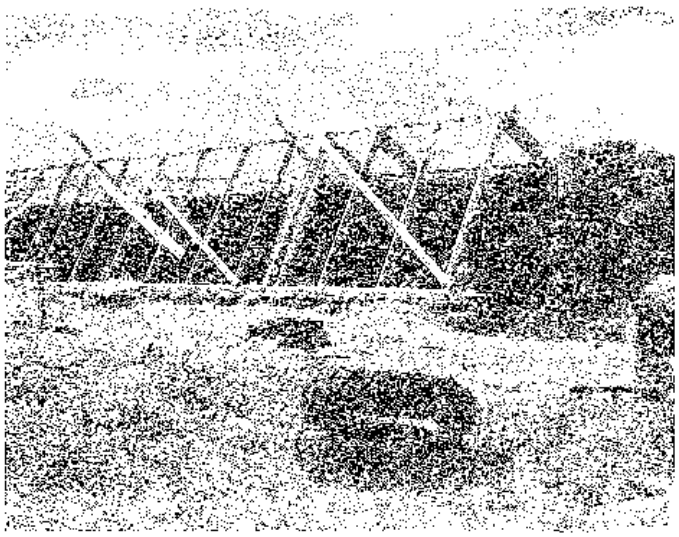
Designing a house that is earth-integrated takes advantage of the warmer temperatures of the earth. In any house, interior heat is conducted through building materials toward colder outside temperatures, and the rate of heat transfer increases when temperatures outside get colder. Earth integrating a house reduces the amount of heat transfer because of the relatively and constantly high soil temperature. During the summer this effect is reversed, and the earth will actually cool the house. In addition to the benefits of solar energy, with these houses there is a reduction in the number of tires in the landfill, and costly building materials are avoided. In some areas you can even get paid one to five dollars per tire to take tires from a garage. Another advantage is that with some hard work anyone can build their own house, thus saving labor costs. The houses require some basic knowledge of structural support, which Mr. Reynolds explains in his book.

These houses struck a chord with me. Most greenhouses require large amounts of heating during the winter because of the poor insulating qualities of the glass or plastic used for glazing. Also, large amounts of thermal mass are required to store enough heat to heat the greenhouse during the night. This can be a major design problem, and be costly. The tire house is a simple, efficient, and economical design for capturing solar radiation and radiating the heat back during the night. It seemed like a worthy solution, but I still had my doubts. So I set out to visit some of the houses Michael Reynolds has built.

I traveled with a friend to Taos and Albuquerque. The first house we visited was built by a woman who had little experience with house building. The house, which was 1000 square feet, cost her $30 per square foot and requires little to no additional heating during the winter. Tomato plants climbed up out of raised beds and along the south glass, and supplied food and shade during the summer months. Because of the earth integration, the temperature inside the house was very comfortable (60-70 degrees). The tires were out of sight under several layers of adobe. The atmosphere was nice. My one concern, however, was how it would feel to live underground in a house with a U-shaped design. I had recently been reading Christopher Alexander's book *A Pattern Language*, which explains fundamental patterns in peoples' lives and architectural designs that promote comfortable and functional living spaces. One of his patterns, "Light on Two Sides of a Room," made me wonder about the fundamental design of the tire house. My feeling before visiting was that the interior would feel like living in a cave. This was not entirely the case, though the deeper the U-shaped room was the more it felt like one. I noticed that when we were visiting with people inside the house we sat and talked under the south-facing glass where all the light was entering. The people we visited who had lived in the structure were very happy with the design. They had a beautiful home that kept them warm throughout the winter by only solar radiation. They said that the air in the house was much more pleasant than in a house heated by wood because it didn't dry out.

The houses I saw were inspiring. They were well designed and looked nice. After reading *Earthship*, anyone who wanted to work hard could build one. With a little ingenuity and scrounging a tire house could be built rather cheaply. Tire houses reduce heating costs by almost 100% in areas like the Southwest, and all the houses I visited had a raised-soil bed under the south glass for growing food. Besides these advantages, I was fairly confident that the design could be modified to incorporate some of the patterns discussed by Christopher Alexander. Incorporating his architectural designs with a tire house could enhance movement throughout the house and create even more comfortable living conditions.

I was also introduced by a staff member at RMI to houses made of hay. Hay as well as sod has been used for house building in the Great Plains since settlers first arrived here. There are several houses in Nebraska that were built in the late 1800s and are still standing, functional houses. Hay bales, the smaller rectangular ones, when stacked like bricks, lined with chicken wire, and thinly coated with adobe or cement, will create a wall with an insulating value of R-50. A super-insulated house has R-30 walls and R-50 ceilings, and most houses fall well below this, with R-20 walls and R-30 ceilings or lower. The



A tire house under construction in New Mexico.

possibilities of house designs integrating hay and tires are endless. The tires could support the thermal mass, earth integration, and structure, while the hay could create a design that moved above ground and make indoor spaces that are comfortable and still well-insulated. Plus, hay is a renewable and cheap building material.

All of these designs promote buildings that significantly reduce energy costs and consumption. However, the tire house may have problems if located in the Northwest or Northeast, and the Ark or RMI house may not work in the Southwest. But RMI, New Alchemy, Miner, and Michael Reynolds should be congratulated for experimenting with solutions appropriate to their bioregions that foster the efficient and sustainable use of resources.

References

1. Amory B. Lovins & L. Hunter Lovins, 1987. "Oilwells and Battleships are the Answer! (But What was the Question?) Why are we Buying Oil for $176 a Barrel?" Rocky Mountain Institute, Old Snowmass, Colorado.
2. Rocky Mountain Institute, 1989. Annual Report. Old Snowmass, Colorado.
3. *New Alchemy Journal*, 1980. "From Our Experience: The First Three Years Aboard the Cape Cod Ark." Stephen Green Press, Brattleboro, Vermont.
4. Michael Reynolds, 1990. *Earthship*, Solar Survival Press, Taos, New Mexico.

Objectivity and Organic Farming

Mike Hamm

Objectivity is often discussed at The Land Institute. One definition of objective is "emphasizing or expressing the nature of reality as it is apart from personal reflections or feelings."[1] This can be contrasted with bias, "an inclination of temperament or outlook; especially prejudice." There are two prerequisites for objective analysis. First, the person performing the analysis must stand outside the problem being studied and observe it. Second, the observer should be able to analyze all of the interactions associated with the problem. But is it possible to stand outside of a question? Do we have the capacity to observe all of the interactions that affect a particular system?

At The Land there is a running joke that we need to learn to be objective the right way. Indeed, a number of people have come to the conclusion that there is no such thing as objectivity. A recent report published by the Institute of Food Technologists (IFT) in the journal Food Technology is useful to illustrate the inability of science to be truly objective. The Institute of Food Technologists is an organization of approximately 25,000 people from universities, industry, and government. It is the major organization in this country related to the post-harvest processing and storage of food. The article, entitled "Organically Grown Foods: A Scientific Status Summary by the Institute of Food Technologists' Expert Panel on Food Safety and Nutrition," is a somewhat lengthy analysis of organic farming.[2]

The IFT article reviews published literature on farmer and consumer attitudes, the definition and labeling of organically grown foods, the organic foods market, the nutritive value of organically grown vs. conventionally grown foods, taste, cost, health benefits and risks, and presents a brief conclusion. The article, and subsequent press releases by the IFT, prompted articles in newspapers across the country and an editorial in *Organic Gardening* magazine.[3] Remembering that objectivity's antithesis is an inclination of temperament, one should be aware of the forms that bias may take. Often the bias in an article is subtle—an alteration of language usage, for example—sometimes blatant, and sometimes hidden behind a scientific reference. The IFT article contains each of these three forms of bias.

Analyzing something objectively implies that the language and tone used in describing all viewpoints should be consistent, and should provoke a consistent set of images in the reader. The introduction to the IFT article describes organic practitioners and advocates as believing that "repeated applications of concentrated inorganic fertilizers may be harmful to the natural soil flora," while conventional farming advantages are "scientific fact." This immediately places organic farming in the realm of something less than scientific.

The IFT states that "This Scientific Status Summary addresses the market for organically grown foods and summarizes the current scientific information available on the perceived attributes of organically grown foods compared to those of conventionally grown foods." In other words, surveys of attitudes will be summarized. Since a summary of this type is a step removed from the original surveys, the reader can't interpret the bias inherent in the surveys themselves. It has been repeatedly demonstrated that the types of questions asked and the method of asking them influences the answers received. It is true that the "data" generated by surveys can be statistically analyzed and significant differences and trends reported. However, the questions that form the basis of these data are, in part, culturally determined. It is impossible for a survey to be objective, because the observer can't be part of the cultural milieu being studied and at the same time objectively study it.

For example, two approaches to a survey regarding food-buying decisions can be constructed.

Surveys cited in the IFT article indicate that consumers "appear to prefer predictable uniformity in their produce and absence of defects." Perfect appearance is associated with quality. But what if the survey questions were posed within an ecological context? A survey was conducted in which consumers were shown pictures of heavily sprayed oranges (for thrips, a cosmetic pest) and oranges sprayed with half the amount of pesticide and showing 10-20% cosmetic damage.[4] Consumers were asked to rate their preference before and after being read a description of the treatments. Before the description the results were predictable: 80% were less willing to buy the cosmetically damaged oranges. After the description a majority of people said they would buy the damaged but less-heavily sprayed oranges.

This doesn't prove that people are concerned about the environment any more than the surveys cited in the IFT article indicate that people are driven solely by appearances. What both surveys indicate is that people are affected by the culture and environment around them. They also indicate that people have the potential for a more broad-reaching analysis than many might think, and that how things are approached is critical. Finally, they indicate that the basis of the IFT-cited survey is not objective.

The selective interpretation of scientific articles such that a desired conclusion is reached must also be watched for. One article in particular was summarized by the IFT committee in such a way as to indicate that organically grown food is a potential health risk. This was discussed in detail by the *Organic Gardening* editorial. The paragraph in question reads:

> Use of fresh, untreated animal manure has resulted in contamination of crops and surface water sources with pathogenic bacteria. For example, use of sheep manure to fertilize fields on which cabbage was grown resulted in the first reported food-related outbreak of listeriosis. Coleslaw contaminated with *Listeria monocytogenes* was responsible for 41 cases of listeriosis and 18 deaths in the outbreak.[5]

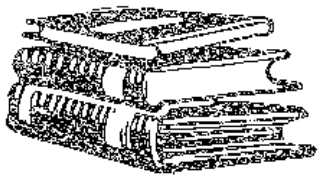
Comparing this paragraph to the original article, a less definitive conclusion should be drawn. The original article agrees that sheep manure was used to treat a field where cabbage was grown, the sheep had a history of listeriosis (but the disease could not be identified at the time of the study), some of the coleslaw in question was made with cabbage from this field, and there were 41 cases of listeriosis with approximately 18 deaths.[6] What was not stated in the IFT summary were the following facts, as indicated in the research article: 1) The cabbage had been stored for a year at a temperature ideal for the growth of *Listeria monocytogenes*, 2) The microorganism could not be cultured from the manure of the sheep at the farm in question at the time of the study, 3) The manure was not composted prior to field spreading. Also, the cabbage does not appear to have been grown organically. Rather, manure was spread on the fields, a common agricultural practice. The original article was published in 1983. The staff at *Organic Gardening* "scanned the medical, agricultural, and occupational disability literature" and could find no documented cases of food poisoning as a result of organically grown food.[7] This is particularly interesting, since, as stated in the IFT article, "The organic foods (produce) industry grew from 273 growers and 9,033 acres in 1982 to approximately 900 growers and 30,000 acres in 1987." Logic would dictate that with the rapidly increasing numbers of growers and acreage an increasing level of disease, rather than its complete absence, would be seen.

What can be concluded from this? That the IFT article is not objective, and that if we were writing it would be? That their article is merely a tool for the agriculture/food processing industry that has a vested interest in opposing organically grown food? Neither of these and both of these. Objectivity implies an expression of reality apart from personal reflection or feeling. But ask virtually any scientist working in the food/agriculture area what their opinion is of organically grown food and they will have one. This opinion is not turned off when preparing a report such as the one reviewed here. Rather, it is disguised behind a veil of "scientific studies." It seems more useful to admit that people and their science are not objective.

The most unfortunate aspect of the IFT report is that, by their own conclusion, "advantages have been identified, however, with the practice of organic farming. Advantages cited include agronomic and environmental benefits." That this is not considered adequate justification for widespread encouragement of organic methods is not objective, but it is very sad.

References

1. *Webster's Seventh New Collegiate Dictionary,* 1965. G.&C. Merriam Company, Springfield, MA.
2. *Food Technology*, December 1990. "Organically Grown Foods," pp. 123-130.
3. Mike McGrath, April 1991. "The Bashin' of the Green, or Kiss Me, I'm Organic," *Organic Gardening*, pp. 5-6.
4. D. Bunn, G.W. Feenstra, L. Lynch, & R. Sommer, 1990. "Consumer Acceptance of Cosmetically Imperfect Produce," *Journal of Consumer Affairs*, vol. 24, p. 268-279.
5. *Food Technology*, 1990.
6. W.F. Schlech, P.M. Lavigne, et al., 1983. "Epidemic Listeriosis: Evidence for Transmission by Food," *The New England Journal of Medicine*, vol. 308, pp. 203-206.
7. McGrath, 1991.



Books

Toward a Sustainable Agriculture: A Teacher's Guide

Board of Regents of the University of Wisconsin, Center for Integrated Agricultural Systems, Sustainable Agriculture Curriculum Project, 1991. 150 pp., $10.00

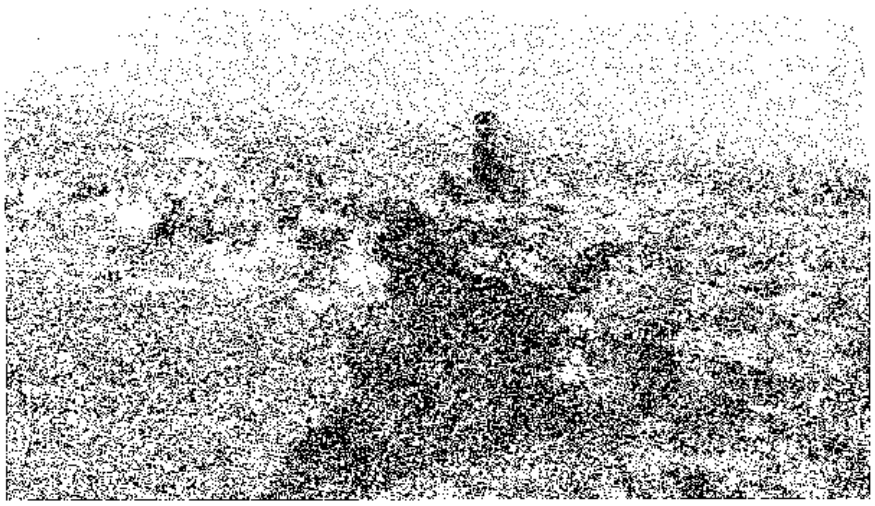
Reviewed by *Adam Davis*

I first heard about The Land Institute's internships in agroecology while in the midst of a hellish semester spent entirely in labs, libraries, and lecture halls on Science Hill at Yale. A teaching assistant from an environmental history class I had taken the year before handed me The Land brochure as we bumped into each other (yet again) at the science library. During a sanity break, I read it. The intern curriculum was refreshing news to my dogma-besieged brain. The Land's "Considerations for a Sustainable Society" aims to complement study in prairie ecology, plant breeding, and plant pathology with an exploration of "the ethics and values that could be the underpinning of a sustainable society and the social and political structures that would allow such a society to evolve." By removing the social blinders that are often worn unknowingly by "objective" scientific researchers, The Land Institute hopes to keep its research true to the larger goal of a sustainable society.

Classes provide interns with tools to address a wide variety of complex questions, rather than taking a single, doctrinaire approach to problem-solving. Interns learn to ask searching questions and to tell when the Emperor is buck naked (not that this ever happens around The Land). For example, is biotechnology research targeted at increasing crop yields, ostensibly to ensure a stable food supply for the world's soaring population, really relevant when pervasive barriers to equitable food distibution are still responsible for mass starvation? The peril of stepping back from detail work to paint a more integrated picture, all too common in interdisciplinary studies, is a loss of specificity that deteriorates into intellectual dilettantism. A common thread such as The Land's agroecological research based on natural systems holds multifarious topics together and provides focus. During the spring and fall, as an applied counterpart to morning classes, interns spend afternoons working in the research plots, garden, and greenhouse, assisting with farm maintenance, and taking field trips. Summertime is devoted to field research, with twice-weekly group discussions to maintain a collective burn-on (Landspeak for intellectual excitement and curiosity).

Fall semester this year presented an exciting opportunity to us interns: the chance to help develop our own Considerations for a Sustainable Society curriculum. In the last days of summer we interns and Jake, our educational director pro tem, discussed the form that fall classes would take. We began by volunteering interesting topics and pertinent books. The resulting list was gargantuan! We made it more manageable by pruning out redundancies, tying together related subjects, and arranging them so as to emphasize connections in the material. The hardest work began when classes started. Small groups took responsibility for preparing the reading and writing assignments for each week of classes. The class facilitators did a lot of work to ensure that the week would be a solid unit as well as fit into the curriculum as a whole.

When I saw *Towards a Sustainable Agriculture: A Teacher's Guide* on The Land's shelves, soon after fall classes began, I felt a measure of respect for the authors before even peering inside. Helping to plan classes in sustainable agriculture and society for a group well-versed in sustainability literature was hard enough. Doing so for high school teachers and their students in a 150-page paperback seemed remarkable. The long list of contributors is testimony to the amount of effort that went into the publication. The Sustainable Agriculture Curriculum Project, led by Dean Gagnon (formerly of the Wisconsin Department of Public Instruction), Margaret Krome (Wisconsin Rural Development Center), and Steve Stevenson (Center for Integrated Agricultural Systems, University of Wisconsin at Madison), was composed of 25 farmers, agricultural educators and researchers, and leaders of concerned non-profit and environmental organizations from Wisconsin. An initial draft was field tested and reviewed by 100 Wisconsin high school agriculture teachers, the guide's target audience. As I flipped through the table of contents and then browsed the chapters, I became more and more impressed. The underlying philosophy of the guide holds that "sustainable principles and practices are applicable to the mainstream of contemporary agriculture." *Towards a Sustainable Agriculture* is a serious attempt at introducing Wisconsin's next



Adam Davis at Castle Rock

generation of farmers, at an early age, to the study of the complex environment in which a farm operates. The guide's goal sounds familiar to this Land intern:

The eventual development of a creative, action-oriented curriculum that will interest and engage both students and teachers, emphasizing systems thinking, cooperative learning and concept learning.

"Emphasizing systems thinking"—acknowledging and exploring connections—immediately raises the question of scope. Where should the boundaries of a chosen system be drawn? The study of connections can be expanded to view how anything and everything fits together: constraints of the physical environment (examined in earth science) interact with human ability to manipulate the environment (gained from scientific and cultural knowledge) which is, in turn, mitigated by social and ethical constraints. The abstract disciplines offered in most high schools are probably intended as a sampler of Everything, but it's very hard for most of us to make the huge leap in thinking that recognizes these discretely-taught subjects as inseparable and relevant to daily decision-making processes. A more direct approach to educating for creative change is to start with a specific issue that the students have grown up with, and then explore assumptions of connectedness and complexity. For example, how does a Wisconsin farm family fit in to the complex web of markets, policy, consumption patterns, agricultural practices, and related agricultural enterprises?

The guide is divided into sections containing background chapters, a model curriculum outline, and suggested learning activities. It begins by introducing the concept of sustainable agriculture and its history. The authors define sustainable agriculture as:

Farming practices, technologies and government policies that are developed in a framework that accounts for their long-term positive impacts on agricultural profitability, environmental quality, food sufficiency and quality, and rural family and community vitality.

Subsequent chapters look at the main structural components of this framework, pointing the way for teachers and students to come to their own conclusions. "Sustainable Cropping and Livestock Systems" reviews alternative agricultural methods, while "The Economics of Sustainable Agriculture" and "Alternative Agricultural Enterprises" look at how farming communities interact with the market system. A brief history of agricultural policy is given in "Public Policy Choices in Sustainable Agriculture." The final background chapter, "Ethics and Agriculture: Can Agriculture Be Good?" throws an interesting twist into the guide. It provides a means of addressing the intangible forces that affect decisions that must be made all the time in agriculture. I can envision some really hot discussions coming out of the questions (and associated ethical principles) that the guide proposes for evaluating ethical issues in agriculture. Following this chapter is an outline for a 15- to 45-

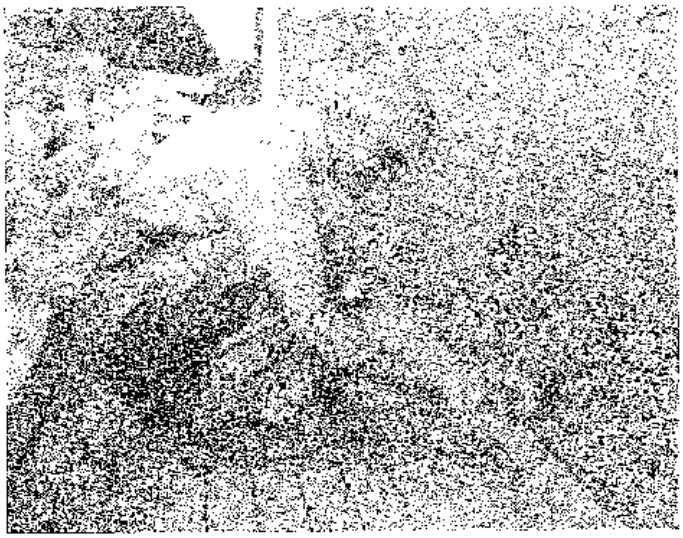
day course on sustainable agriculture. It is arranged to guide classes through scientific, socio-political, and finally philosophical aspects of sustainable agriculture, taking time to be experiential and lively along the way. This is possibly the most important part of the curriculum guide. The final section outlines twenty-one learning activities, ranging from compost making to a debate on moral and ethical issues in agriculture.

Compost making and ethical debates? These aren't just clever ways of making the material go down more smoothly. Locally relevant learning activities are crucial to grounding interdisciplinary study in reality, and especially for giving students experience in cooperative problem solving. The guide fosters critical thinking and creative solutions by drawing from many sources. Such an approach highlights what a complex, ongoing process growing towards sustainability is, and leaves room for diverse approaches to sustainable agriculture. The authors point out that their definition of sustainable agriculture is "consciously broad, emphasizing that agriculture is not something that happens only on farms but is part of a larger, changing economic, social and political structure." Acknowledging diversity and relativism is essential, as there are as many different opinions of how things should be as there are people. Each of us has a unique hierarchy of connections with the rest of the world. Teachers who want to see their students develop the skills necessary for working with others towards the development of a sustainable society have an enormously difficult and exciting job to do: to show how the myriad connections intersect and influence each other as they extend from the individual to the universal, and vice-versa. There is no room for "NIMBY" in such an outlook: one's backyard becomes too large to throw things over the fence.

Towards a Sustainable Agriculture has a number of things going for it. It is clearly written, and conveys a lot of information. The guide's six background sections give lucid, detailed descriptions and have extensive, up-to-date bibliographies. Unlike many environmental education survey courses, it chooses a specific issue, the sustainability of agricultural systems, and runs with it. Viewing the gamut of environmental problems from Atrazine contamination of groundwater to zebra poaching can dim the bright eyes of most potential activists. There's plenty of time for dismal reality checks along the way; better to encourage positive attitudes from the start. With agriculture as its specific entrance point into environmental awareness and discussions of sustainability, the guide is also pertinent to place. Many of the students who will be taught from this curriculum come from farming backgrounds, and may continue as farmers or in related occupations.

If growth towards a sustainable society is to be harmonious and lasting it cannot be based upon a master blueprint, imposed from above. Such a scenario could quickly devolve into eco-fascism. One way to prepare ourselves for voluntary evolution in the direction of peaceful coexistence is to educate new generations of humans to be more conscious than their parents were of how their actions affect the whole. *Towards a Sustainable Agriculture* contains no prescriptions for change except a "challenge to the concept of production maximization as the dominant factor in farm decision making." It leaves the direction that Wisconsin's future farmers, entrepreneurs, and policymakers take wide open.

The choices that they make, of course, will be heavily influenced by other future decision-makers. Corresponding curricula need to be developed that help children in other regions—including urban areas—become aware of how their immediate environment ties into the larger whole. Generic Social Studies classes could be transformed into place-specific investigations. Education for being an earthling can no longer ignore that we are all directly responsible for the health of the planet and all of its inhabitants. *Towards a Sustainable Agriculture* is a big step in the right direction.



The 1992 Prairie Festival

The Land Institute's 14th annual Prairie Festival will be held on May 30-31, 1992.

A celebration of the prairie ecosystem and prairie folk, past festivals have brought nationally-known scholars, activists, and performers together with local notables and friends to help us think through ways of making the transition to a more sustainable society.

The theme of the 1992 Prairie Festival is "Learning from the Land."

Left: Berni Jilka and Stan Amick paint the Krehbiel House, our office building, dubbed the Keebler House by this year's interns in honor of the industrious elves who work there.

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