

20TH ANNIVERSARY ISSUE #55-56, PART 1



The Land Report: 20 Years

A publication of The Land Institute Number 55/56 Summer 1996

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When people, land and community are as one, all three members prosper; when they relate not as members but as competing interests, all three are exploited. By consulting nature as the source and measure of that membership, The Land Institute seeks to develop an agriculture that will save soil from being lost or poisoned while promoting a community life at once prosperous and enduring. To become a Friend of the Land and support the work of The Land Institute, please turn to page 79.

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Editor: Brian Donahue
Research Report Editors: Jon Piper
and Marty Bender
Assistant Editor: Sheri Walz
Graphic Design: Arrow Printing
Circulation Manager: Alice Sutton
Photo Editor: Aron Gannon
Arts Associate: Terry Evans
Printed by Arrow Printing Company

STAFF: Ron Armstrong, Marty
Bender, Aaron Bolster, Heather
Brummer, Brian Donahue, Emily
Hunter, Wes Jackson, Stephanie Krug,
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2440 E. Water Well Rd.
Salina, KS 67401
(913) 823-5376
theland@igc.apc.org

Introduction

Brian Donahue

Here is the "Summer" 1996 *Land Report*. We discovered we needed an 80 page double issue and a few extra months to do justice to twenty years of Land Institute history and 54 previous *Land Reports*. Excerpts have been taken from more than 50 articles.

In putting this history together we have followed five interwoven themes. First is the tradition from which the Land Institute sprang; our mentors such as E.F. Schumacher, Paul Sears, Hans Jenny and Aldo Leopold. Another is our place in the national community of environmental thinkers, activists and organizations that grew up in the 1970s including Amory and Hunter Lovins of the Rocky Mountain Institute, John and Nancy Jack Todd of the New Alchemy Institute, Donald Worster and Wendell Berry to name a few. A third is the connection of The Land Institute to related efforts within Kansas. A fourth is the immeasurably important firing of the minds and spirits of nearly 200 interns and research associates. We do not claim credit for their accomplishments, but we are proud of what they do.

The central theme, of course, is the development of thinking and research at The Land Institute itself. Here you will notice continuity of ideas along with change and elaboration. Over the first ten years of the organization the focus tightened on what we now call "natural systems agriculture," and alternative shelter, energy and community concerns moved to the periphery. This was symbolized by prairie roots replacing the wind machine on our logo in 1986. But, these early concerns have reappeared in the Sunshine Farm and Matfield Green projects.

I want to extend special thanks to Dana Jackson for her suggestions of articles to reprint, many of which I took. Of course the final choices were mine and she cannot be held responsible for my slant on the Land's story. She *can* be held responsible for the consistently high quality of the material I had to work with. These articles were well-written and tightly edited to begin with. It was a real pleasure reading through all the issues that Dana (as well as Jake Vail and Laura Sayre) put together. In more ways than one it is her work that is reflected here, too.

I apologize to both the readers and especially the writers of these line essays for cutting them so ruthlessly. They were all much better in their original form. I had to do it to include the widest possible range of voices and ideas. Only Wes' "Living Nets" and Dana's "Lost in the Garden," along with one or two shorter pieces survived intact. In most cases I was able to contact the authors for their acquiescence. Where I failed to do so, I hope I have given no offense. After consulting with several of the writers I decided not to use the grating... symbol except in a few cases.

Finally, I apologize to the many deserving interns and staff who have not been pictured or mentioned by name, and to the photographers whose work has been reprinted without attribution. Where I could identify the photographers I have credited them. I assume many of the uncredited pictures were taken by Dana. Of course Terry Evans' work is found throughout, and her photos grace both covers, as is only fitting.

The Land Report 3

Readings and Discussions

Wes Jackson

Number 1, December 1976

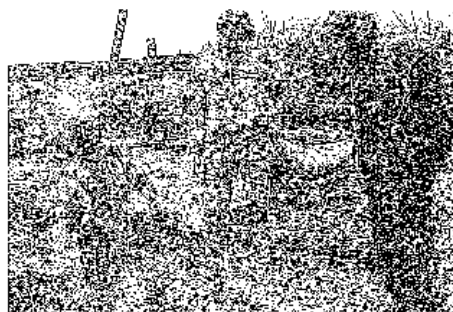
The Indian House, experimental mud pies with varying earth/portland cement ratios, newspapers bound and plastered into a livable structure, a tower supporting whirling blades, thirty-two volts worth of industrial batteries stored in a dog house, two flat plate collectors (one air and one water), milo flour and milo pancakes—all are part of the visual experience, the visible accomplishment here at The Land. They can be viewed, evaluated, climbed on, walked around and touched. These are the tangible alternatives, the visible effort.

But there is the intellectual and religious effort as well. What, after all, would Black Elk think of these alternatives for the twenty-first century? Or for that matter, Lao Tzu? Or Don Juan, or even Aristotle? We have never asked ourselves these questions specifically, of course, but we have steeped ourselves in a mix of intellectual, philosophical and religious considerations. We have asked if Western civilization is alienated from the environment because of the subject-object dualism which we can trace at least as far back as Aristotle. We have wondered if primitives regarded nature as being "out there," rather than being of nature themselves. We have sought to learn whether the de-mythologization of nature through Christianity and later science is really at the root of the ecological crisis.

In our search we have carefully studied Robert Pirsig's *Zen and the Art of Motorcycle Maintenance*, Theodore Rozak's *Where the Wasteland Ends*, Aldo Leopold's *Sand County Almanac*, and are about to wade into *Small is Beautiful: Economics as if People Mattered* by E.F. Schumacher.

When our heads begin to spin, we are secretly happy that the visitor to The Land cannot inspect these dizzying thoughts as readily as he can the batteries and collectors. Yet the scholarly and religious ideas are as much a part of The Land effort as the hedge posts and the portland/mud.

Perhaps these ideas lie in the safety of the shadows cast by the technological alternatives, and like them they are waiting for their time to come.



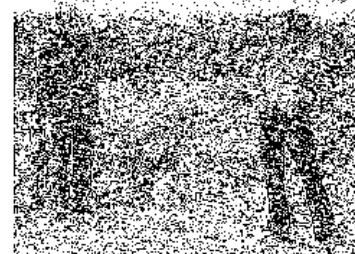
Rebuilding the classroom. Wes, Steve Burr, Leland Lorenzen; Ken Baker in background.

Schumacher Visits The Land

Dana Jackson

Number 2, June 1977

There were scant signs of spring at The Land on March 8 when Dr. E. F. Schumacher visited, but it was a pleasantly warm day, just right for a walking tour. Wes Jackson



E.F. Schumacher & Wes Jackson

and four fall session students, Kyle Mansfield, Eric Herminghaus, Nancy Vogelsberg and Sue Leikam showed Dr. Schumacher the student projects and the new shop and classroom building under construction and explained the goals and philosophy of The Land Institute.

Dr. Schumacher explained the need to develop appropriate technology in a free public lecture given to an overflow audience at the Salina Community Theatre that evening. After covering the main themes included in his book, *Small is Beautiful*, Dr. Schumacher discussed the importance of involving diverse elements of society in bringing about a change from the emphasis upon large-scale, energy-intensive, violent technology to appropriate technology.

Everyone associated with The Land Institute was pleased to share Dr. Schumacher's visit with the public. As we inevitably lessen our dependence upon oil, perhaps we can follow some of Dr. Schumacher's suggestions in our local community and make the transition easier.

A Philosophy of Materials

Wes Jackson

Number 2, June 1977

Friends and acquaintances in Salina know about our junk pile at The Land. Not everyone is aware of the difference between "good" junk and "bad" junk, and sometimes people are too happy to unload basement accumulations on us. However, most of the time we appreciate the gifts and the tips on inexpensive materials available.

What about our accepting the slop-over from affluence, our being the receivers and users of "goodies" in a culture of plenty? Surely, one might insist, these "goodies" will not be available in times of resource scarcity for pioneers of the 21st century. Are we really seriously engaged in a search for alternatives when so many of our projects are leftovers from the fat of our present culture? I posed this question to E. F. Schumacher when he visited in March. He didn't answer right away, but as we walked away from the patio doors he said, "Never mind. Materials want to be used and they will show you how."

June 7, 1976. The Land Institute is founded by Wes and Dana Jackson.

September 13, 1976. Seven students begin the first semester.

October 17, 1976. The classroom building is destroyed by a fire probably caused by a woodstove. Class resumes October 18 in the Jackson's living room. "Friends of the Land" help rebuild the classroom, and provide funds to buy new books.

1976

I haven't resolved this question yet, but I have arrived at a temporary stopping point in my considerations. When a modern designer of shelter or tools prepares to make his drawings, he has a ready inventory before him in numerous catalogues. Gear A can be ordered out of Akron; module B can be shipped to arrive within 30 days from Toledo. Usually when we are confronted with a problem at The Land, we sort through the iron and wood piles, or check the wire and miscellaneous pile. Often we find something that will work, that will do the job we have in mind. The part that we choose often dictates much of the structure and form of our projects.

Such an approach at The Land forces us to use our imagination. It also requires time. Here, I think, is the crux of the consideration. As important as materials during the coming period of scarcity will be the imagination to use what we have and the patience not to feel terrible if it takes awhile to solve a problem.

I think we can justify using the excesses of affluence as a way of preparing ourselves for a future of scarcity. Perhaps our imagination can grow even as scarcity grows. Perhaps if we develop patience, we can cope more gracefully with scarcity.

Friends of the Land: 1940-1962

Frank Anderson

Number 2, June 1977

In 1940, the United States was emerging from the depression and the dustbowl years and gearing up for war. ...The U. S. Department of Agriculture was exhorting farmers to increase their production through the use of chemical fertilizers and insecticides. ...Never mind about the long range effects of the indiscriminate use of chemicals, or damage caused by farming land which needed to rest. This was not really an auspicious time for the establishment of an organization interested in the conservation and preservation of America's land and natural resources. Yet, in 1940, a group of concerned citizens met in Washington to organize a society called "Friends of the Land." Louis Bromfield, American novelist and owner of Malabar Farm in Ohio, wrote about the founding group in a 1944 Reader's Digest article:

These men ...resolved to educate the American people to the danger of our soil being destroyed, our forests cut down without replacement, our towns and farms washed away by floods, and great areas of once fertile land turned into desert. ...[T]he men present at the first meeting ...were aware that no remedial measures would be effective if imposed by government. The people themselves had first to understand the gravity of the situation and then cooperate in demanding and carrying out reforms. It is a slow process, an educational one, but the only sound method under democracy.

Adventures in Conservation with Paul Sears

Dana Jackson

Number 4,
February 1978

The first hard freeze had not occurred when

Professor Paul Sears visited The Land on October 11.

We showed

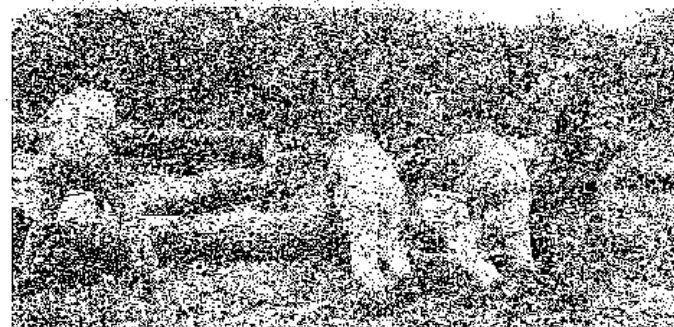
him the experimental village area, then walked through what was left of the garden. Dr. Sears enjoyed eating tomatoes and green peppers picked during the tour. The sharp wind that morning signaled the demise of summer gardens, however, and before dawn on October 12, the tomato and pepper plants were black from the frost.

The topic of Professor Sears's address was "Adventures in Conservation." In his speech, [the author of *Deserts on the March*, first published in 1935] traced the development of the conservation movement as he had observed and participated in it. Of special interest was his description of the Friends of the Land, a group organized in 1940 to help promote soil conservation and aid the new U. S. Soil Conservation Agency. Through a gift from Dr. Wendell Nickell, The Land Institute now owns a good collection of the *Land Quarterly* [published from 1941 to 1959].

Everyone at The Land had an opportunity to learn from Dr. Sears again during the morning session on October 12. The discussion covered a wide range of topics, from the importance of precise language, to the mining of fossil water, to the extravagance of space exploration. "The human race has a positive genius for learning the hard way," he said, and then went on to express his opinion that although Americans are capable of being generous, probably no substantial change in our pattern of environmental destruction will occur unless forced.



Paul Sears and Wes



Fall, 1976. The first wind generator, a 32 volt 500 watt Airchurger, is installed at The Land Institute.

December, 1976. The first issue of *The Land Report* is published.

Soil Loss and the Search for a Permanent Agriculture

Wes Jackson

Number 4, February 1978

The Human-Nature Split

Nowhere is the human-nature split more dramatic than the manner in which land is covered by vegetation. To maintain the "over-normal" granary, agricultural man's pull historically has been toward the monoculture of annuals. Nature's pull is toward a polyculture of perennials. This is not to say that we humans exclude perennials from our agricultural endeavors, just as nature does not exclude the annual plants as part of her strategy to keep vegetation on the ground. Certainly the numerous nut

and citrus trees, grapes and berries (be they blue, black, rasp or straw), along with other perennial plants, are important to this agricultural species of ours. As for nature, no naturalist need remind us that her annuals are widely dispersed in natural ecosystems.

The main purpose of this paper is to consider the implications of these opposite tendencies on our earth with an eye to the serious work involved in healing the split. Nature is at once uncompromising and forgiving, but we do not precisely know the degree of her compromise and the extent of her forgive-



Scott Jackson, John Craft and Wes with wind tower

ness. I frankly doubt that we ever will. But we can say with a rather high degree of certainty that if we are to heal the split, it is the human agricultural system which must grow more toward the ways of nature rather than the other way around.

The problem is this: to maintain any system, agricultural or natural, bills must be paid eventually. In nature's prairie, the bills are paid automatically and with amazing regularity. The wild forms have evolved methods for dispersing seed, recycling minerals, building soil, maintaining

chemical diversity, promoting new varieties and even controlling weeds, e.g. through a shading system. The prairie has been successful because close attention has been paid to seeing that these jobs get done. Most biologists believe that natural selection alone was up to these tasks, and that purpose was not necessary.

This "no-free-lunch law" applies just as much to man's culture as it does to the biotic cultures of nature. For when agricultural man substitutes his annual monoculture on this prairie land, be it corn, wheat, milo, sorghum, rye, oats or barley, the same bills have to be paid or failure is inevitable. Mechanical and commercial preparation of the seed and planting, the application of fertilizer, chemical and power weeding, mechanical soil preparation, pesticides and fungicides and plant breeding are all the clumsy inventions we have devised for paying the same bills nature pays.

[T]he monoculture of annuals leads to soil erosion. The methods almost inherent in the monoculture of annuals require that ground be devoid of vegetation for too long a time, often during critical periods of the year. The forces of wind and rain can now rapidly move soil seaward. Even during the growing season, especially for the row crops, the loss is substantial. Crops such as corn, cotton and soybeans have much of their holding power destroyed between the rows as the farmer loosens the earth to cultivate. For this reason, J. Russell Smith called corn, "the killer of continents...and one of the worst enemies of the human future."

The polyculture of perennials is another matter, however. The more elaborate root system is an excellent soil binder. It has been estimated that before the white man, fires were sufficiently common and any given area became burned at least once in a decade. Though the top organic matter may have been absent for brief periods, the roots at least were alive and binding the soil.

What Will Nature Require of Us?

It seems doubtful that nature will uncompromisingly insist that the polyculture of perennial is the only way humans can peacefully co-exist with her. As I mentioned earlier, she employs some annuals in her own strategy. One might begin a limited systematic inquiry into the nature of a high-yielding and permanent agricultural by asking whether it is the annual versus perennial condition of the plant or monoculture versus polyculture we need to investigate first.

In a more thorough-going systematic study, we may have to contrast, not just annual versus perennial, or monoculture versus polyculture, but the woody versus the herbaceous condition and whether the human interest is in the fruit/seed product or the vegetative part of the plant. When we consider these four contrasting consider-

March 8, 1977. E.E. Schumacher visits The Land Institute and gives a public lecture in Salina. Schumacher becomes the first honorary board member.

Spring, 1977. Twenty-five native prairie wild flowers are planted at The Land Institute with seeds obtained from the USDA Plant Materials Center in Manhattan, KS. "It doesn't seem at all out of the question that we will one day turn to the wild relatives of our domestic crops for genetic raw material." - Wes Jackson.

1977

ations, in all possible combinations, we have sixteen categories for assessment.

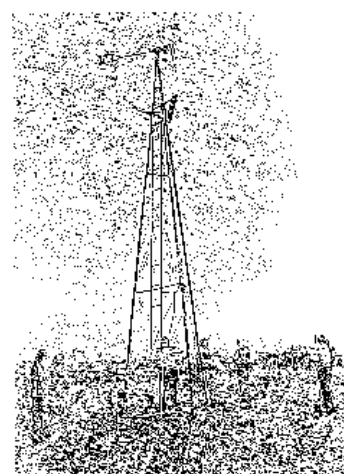
We can eliminate four of these sixteen categories listed in Table I for they involve woody annuals, a rare phenomenon in nature. This leaves us with twelve categories for consideration. Eleven of these remaining combinations are currently employed in the human enterprise. But there is one, category seven, which involves the polyculture of the herbaceous perennial for seed/fruit production. This category is almost opposite of our current high-yielding monoculture of annual cereals and legumes.

Fruit/seed material is the most important plant food humans ingest. This is so because of the readily storable, easily handled, highly nutritious nature of the seeds we call grains. Unfortunately, none of our important grains are perennial. If a few of them had been, we might not have so thoroughly plowed from the edge of the eastern deciduous forest to the Rockies. Where we did not plow or where we did plant back nature's herbaceous perennial in polyculture, our livestock have become fat on the leaf and seed products. Throughout this entire expanse, the mixed herbaceous perennials have not been cultured for the purpose of harvesting the seed except for the rare times when collections were made to plant more mixed pasture.

In the eastern tall grass region, the white settler substituted the domestic tall grass—corn. In the middle or mixed grass region, he substituted a domestic middle-sized grass—wheat. Part of the problem of the dust bowl is that we tried to substitute the middle-sized grass wheat in what was short grass prairie.

The Dust Bowl followed the great plowing of the teens and twenties. When the dry winds blew in the thirties, the bad reputation for the region became firmly

implanted on the American mind. We have had other severe droughts in the area since, and the wind has blown just as strong. All the work done by the Soil Conservation Service and others to prevent this major loss of our ecological capital should be applauded. It is truly the work of thousands of diligent and dedicated people who have spent most of their productive lives thinking and working on the problem, but a most sober fact can not be ignored. The soil is going fast. On some flat land there may be very little loss, but on rolling land the loss can be as high as sixty tons per acre per year. According to the Soil Conservation Service, the average yearly loss is nine tons per acre per year.



Unless the pattern of agriculture is changed, our cities of this region will stand as mute as those near the Great Wall of China, along the Fertile Crescent or the region of Egypt which once hosted grain fields that supplied the empire of ancient Rome.

If we are serious in our intentions to negotiate with nature while there is still time for the American to heal the split, are we not being forced to ask if nature will uncompromisingly require us to put vegetation back on the ground with a promise that we are never to plow again? If that is nature's answer from the corn belt to the

Table I

	<u>Poly vs.</u> <u>monoculture</u>	<u>Woody vs.</u> <u>Herbaceous</u>	<u>Annual vs.</u> <u>Perennial</u>	<u>Fruit/Seed vs.</u> <u>Vegetative</u>	<u>Current Status</u>
1.	Polyculture	Woody	Annual	Fruit/Seed	Not Applicable
2.	Polyculture	Woody	Annual	Vegetative	Not Applicable
3.	Polyculture	Woody	Perennial	Fruit/Seed	Mixed Orchard
4.	Polyculture	Woody	Perennial	Vegetative	Mixed Wood Lot
5.	Polyculture	Herbaceous	Annual	Fruit/Seed	Dump Heap Garden,*
6.	Polyculture	Herbaceous	Annual	Vegetative	Companion Planting
7.	Polyculture	Herbaceous	Perennial	Fruit/Seed	
8.	Polyculture	Herbaceous	Perennial	Vegetative	Pasture & hay
9.	Monoculture	Woody	Annual	Fruit/Seed	Not Applicable
10.	Monoculture	Woody	Annual	Vegetative	Not Applicable
11.	Monoculture	Woody	Perennial	Fruit/Seed	Orchard
12.	Monoculture	Woody	Perennial	Vegetative	Managed Forest or Woodlot
13.	Monoculture	Herbaceous	Annual	Fruit/Seed	High-Producing Agriculture
14.	Monoculture	Herbaceous	Annual	Vegetative	Ensilage for Livestock
15.	Monoculture	Herbaceous	Perennial	Fruit/Seed	Seed Crops for Category 16
16.	Monoculture	Herbaceous	Perennial	Vegetative	Hay Crops & grazing

*See *Plants, Man & Life* by Edgar Anderson for the splendid chapter on Dump Heap Agriculture.

1977. Two Jacobs and a Wincharger wind generators are installed. "With all the wind energy whistling by The Land it was only natural to want to put the available energy and resources to useful work." — John Craft.

October 11-12, 1977. Ecologist Paul Sears visits The Land Institute and gives a lecture in Salina.

1977. Contributors to The Land Institute are formally recognized as "Friends of The Land," and receive the Land Report and other Land Institute publications.

Rockies, will it require that we develop an agriculture based on the polyculture of herbaceous perennial which will yield us seeds not too unlike our cereals or legumes? This category, so glaringly blank in our table, needs filling desperately; and yet to contemplate the research, breeding, establishment of the crops, the harvest and separation of seeds is mind boggling. All this effort must go hand in hand with the transportation, milling and ultimately, the eating of this "instant granola in the field."

Is it too much to expect plant scientists to come up with such perennials, either through some inter-generic crossing of our high-producing annuals with some perennial relatives, or by selecting some wild perennial relatives which show promise of a high yield of a product that is at once abundant and tasty? Any scenario surrounding such an agriculture does seem to be truly in a fantasy world. For mechanized agriculture it would mean either a minimum amount or a complete absence of plowing, disking, chiseling and mechanical power weeding. There would be only harvest, fertilizing, pest control, genetic selection and the occasional replanting.

In Conclusion

The depth of the human-nature split, symbolized by the depth of the hillside gullies, as far away as the Great Wall of China, or maybe as near as our closest field at home, is not highly visible in modern agriculture. The chemotherapy treatments to the land promote a temporary vigor more impressive than these fields have ever known. Though the physician may rejoice with his cancer patient that he is feeling better in response to the treatment, he is also careful to monitor the telltale systems of the body. Similarly, those interested in the long-term health of the land need only stand on the edge of a stream after a rain and watch its plasma boil and turn in the powerful current below and then realize that the vigorous production of our fields is, unfortunately, temporary. Since we initiated the split with nature some 10,000 years ago by embracing enterprise in food production, we have yet to develop an agriculture as permanent as the nature we destroy.

Experimental Plots Started

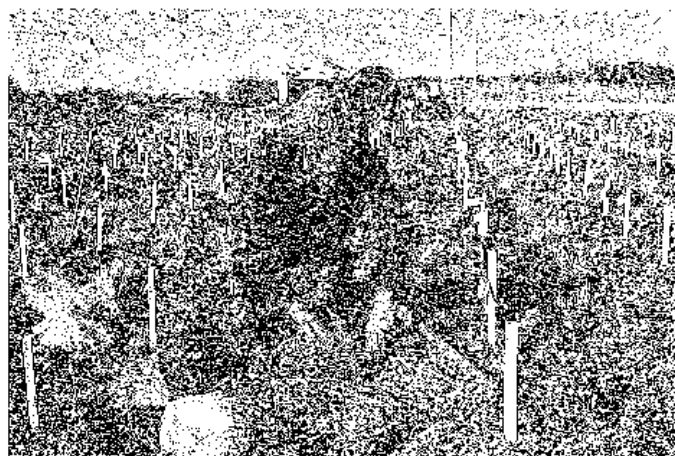
Maureen Hooley

Number 5, Summer 1978

Seed from thirty-five different varieties of perennial forbs and grasses has been planted in our new experimental garden at The Land. Our purpose is to establish a strong stand of various species as candidates for use in breeding alternative seed crops.

The seeds were made available from the U.S.D.A. Plant Materials Center near Manhattan, Kansas, through the cooperation of the local Soil Conservation Service. They were then planted by hand in rows sixty feet long, in roughly roto-tilled strips of mowed alfalfa. Fine top soil was lightly sprinkled over them after sowing. Most species have germinated.

We expect Eastern Gama Grass, *Tripsacum dactyloides*, to be especially promising because the stamens and pistils are contained in separate flowers but localized on the same spike. We know this close relative of maize is highly nutritious and prized by cattle.



Fall, 1977. The Prairieland Food Coop is organized in Salina.

Fall, 1977. "Alternatives in agriculture interest us at The Land. We hope to be developing experiments and ongoing projects in this area in the future. However, in this first year of construction and reconstruction, organization and development of The Land Institute, we have nothing to show except the Jackson family's large organic garden." - Dana Jackson.

The Feasibility of Perennial Crops

Wes Jackson

Number 5, Summer 1978

We have begun to promote and work on the development of seed-producing herbaceous perennials as substitutes on our uplands for the high-yield annuals such as wheat and corn. As I stated in the last *Land Report*, it would appear that it is the cultivation of annuals which makes the soil vulnerable to wind and water erosion at the rate of nine tons per acre per year nationwide. The critical question becomes: is the development of seed-producing herbaceous perennials, as substitutes for the annuals, technologically feasible in the near future?

We do not know the answer yet, but essentially no new breakthroughs are necessary for us to begin a very large program involving hundreds of crosses and selection experiments now. Most of the science and technology for this work occurred during the first half of our century when Darwin's ideas of evolution through natural selection were fused with Gregor Mendel's principles of heredity. Techniques were developed to count chromosomes and follow them through the various stages of replication and division. Chromosomes were irradiated, broken and fused, and their gene sequences mapped. Sterility barriers between species came to be understood, and artificial hybrids, including some resulting from intergeneric crosses, were successfully made. We came to

understand how species arose through chromosome numbers being doubled or reduced, and investigators learned to artificially induce these changes.

This reservoir of practical knowledge could enable us to begin the second agricultural revolution.

The Environmental Vision

Wes Jackson and Martin Bender

Number 6, Fall 1978

The croding American uplands ultimately need a polyculture of herbaceous perennials that are grain producers to substitute for annuals that are grain producers. We imagine that the lowlands can continue to grow the traditional crops, and we would encourage vegetative cover for forage on land not necessary for grain production. Ideally then, we need to bring several species along at once and evolve them in concert. Such an approach would entail a new era in plant breeding. For humans to direct the evolution of a diverse agricultural ecosystem with an eye to sustainability first, and overall yield second, will require more of an understanding and application of ecosystem principles than has been necessary previously. This will probably require a vast amount of team research on the polyculture of crops in order to determine which seeds would set together and which ones far enough apart so there is no problem of shattering during the harvest of each crop.

The transition from the hard energy path to the soft will likely require fifty years for completion, Amory Lovins estimates. But such a long venture seems worthwhile for the American culture since the hard path emphasizes strength through exhaustion and the soft emphasizes sustainability. Similarly, the transition from the hard agricultural path built around monoculture, high energy pesticides and fertilizers, to a soft agricultural path patterned after nature will probably take all those fifty years and more. But again, the soft path is sustainable. An holistic approach would suggest that it is just as important to save our soils and keep them healthy as it is to shift our energy economy toward a sunshine future.



Wes Jackson and Marty Bender planting experimental plots of Eastern gamagrass and other perennial grain candidates, 1978.



1978

March 11, 1978. The first of many "Green Thumb" organic gardening workshops is held at The Land Institute, organized by Dana Jackson and featuring veteran Salina organic gardener Ted Zerger.

May 28, 1978. Two Carpathian walnuts are planted on Arbor Day to honor E.F. Schumacher, who died September 4, 1977. "We have all been sitting under trees planted by our ancestors, so let us plant trees so that our children and grandchildren can sit under them and possibly get the harvest." - E.F. Schumacher.

Soft Energy Paths: Energy Policy for a Shrinking Planet

Number 6, Fall 1978

The League of Women Voters and The Land Institute co-sponsored a Soft Energy Paths conference in Salina on October 21, 1978. The featured speakers were Ruth Hinerfeld, an international relations expert whom Dana Jackson had met on a "Transnational Dialogue" trip to South Asia the previous fall; and Amory Lovins, whose book on Soft Energy Paths had just appeared. These are excerpts from the dialogue that followed their talks.

Question: Some developing countries resent efforts of developed countries to sell them alternative energy technologies rather than nuclear. The attitude that nuclear technology is safe if produced and used by developed countries, but not when used by developing countries, supports a double standard unacceptable to developing countries. They suspect that the talk about appropriate technology for developing countries is a ruse to keep them from modernizing. Is there any justification for this suspicion? What principles should guide the transfer of technology to developing countries?

Ruth: There is justification for that attitude.... Look at who are the powers in the world. The countries who have nuclear weapons. They are the role models. It is very difficult for developing countries to have these role models

who are playing in the big leagues say to them: 'you play your own game,' particularly in terms of recognizing we are not doing what we promised them in the nuclear proliferation agreements that went into



Wes and Amory Lovins

effect in 1963. We said to non-nuclear countries, 'Your part of the bargain is that you do not develop nuclear weapons. Our part of the bargain is that we will not increase our development of nuclear weapons. We will disarm.' Obviously we have not been doing this, so they feel they are under no obligation to do what we want them to do in that respect.

Amory: If we with all our fuels, money and technical skills say we have to have nuclear power, and renewables aren't enough, then how can we expect other countries

lacking all those advantages to come to a different conclusion?... (There is further suspicion that our interest in renewable sources for developing countries is often just a way of opening up markets for our own aerospace industries. That suspicion is indeed justified, and the only way we can get around that is to transfer technology with no strings attached, give away free patent rights, deliberately cut ourselves out of many consumer markets. It's still worth our while to do that because of what it will do for world development, equity and peace.

Question: The United States' energy consumption is nearly 40% above that of Western European nations with similar standards of living.

If the U.S. should seriously strive to lower consumption through conservation, would the energy saved actually benefit the life of the campesino,



Ruth Hinerfeld and Dana

the beggar sleeping on the streets of Calcutta, or the peasant farmer in Senegal? (Did a single Armenian ever benefit from the peas forced down the American child forty years ago?)

Amory: I've already mentioned the surprising opportunity for energy conservation in developing countries. It may seem as though people who have no energy in our sense have nothing to conserve, particularly if you think of conservation wrongly as curtailing functions rather than using the energy more efficiently. Most of the energy used in the developing world is not commercial energy. It doesn't show in the statistics at all. It's things like firewood or dung, and it is a greater amount of energy than all the oil moving in world trade today. But it's used very inefficiently, like open fires in cooking, and very simple, zero-capital things like clay cooking stoves could stretch scarce fuels much further. But it's absolutely impossible for countries—where we jump into a several ton automobile to drive half a mile to get a six pack of disposable aluminum cans—to say anything to people in that position about the wise use of energy. So our model is very important. The way we are guzzling too much of the world's oil and other resources is very important...and then there are all the indirect ways in which our wasteful consumption falls out on everyone else because of the economic imperatives we are driven into to try to pay for the oil.

Spring, 1978. The first plots of potential alternative grain candidates are planted at The Land Institute.

June 3, 1978. A "Soft Agricultural Paths" symposium is held at The Land Institute. "[W]e should start thinking very hard about how to 1) live on a renewable energy source, 2) cut erosion to level of replacement, 3) reduce pesticide application to near zero." — Invitation to symposium.

The New Alchemists: The Village as Solar Ecology

Dana Jackson

Number 7, Spring 1979

The New Alchemy Institute is located on Cape Cod in Massachusetts. It is probably the most famous of all the "New Age" research/education organizations. ... We first learned about New Alchemy in 1973, and were inspired by their efforts "To Restore the Lands, Protect the Seas, and Inform the Earth's Stewards." Through their beautiful journal we became informed about their aquaculture projects and intensive bed gardening.

The approximately twenty New Alchemists work on a twelve acre "farm" which contains various small experimental greenhouses and the Ark, a large bioshelter, entirely solar heated, which produces vegetables all year. A major element in the Ark is the research being done on fish culture in algae-green plastic pools. ... Outside, the intensive-bed gardens, tree crop research, and various fish culture experiments are not there simply to produce food, or to demonstrate neat ideas. ... [A]s modern agricultural methods, researched and taught in land-grant universities are depleting and poisoning soils, alternative approaches must be sought somewhere else.

"The Village as a Solar Ecology: a Generic Design Conference" was convened by John H. Todd and Nancy Jack Todd on April 16 on Cape Cod. The purpose of the

conference was to determine whether it is possible to design a village that is a solar ecology, using modern scientific knowledge, ancient techniques of building and siting, and rely-



Terry Evans and Dana

ing exclusively on renewable sources of energy. It was inspired by and dedicated to Margaret Mead, who was the first to see that the New Alchemy Arks or bioshelters belonged on a scale other than the household or the small self-contained homestead. For her the blending of architecture, solar, wind, biofuel and electronic techniques with housing, food production and waste utilization within an ecological context was the basis of creating a new design science for the post-petroleum era. Dr. Mead was excited by the Arks, but in her opinion the scale was not right. "Arks and villages belong together if people are to relate to them," she said.

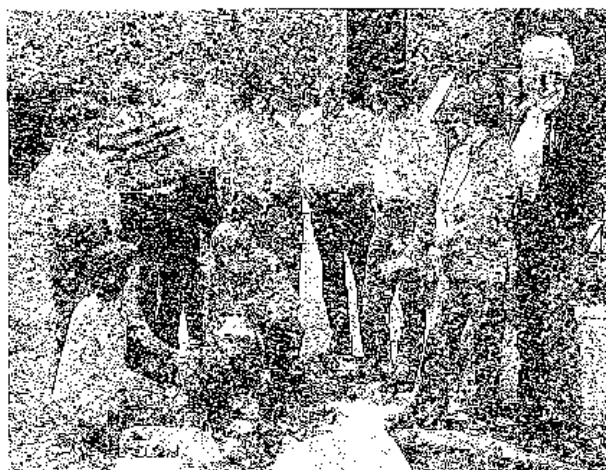
William Irwin Thompson, elaborating on some of the ideas eloquently expressed in Chapter 2, "The Metaindustrial Village," from his book, *Darkness and Scattered Light*, presented an opening lecture which set the tone for the conference. "We must understand the village as something in and of itself, not on the way to becoming a city. We need to balance communal process with architectural excellence... We must not idolize cultural peaks and ignore indigenous needs and style... but the counter culture has been swung too far the other way."

When John Todd opened the second day of the conference with a talk entitled "Ecology and Design," he suggested a value system for the development of communities seldom recognized in current design. "The biosphere needs must come first before human needs. If they don't, then any solution is short term." ... As design principles previously discussed were applied to ... specific sites, amazing ideas and images resulted. Sym Van der Ryn had said earlier, "We need images people can relate to. Then the images will create the reality."

In the summer of 1978, Margaret Mead urged the Todds to get on with the task of developing images of the village as a solar ecology, saying that there was little time to waste if the human community was to have genuine alternatives to the dubious atom. Meeting in the wake of the Three-Mile [Island] Nuclear Power Plant Accident in an area where 35% of the electricity is provided by nuclear power plants, participants felt a special urgency and sense of important mission to make their images, their vision, into reality.



Dana Jackson



Name these first Prairie Festival attendees! Answer on page 49.

October 21-23, 1978. Amory Lovins visits The Land Institute and a "Soft Energy Paths" conference in Salina.

Fall, 1978. The Land Institute's first barrel composting toilet is installed. In 1983, it is refurbished and christened "World Headquarters."

December, 1978. Wes Jackson's article "The Search for a Sustainable Agriculture" is published in the *Friends of the Earth* journal *Not Man Apart*.

Energy from the Land

Charles Washburn

Number 8, Fall 1979

[W]e can't ...easily imagine meeting our transportation energy demand with "fuels from the land." We can imag-



Charles Washburn and John Craft

ine meeting high levels of heat and electrical energy use by covering our buildings and some land, not needed for crop production, with solar collectors. But if we're going to even consider producing portable liquid and

gaseous fuels from the land, we must carefully look at the scale of our transportation energy demand, the potential of the land to "grow fuel," other needs for productive land, and the impact of "growing fuel" on the land.

First of all, it's plainly impossible to contemplate powering our current transportation system, or even one remotely resembling it, from the land. Our transportation system directly consumes twenty million billion Btu's of fuel energy each year. If every acre of the coterminous U.S. land area—including cities, deserts, and mountains—were devoted to fuel production and could produce it at a rate equal to that of a ninety bushel acre corn field, the total alcohol yield would just about equal our transportation fuel use.

So the question of meeting all our current transportation energy "needs" from the land can be clearly answered. But what if we're willing to mentally change both our transportation system and our approach to gaining liquid fuels from the land? What kind of transportation system could be fueled from the land which is not needed for food production and that could be safely "cropped" ...? At this time only some rough outlines of the potential supplies are possible.... If the urban, agricultural and forestry wastes which are readily collectable are used together with the agricultural products from "surplus" land to produce transportation fuels, the net energy available will be from 1/20 to 1/10 that now consumed by our transportation system.

[W]e're sure to hear more about biomass-derived fuels in the years ahead. The country may jump into a crash program to make liquid and gaseous fuels from coal, but even if successful, our coal can provide only a short diversion between our unsustainable, petroleum-based society and some future society based on sustainable energy sources. ...This time could be further shortened if concerns about rising atmospheric CO₂, acid rain from coal

burning, land destruction, or diversion of scarce western water supplies to synthetic fuels production become more important political issues in the U.S., i.e., if people choose the land over the car. The American experience with nuclear power has at least pretty well defined the unresolvable uncertainties associated with its use; there is little reason to believe that the uncertainties associated with synthetic fuel from coal or shale will be fewer.

When the coal boom has ended, people will once again be asking how much liquid fuel can come from the land. I can't but wonder to what extent the productivity of the American soil will have been further eroded by that time. The study of America's energy problems has repeatedly shown us that our consumption level is incompatible with sustainable production of fossil fuels; analysis of the bio-fuels potential shows that our consumption level is incompatible with sustainable production from the land.

What is a Renewable Resource?

Mari Peterson

Number 10,
Summer 1980

Advocates of massive alcohol fuels policies ...are taking a shallow, short-term approach to understanding what a renewable resource is. If

alcohol from biomass is to be a renewable resource..., then it must be a sustainable system over indefinite periods of time. To qualify as renewable the intensive plant production and resource utilization cannot exceed the replenishing capacities of the soil. It is the renewing capabilities of the soil which make the production of plants a renewable resource. But we are already aware that soils are not being replenished as fast as they are being washed away and depleted of nutrients. A more intense and less diverse agricultural system will do nothing to alleviate this problem. Small-scale, on-farm production of alcohol fuels for farm use in conjunction with a perennial polyculture agricultural system may indeed be sustainable.

We need people ...to devise truly renewable systems to sustain our transportation network. Perhaps this may be a hydrogen-based transportation economy with hydrogen produced through photovoltaic cells rather than an alcohol fuels system. In the meantime, dollar for dollar (or pound of soil for pound of soil), conservation is the best resource to tap.



Mari (Peterson) Detrixhe

1979

Spring, 1979. The "Indian House" is completed. "The original intent of this Indian House Project was to construct a shelter made only from local materials. When asked why he decided not to continue with local materials only, Wes replied, 'We failed. We aren't smart enough to live in a third world country.'"

June, 1979. Dr. Charles Washburn, Professor of Engineering at California State University, Sacramento, teaches an energy course at The Land Institute.

Living Nets in a New Prairie Sea

Wes Jackson

Number 11, Summer 1980

The difference between a wheat field and the prairie is clear to scientist and artist alike. For the scientist, the first considerations are biological and involve the most rock-bottom basics of ecology. The artist picks up the reflections of these differences in ensemble, emphasizing the aesthetic level. But it isn't just the scientist or the artist, or for that matter the conservationist, who has exclusive rights for judgment, for anyone who goes beyond the superficial to sense the profoundness inherent in these differences between farm fields and the ancient grassland knows two things. The first is that the prairie builds and protects soil, while agriculture erodes and wears it out. The second is that the future of the human experiment depends not only on our collective understanding of these basics, but on our caring enough to make the necessary choices to develop a truly sustainable agriculture.

What are these differences from an ecological point of view? Most obvious, perhaps, is the fact that the prairie emphasizes a mixture of plants or, as the ecologist would say, polyculture. The human, over most of the landscape, struggles to maintain monocultures. The next most obvious fact is that the prairie features perennial plants while agriculture features annuals. For the prairie, at least, the key to this last condition resides in the roots. Though the above-ground parts of the prairie's perennials may die back each year, the roots are immortal. For whether those sun-cured leaves, passed over by the buffalo in the fall migration, go quickly in the lightning-started prairie fire or, as more often the case, burn through the "slow, smokeless fires of decay," the roots hold fast what they have earned from rock and subsoil. Whichever way these top parts burn, with smoke or without, the perennial roots will soon catch and save most of the briefly-free nutrients for a living future. And so an alliance of soil and perennial root, well-adapted to the task of blotting up a drenching rain, reincarnates last year's growth.

Soil still runs to the sea in nature's system, as in the beginning before land plants appeared, but gravity's influence can't compete with the holding power of the living net and the nutrient recharge managed by nosing roots of Dalea, Pasqueflower and Bluestem.

Species diversity breeds dependable chemistry. This above-ground diversity has a multiplier effect on the kinds of seldom-seen teeming diversity below. Bacteria, fungi, and invertebrates live out their lives reproducing by the power of sun-sponsored photons captured in the green molecular traps set above. If we could adjust our eyes to a power beyond that of the electron microscope,

our minds would reel in a seemingly surrealistic universe of exchanging ions where water molecules dominate and where colloidal clay plates are held in position by organic thread molecules important in a larger purpose, but regarded as just another meal by innumerable microscopic invertebrates. The action begins when roots decay and above-ground residues break down and the released nutrients begin their downward tumble through soil catacombs to start all over again. And we who stand above in thoughtful examination, all the while smelling and rolling fresh dirt between our fingers and thumbs, distill these myriads of action into one concept—soil health or balance—and leave it at that.

Agriculture coasts on the accumulated principle and interest hard-earned by nature's life forms over those millions of years of adjustment to dryness, fire and grinding ice. Lately agriculture has been coasting on the sunlight trapped by floras long extinct. We pump it, process it, and transport it over the countryside as chemicals, and inject it into our wasting fields as chemotherapy. Then we watch the fields respond with an unsurpassed vigor, and we feel informed on the subject of agronomics. That we can feed billions is less a sign of nature's renewable bounty and our knowledge and more a sign of her forgiveness and our discount of the future. For how opposite could the annual condition in monoculture be from what nature prefers? Root and above-ground parts alike die every year, so through much of the calendar the mechanical grip on the soil must rely on death rather than life.

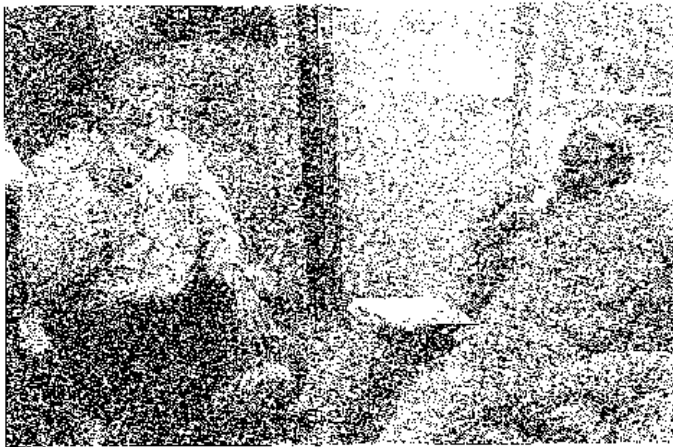
Mechanical disturbance, powered by an ancient flora, imposed by a mined metal, may make weed control effective, but the farm far from weatherproof. In the course of it all, soil compacts, crumb structure declines, soil porosity decreases and the wick effect for pulling moisture down diminishes. Monoculture means a decline in the range of invertebrate and microbial forms. Microbial specialists with narrow enzyme systems make such specific demands that just any old crop won't do. We do manage some diversity through crop rotation, but from the point of view of various microbes, it is probably a poor substitute



June 2-3, 1979. The first Prairie Festival, "Prairie Roots, Human Roots: the Ground of our Culture and Agriculture," is held. It is organized by Jim Peterson and Terry Evans. The featured speakers include Amory Lovins, David Brower, Steven Hind and Harley Elliott.

Summer, 1979. Salina photographer Terry Evans becomes the Land Institute Arts Associate.

Fall, 1979. Over 80 people attend the Land Institute's first annual Fall Visitors' Day open house.



Wes cracks Wendell Berry up

for the greater diversity which was always there on the prairie. Monoculture means that botanical and hence chemical diversity above ground is also absent, which invites epidemics of pathogens or epidemic grazing by insect populations which can spend most of their respiratory energy reproducing, eating and growing. Insects are better controlled if they are forced to spend a good portion of their energy budget buzzing around hunting, among many species in a polyculture, for the plants they evolved to eat.

Some of the activity found in the pre-turned sod can be found in the human-managed fields, but the plowing sharply reduced many of these soil qualities. Had too much been destroyed, of course, we would not have food today. But then who can say our great grandchildren will have it in 2080? It is hard to quantify exactly what happened when the heart of America was ripped open, but when the shear made its zipper-sound, the wisdom the prairie had accumulated over the millions of years was forgotten in favor of the simpler, more human-directed system.

So where does all this leave us? Is there any possible return to a system that is at once self-renewing like the prairie or forest and yet capable of supporting the current and expanding human population? I think there is.

Much scientific knowledge and narrow technical application has contributed to the modern agricultural problem. Nevertheless, because of advances in biology over the last half-century, I think we have the opportunity to develop a truly sustainable agriculture based on the polyculture of perennials. This would be an agriculture in which soil erosion is so small that it is detectable only by the most sophisticated equipment, an agriculture that is chemical-free or nearly so, and certainly an agriculture that is scarcely demanding of fossil fuel. We are fortunate in this country to have a large and sophisticated biological research establishment and the know-how to develop high-yielding, seed-producing polycultures out of some of our

wild species. It is a bio-technical fix proposed here, and of course is not the entire answer to the total agricultural problem, much of which involves not only a different socio-economic and political posture, but a religious dimension as well. Breeding new crops from native plants selected from nature's abundance and simulating the pre-settlement botanical complexity of a region should make it easier for us to solve many agricultural problems.

As civilizations have flourished, many upland landscapes which supported them have died, and desert and mudflat wastelands have developed. But as it happened, civilizations passed on accumulated knowledge, and we can say without exaggeration that these wastelands are the price paid for the accumulated knowledge. In our century this knowledge has grown enormously, and on the balance it seems arrogant to ignore it, for this knowledge has restorative potential. The goal to develop a truly sustainable food supply could start a trend exactly opposite that which we have followed on the globe since we stepped onto the agricultural treadmill some ten millennia ago.

Aldo Leopold lamented that "no living man will see the long-grass prairie, where a sea of prairie flowers lapped at the stirrups of the pioneer." Many share his lament, for what is left are prairie islands, far too small to be counted as a "sea." Essentially all this vast region, a

million square miles, was turned under to make our corn belt and bread basket. But now the grandchildren of pioneers have the opportunity to establish a new sea of perennial prairie flowers, the product of accumulated scientific knowledge, their own cleverness, and the wisdom of the prairie.



Marty with Zea diploperennis in Mexico

January, 1980. Marty Bender joins an expedition (led by Hugh Hltis of the University of Wisconsin) to Mexico to visit sites of *Zea diploperennis*, a perennial relative of corn.

Spring, 1980. Marty Bender extends earlier experimental plantings by establishing the prairie herbarium featuring "perennial native and naturalized grasses and wild flowers of the prairie states," for research and education.

May 31-June 1, 1980. The 2nd Prairie Festival features John Todd of the New Alchemy Institute.

1980

The Land Purchases 160 Acres

Wes and Dana Jackson

Number 15, Winter 1982

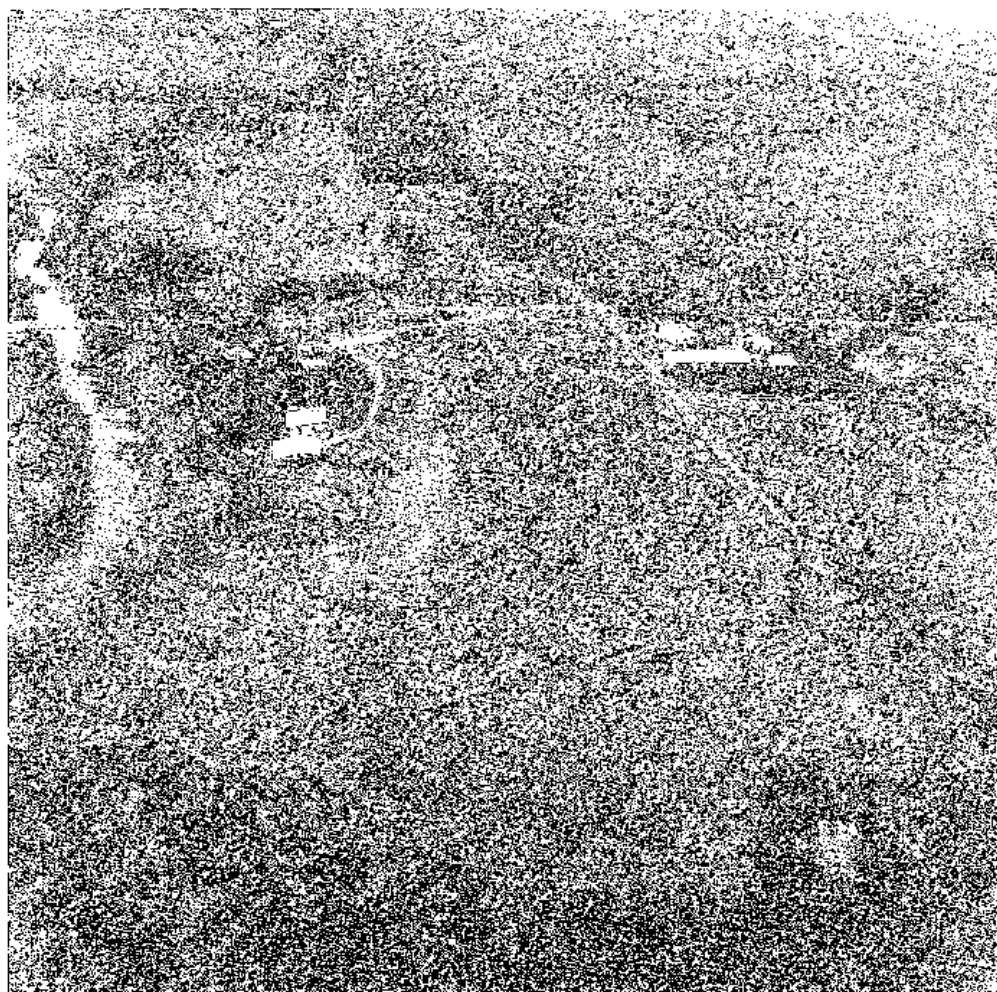
At a special meeting on January 10, the Board of Directors of The Land Institute approved a proposal to organize a fund drive to buy land owned by Mr. Edward Sudendorf II. Early in February, Mr. Sudendorf agreed to sell us 160 acres nearly adjacent to The Land, which included 68.5 cultivated acres, approximately 80 acres in pasture, and the balance in trees and wildlife habitat. Were it not for the county road, the southwest corner of this property would touch our northeast corner.

[W]ith only 28 acres where we are now (property owned by the Jacksons), The Land Institute is limited if we want to do agricultural research. We are soon to reach a point where we need to expand some experiments to the field level. This is probably our last best chance to obtain land nearby.

Some economically feasible examples of the type of agriculture we are researching will be essential in the future. It is not good enough to simply talk about peren-



Robert Rodale, John Haberern and Richard Harwood visit from Rodale Institute



The Land Institute, late 1980s. The original site is at left, the Krehbiel house and greenhouse at right, and the "160" with research plots at the upper right.

nial polyculture; we want to try it, and we will need land to do so. Someday we would like to put together a "Sunshine Farm," one which relies on the sun's energy for almost all operations. This would mean not just solar and wind equipment and conservation building design, but solar-powered field operations, whether that be draft horses, or tractors running on methanol or a vegetable oil-based diesel fuel. The crop mixes on sloping soil would be less demanding of fuel, which makes this more feasible than it would be with conventional monocultures.

And so we are entering a new era...

August, 1980. *New Roots for Agriculture*, by Wes Jackson, is published.

August 29, 1980. "The tail to the Wincharger lay by the base of the tower, and two blades were screwed into the board fence north of the garden after a wind storm on August 29. We reasoned that a twister had torn off the tail, which kept it out of the wind, and the blades began spinning so fast that one flew off and the shaft broke, sending the other two to the ground. We have never found one of the blades."

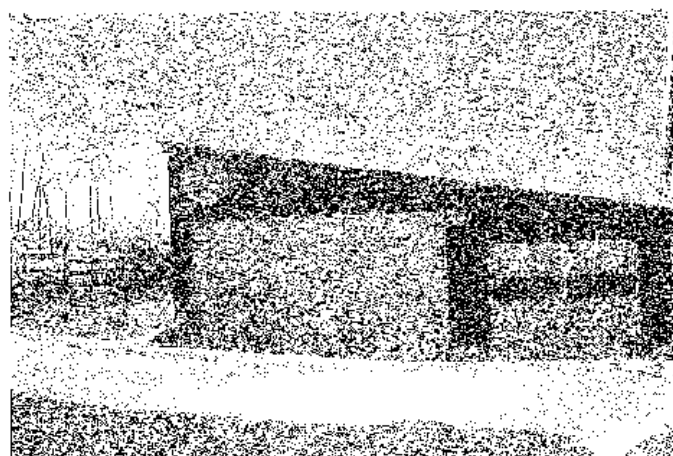
Gardening—A Winter Perspective

Dana Jackson

Number 18, Spring 1983

January isn't too early to begin thinking about the garden at The Land. I always check the seed left over from last year, review the old order sheet and any notes on germination or pest problems in the garden notebook, and then mentally picture the garden space available to make tentative planting diagrams. By that time, it's February and I order the seeds.

We usually plant standard hybrids sold by the well-known seed companies in the Midwest. When we first started gardening here in the summer of 1974 before The Land Institute existed, we weren't beginning a hobby. We needed to grow as much of our food as possible to support the family, and we were relatively inexperienced, so we chose varieties with disease and heat resistance. Someday, we may obtain some of the more specialized, older varieties and save our own seed, but up to this point we have not wanted to add another task to the work of gardening. However, I am bothered by the fact that I.T.T. owns Burpee Seed Company, and that Union Carbide owns Ferry Morse, and don't like supporting the corporate giants whose vertical integration in our food system works to the disadvantage of small farmers in this country.



The red barn in winter

For nine years, the Jacksons have grown vegetables in a large organic garden, freezing, canning, and drying them for the winter. Although in the beginning the garden was clearly a family project, it has also become part of The Land Institute. People expect to see an organic garden when they visit here. We have always shared abundant produce with summer employees and have, of course, allowed them to do any weed pulling they wish!

In the spring of 1982, Dana McCain, a student, helped every afternoon, and we grew enough lettuce, spinach, radishes, onions, and snow peas for all the students to harvest as much as they wanted. With our new 43 week program, there will be students at The Land over the summer to share the garden, so we will expand it and involve all the students in planting and tending it.

Each year there is a garden plan sketched out in a notebook. We never grow a crop in the same area two years in a row and don't follow a vegetable like cabbage with relative, such as turnips or broccoli. I've learned to group the beds and short rows together, and plant the long rows of corn, potatoes, and beans in one area so we can make easy turns with the rototiller. The herb bed and all the perennials, except raspberries, are located in the south end of the garden now.

How the garden looks is important. We design the salad beds to enjoy the stripes of onions, radishes, red let-



Linda Okeson checks the mail

1980. The Land Institute speaks out against proposals to divert water from the Missouri River to recharge the Ogallala Aquifer.

December 18, 1980. Wendell Berry makes his first visit to The Land Institute to interview Wes Jackson for *New Farm*, and to speak on the human need to find the right balance between what is wild and what is domestic in ourselves.

lucce, dark green spinach, and various shades of lighter green lettuce. The snow peas have lovely pink blossoms, and the luxuriant beet leaves and lacy carrot leaves make appealing arrangements when planted in the beds.

We have always planted marigolds in the peppers and eggplants, and they are brilliant until frost. Last summer we also planted borage around the beets, carrots and onions, and this summer we'll put it with squash and cucumbers. Bees are attracted to the blue flowers, and this should help attract them to the cucurbits for better pollination.

Each year there are new problems in the garden and new successes. Each year some crop fails and some crop succeeds beyond our expectations. We do learn from experience. This year we will harvest the onions earlier and dry them more thoroughly. We will plant more white clover, not yellow clover, to compete in gardenside spaces with the bindweed. We learned that bindweed climbs up the yellow clover and blooms profusely at the top of the plant. I'm going to make sure that okra gets full sun and is planted in east-west rows if possible. I'm going to devise a better staking system for the bushy Roma tomatoes. A list of good intentions could continue for an entire page!

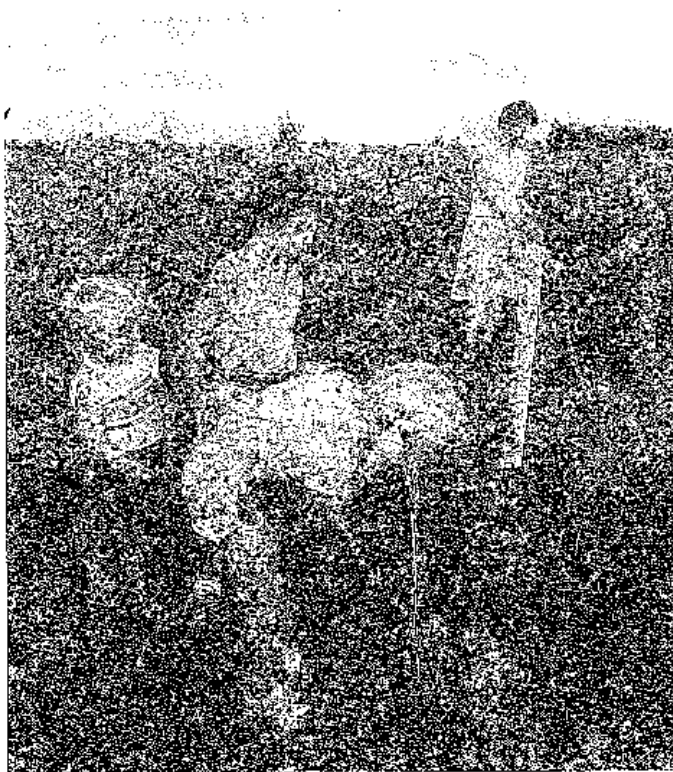
One of the best things about the garden is how simple it makes meal planning. An hour before lunch or dinner,



Balloonists overlook 1983 Prairie Festival

I walk through the garden, pick what is abundant or what is mature and must be harvested, and plan the meal around those vegetables. Often we eat as many as ten different vegetables at one meal. Generally there is variety because we don't always prepare the same combinations or the same recipes.

The third weekend in February, I went shopping for a cheap pair of running shoes to wear when working in the garden. What interesting conversations the salespeople and I had! We exchanged information about plant varieties, tools, pest control and food preservation. No one mentioned the first look at the strawberry bed after a hail storm, or the feeling at 9:00 P.M. when the bushel of cucumbers is delivered to the kitchen for canning, or the moment of formal surrender to the squash bugs in the zucchini. From a winter perspective, gardening is pure golden—green warmth and joy!

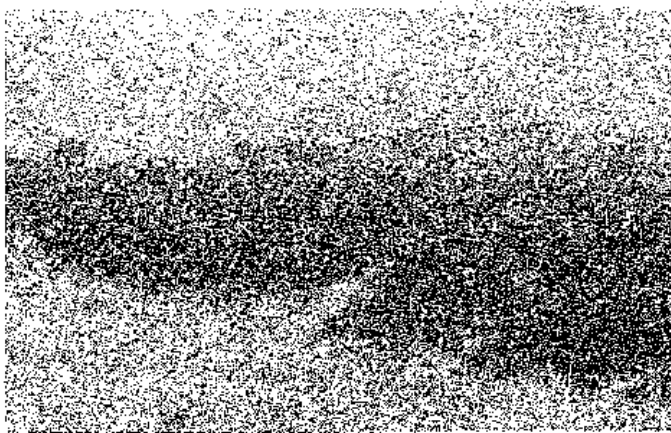


1981

March, 1981. The old wooden bridge on Water Well Road over the Smoky Hill River beside The Land Institute is brought down by a truck carrying a backhoe. A new concrete bridge is not completed until 1984.

Spring, 1981. The kitchen in the classroom building is installed by Annie Ronsse.

May 30-31, 1981. The 3rd Prairie Festival, "Diversity," features Alan and Joan Gussow, Gus Speth, Dwight Platt, and William Irwin Thompson as speakers.



The neighbor's bison watch a prairie burn on the 160

Under the Line of Fire

Wes Jackson

Number 18, Spring 1983

A few years ago, Dana and I attended a conference in Oakland, California, organized around the theme "Technology: Over the Invisible Line." Those who attended had many interesting ideas about the good and bad sides of different kinds of technology.... I kept bringing up the subject of grass fires set by Native Americans to drive or lure game in the Great Plains and Midwest. I thought this was a most important beginning point for those of us looking for that invisible line, for here were some people using grass fire technology... with no apparent damage to the long-term ability of the land to support a variety of life and Indian culture.

The settlers who were to follow put the plow to the same prairie, and with no flames in sight, "burned" more options for future generations with one turn of the sod than the first discoverers of America had "burned" during the 15,000 years or so that they had inhabited the land. Shortly after this initial plowing, a full third of the energy-rich carbon molecules present in the soil of the old prairie disappeared. Some molecules sponsored the high yields in the first few years of plantings, some quickly oxidized and burned, and billions of tons blew and washed away.

Energy-rich carbon molecules above ground are young. They represent contemporary energy, for most of them are probably less than a decade old. Below ground energy-rich carbon molecules are

older, averaging in the decades or maybe even hundreds of years. Much of our agriculture has been built on mining them. When the settler arrived, his plowing amounted to a Promethean theft of this "older fire" (still packaged in chemical energy). Though most of it was wasted, it was the theft of this "fire" which made civilization possible in a place in which the cultural level of human organization had been good enough for millennia. ...At this early stage in our history, technology had already moved over the invisible line.

The use of the draft animal to plow and thereby mine and waste "non-contemporary" solar energy from below the surface was a faint foreshadow of the fossil fuel epoch which was to come. The Promethean urge, which had sparked the imaginations of these settlers, burst into a roaring flame to meet the demands of their children, demands which caused them to reach farther into the past for energy-rich carbon, the dead plant material whose age is measured in the hundreds of millions of years.

And now we eye an even older energy package with no assurance that we will use it any more wisely than we have used the packages of fire we have already stolen. These are the fires of ultimate destruction, the fires which were put there during the origin of the universe itself, fires whose age is measured in the billions of years. We have been given no more authority to split the atom—to have access to these ancient fires—than we were given to destroy the American wilderness. Both arise out of the Promethean impulse, the impulse which causes us to steal non-contemporary energy which results in what we call civilization.

The Promethean urge was given its first foothold with till agriculture. Non-contemporary energy in the carbon molecules of the soil fueled this impulse, and the face of the earth was changed—in geologic time—overnight. Philosophers and thinkers on the origin and nature of the human condition ultimately talk about the split between the human and nature, and we have come to accept it as an inevitability. I don't think we have to... [A]t The Land we have chosen to begin with agriculture where the split began.... We want to see if we can breed a vegetative structure which has its ancestry in the

old prairie, an agriculture which runs on "contemporary energy" again, in which our harvest is mostly from above the surface rather than out of a soil mine or a fossil wellhead, or out of a reactor core. I imagine that one of our main management tools will be fire, visible lines of fire, controlled domestic prairie fires. Contemporary energy equals non-Promethean energy equals a technology on the correct side of the invisible line.



The demolished bridge, with the truck and backhoe that brought it down.

Fall, 1981. A 500 watt Wincharger is installed next to the Indian House. In 1996 it is the only wind generator still standing at The Land Institute, although not in use.

October 1, 1981. The Land Institute and other local organizations sponsor a Salina Energy Fair "to provide information about low-cost conservation and solar options, and to demonstrate specific technologies which are available commercially."

Solar-Powered Amish Farms

Wes Jackson

Number 19, Summer 1983

For five days during the last half of July, I traveled among the Amish farms in northeastern Ohio and Lancaster County, Pennsylvania. ...Marty Bender, my son Scott and I joined the Ohio tour sponsored by the Draft Horse and Mule Association the first few days; and when that was over, I continued on to Lancaster County Amish country with writer and farmer Wendell Berry, [and] Maurice Tellegen, the editor of the Draft Horse Journal.

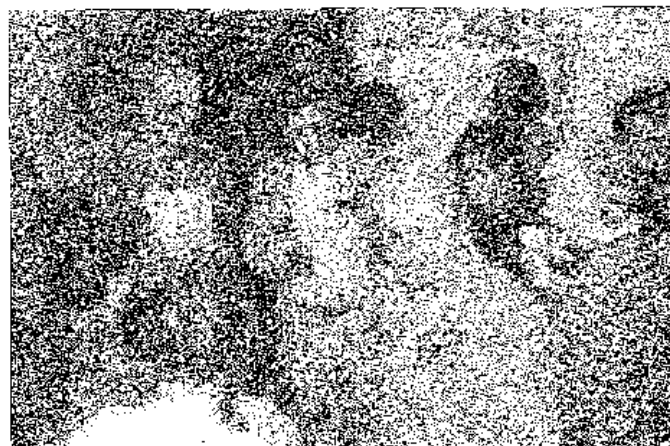
The three of us from The Land went on this trip because we wanted to know about the practicality of farming with muscle power in an oil-less future. We have a long-range goal at The Land to work toward a sun-powered farm on the 160 acres. Marty Bender and I had published a study of the energy costs of a draft animal-powered farm versus a tractor-powered farm and had concluded that the muscle-powered farm uses less energy. But paper studies never tell the whole story, and we wanted to know more. What we saw convinced me, from several angles, that a biological approach which depends on muscle power is more inherently right for a sustainable agriculture than one which depends on fossil-fueled machinery.

Probably the first lesson to be learned if we are serious about a solar-powered agriculture using the conven-



Marty in the classroom-building greenhouse

tional crops, is how many people will be necessary to properly care for the land. Almost everywhere we looked, we saw lots of busy people. ...Had we driven all the way [to Ohio] from Salina, it would have required nearly two days ...on a transect through the prime agricultural land of our country. My guess is that ...we would have seen fewer people at work in agriculture than we saw in a comparable amount of time in the Amish countryside.



Wendell Berry with Friends of the Land, 1984. The ever-helpful Charlie and Ivy Marsh are in the right foreground, founding board member Sam Evans at far right, poet Harley Elliott by the fridge, talking with Ann Zimmerman.

Among all U.S. farming communities, the Amish must rank at the top as far as the percentage of their total farm activity which is run on sunlight. Most proponents of nuclear power are forever reminding us how bleak it is all going to be if we don't put large amounts of energy to work for us. But the hard-working Amish seemed content and prosperous. They moved quickly, but not in a manic rush to get things done. It was good to see them all move at a comfortable pace.

Of course, the Amish can prosper partly because they are able to avoid many of the costs which conventional farmers have to pay. They avoid the high capital costs for large, expensive equipment and for fuel. Their water flows downhill from a spring or is pumped by the wind, instead of by electric or gasoline pumps. Amish fire insurance is direct. If a barn burns down, it is often rebuilt by the members of the church community in one day, with wood provided by one of their sawmills. They don't have to set money aside for retirement. When parents get old, they move into smaller quarters on the farm and are provided for.

During the entire trip I observed more "appropriate technology" than I have ever seen since the A.T. movement began. I saw more of an application of a land ethic than I have seen anywhere else in the U.S. I saw more examples of "small is beautiful" in three counties than I have seen in three hundred counties across this land. Yet I never heard any of these phrases which are in the terminology of the alternatives movement.

After traveling in Ohio and Pennsylvania, I have wondered what would happen if every community could attract an Amish settlement. In a world with a shrinking energy pie, an Amish settlement would be an asset as a model of how to save the land and run agriculture and culture on sunlight.

1982

Spring, 1982. The Land Institute purchases a 160 acre quarter-section across the road. The plant breeding program is greatly expanded on the new land. 4,000 accessions of wild perennial grasses are planted out.

March 23, 1982. Joan Stone and her troupe dance "Grass Variations" in Salina, followed by a slide presentation of Terry Evans' prairie images. "'Imitate us until you learn our dance,' say the grasses ...What motions do grass and human bodies have in common?" - Joan Stone

Walking Across the Tallgrass Prairie

Kelly Kindscher

Number 21, Summer 1984

We reached Horsethief Canyon [at Kanopolis Reservoir in central Kansas] on the 25th day of our trans-prairie walk, when the 1983 Prairie Festival was already in progress. I had wanted to attend the event, but it was four and one-half days away with my walk-time perspective. Car travel, even to the Land Institute, was ruled out, as I had not been in one, nor had any desire to be, since the walk began.

The Horsethief Canyon area is one of the farthest west places in Kansas where big

bluestem and other tall grasses grow on the top of hills, and where a considerable number of hardwood trees can be found in the ravines. Walking west along the north side of the reservoir, I noticed that there were bur oak, red elm, Kentucky coffee, ash and hackberry trees.

On the northwest side of the reservoir I came to see what I could consider to be the last significant forest island. Here beneath some bluffs, where I had come to visit some mystical Indian petroglyphs, was a long band of bur oak trees, and underneath them was a woodland wildflower called green dragon. Green dragon is a relative of jack-in-the-pulpit and its flower, actually its spathe and spadix, resemble a dragon's head and tongue, and its five-parted leaves resemble a dragon's clawed toes and fingers.

According to Janet Bare in *Wildflowers and Weeds in Kansas*, green dragon is found in the eastern third of Kansas in moist, rich woods and mostly in wetter ground than jack-in-the-pulpit. Here it was located in central Kansas, not just one plant, but dozens, creating a large colony. The furthest west location I had previously



Kelly Kindscher, 1985 Prairie Festival

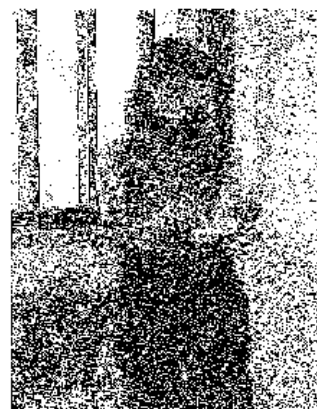
known for this plant was Marty Bender's find of a single plant in the woods at The Land Institute immediately above the Smoky Hill River. However, the *Atlas of the Flora of the Great Plains* does show Ellsworth county as its westernmost location.

Wildflowers and edible plants enhance the specialness of the Kanopolis Reservoir area. Green dragon has a root (actually a corm) that is edible if cooked. In the raw state, it is considered poisonous because there is so much calcium oxalate in it that when one bites into it, it seems to bite back twice as hard and then chew for awhile. The pullet egg-sized roots are good when cooked and known to have been eaten by Indians.

Waldo Wedel, in his *Introduction to Kansas Archeology*, notes that there was an Indian village site located across the creek from these oaks and green dragon plants. Because this plant is well west of the major part of its range, is growing in a large colony, and was the only woodland wildflower present, I believe that there is a strong possibility that it was originally established by some Indian women who were well aware of the plant's edibility and ecological requirements and decided to plant it here in the sandy soil and leaf mold for future harvesting.

Walking west from this area, we left the last significant forest island with the last species of woodland wildflower that I was to encounter until the foothills of the Rockies. Even though there is a possibility that this last woodland wildflower may have been planted here by some people who recognized its food value, it is filling its proper ecological niche and has withstood the test of time, proving that it is adapted to be in this locality.

After I left the Kanopolis Reservoir behind and ventured into the mid-grass and then the short-grass prairie further west, I began to appreciate the perspective I had gained of the Tallgrass Prairie. This a diverse and unique region and it takes time to explore it. My walk across "the floor of the sky" enabled me to become more familiar with the plants and begin to understand the rhythms and ecological relationships of the Tallgrass Prairie.



Terry Evans

May 29-30, 1982. The 4th Prairie Festival, "Resettling America," features Wendell Berry and Donald Worster.

Summer, 1982. *Kansas Energy: A Resource Guide for Community Action*, by Mari Peterson and Diane Tegmeier is published. This is a joint project of Energy for Rural Self-Reliance, the Kansas Natural Resources Council, and The Land Institute.

More Wind Energy Experiences

John Craft

Number 21, Summer 1984

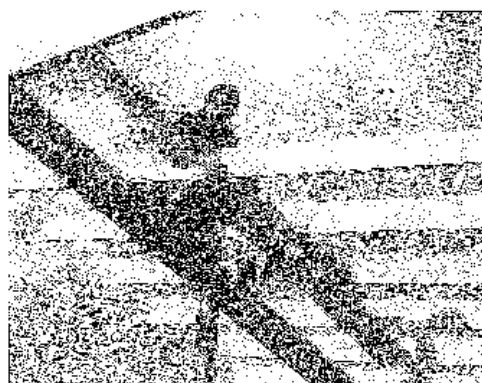
On February 22, the experimental downwind electric generating unit, which I designed and installed on a 90 foot tower at The Land, failed and plunged to the ground. The machine was an experiment to test several innovations in rotor and induction generator controls. I had installed it during Thanksgiving vacation after testing it for only one week.

The failure was caused by a chain of events, originating with oil leakage from stripped-out threads in a gearbox bracket mounting and culminating by an apparent binding of the rotor-governing machine. The failure occurred in gusty winds of 20-30 miles per hour as Wes Jackson was manually shutting it down. Instead of coming to a stop, the rotor oversped and the machine ran out of control for about an hour and a half. Eventually the 1/4 inch blade shaft fatigued, and one blade came off. The resulting violent vibration caused the failure of the yaw bearing housings, and the entire unit fell, landing 510 feet from the base of the tower. One of the blades fell by a telephone pole, and the other shattered into pieces along the road. No persons were hurt; no property was damaged. The unit itself was totally destroyed.

The 90 foot tower stayed empty until May 21, 1984, when I bolted an induction generator with rotors 15.5 feet in diameter at its top. ...Windcraft 3500... is expected to produce 500 Kwhrs each month on the average and is interconnected with the Kansas Power and Light Company's utility lines that serve The Land Institute.

The 32 volt DC 2500 watt Jacobs Wind Plant has not proven to be the trouble-free machine its near legendary reputation suggests. The review of previous Land Reports would give the reader a peek at about half of the problems actually experienced.

The basic design of the old Jacobs unit appears solid, and probably worthy of its reputation as being the "Cadillac" of the old wind plants. One must remember that the unit at The Land was manufactured in the 1930's, remained in operation until the late 1950's, and was abandoned on a tower top until the late 1970's. It has been in operation at The Land for seven years. Although many parts have been repaired or replaced, it is still an aged piece of machinery. Even old Cadillacs require maintenance.



Weeden Nichols

Wind Machines Crippled

Weeden Nichols

Number 24, Summer 1985

On June 21st, ...South Salina and environs experienced a "downburst storm." Many residents swore it was a tornado, though no funnels were sighted. ...The Land experienced negligible damage to trees and buildings at ground level, but extensive damage to the 1933 Jacobs and 1984 Windcraft wind-powered electrical generators, high on their respective towers. ...[B]oth machines were struck so suddenly by winds of such high velocity that neither could protect itself. The Jacobs, due to the great centrifugal force generated by the sudden violent motion of the blades, threw a blade shaft

completely through the cast governor housing. When the Windcraft was struck by the same violent onslaught of wind, two out of three of its tough Sitka spruce blades were destroyed, apparently by striking the tower while bent backward by the wind. The aluminum cowl covering the generator itself and some of the

electronics and associated gear was popped open, and such items as large electrical capacitors spread over a wide area.

We are still committed to renewable energy sources, even if we received a blow to the economic feasibility.



Raising the barn poles

1983

February, 1983. The new 10-month agricultural internship program begins. Intern experiments are added to the agricultural research program. Experiments in shelter and energy become less prominent. "We abandoned the traditional semester calendar and oriented our academic calendar to the growing season." - Wes Jackson

May 28-29, 1983. The 5th Prairie Festival, "Food and Peace," features David and Joan Ehrenfeld, and Frances Moore Lappé.

Prairie Birthday

Dana Jackson

Number 24, Summer 1985

Every July I watch eagerly a certain country graveyard that I pass in driving to and from my farm. It is time for a prairie birthday, and in one corner of this graveyard lives a surviving celebrant of that once important event.

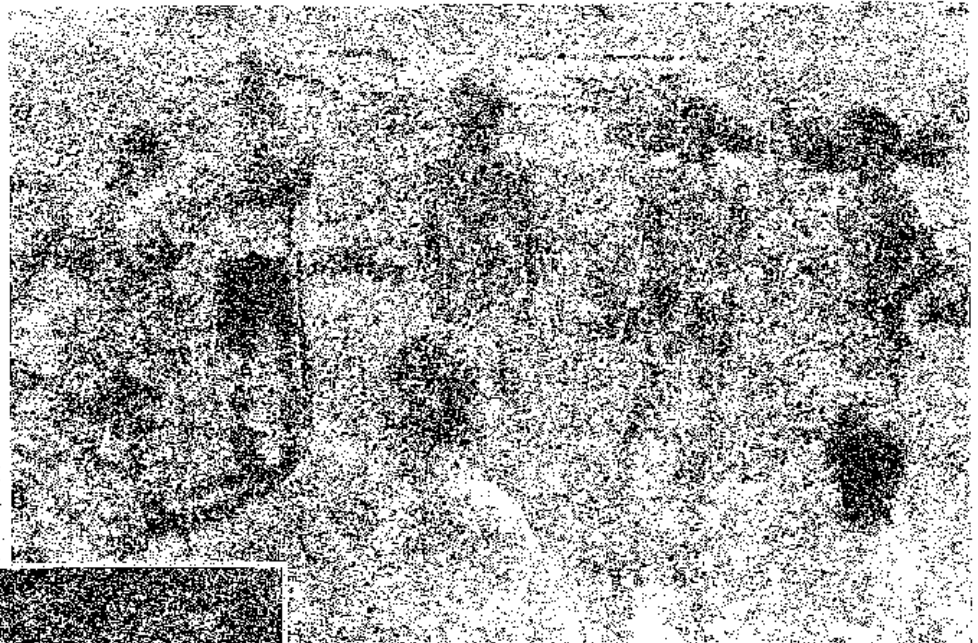
It is an ordinary graveyard, bordered by the usual spruces, and studded with the usual pink granite or white marble headstones, each with the usual Sunday bouquet of red or pink geraniums. It is extraordinary only in being triangular instead of square, and in harboring, within the sharp angle of its fence, a pinpoint remnant of the native prairie on which the graveyard was established in the 1840's. Heretofore unreachable by scythe or hand mower, this yard-square relic of original Wisconsin gives birth, each July, to a man-high stalk of compass plant or culleaf Silphium, spangled with saucer-sized yellow blooms resembling sunflowers. It is the sole remnant of this plant along this highway, and perhaps the sole remnant in the western half of our county. What a thousand acres of Silphiums looked like when they tickled the bellies of the buffalo is a question never again to be answered, and perhaps not even asked.

This year I found the Silphium in first bloom on 24 July, a week later than usual; during the last six years the average date was 15 July.

When I passed the graveyard again on 3 August, the fence had been removed by a road crew, and the Silphium cut. It is easy now to predict the future; for a few years my Silphium will try in vain to rise above the mowing machine, and then it will die. With it will die the prairie epoch.

Aldo Leopold,
*A Sand
County
Almanac*

When Wes and I discovered several Silphium plants on the site we purchased for our home in 1970, we felt privileged and blessed. We protected these plants during our building phase, and when lawns were established beside the buildings, we mowed around the Silphium. The most prominent plant grows "man-high" in front of our classroom building, where it has little competition and some benefits from garden and grass waterings. This year it began blooming the last of June (I always mean to keep exact records as Aldo Leopold did). On July 2, we celebrated its birthday by standing around it and reading aloud what Aldo Leopold wrote about Silphium in the "July" segment of *A Sand County Almanac*.



Land Institute staff
and interns celebrate
a prairie birthday in
1985 (left) and 1987
(above)

October 19-20, 1983. Garrett Hardin visits The Land Institute.

November, 1983. John Craft installs a prototype 4 KW wind generator atop the new 85 foot tower. It fails, and is replaced by a Windcraft 3500 in early 1994.

The whole of *A Sand County Almanac* has been a constant source of inspiration and guidance since we first discovered it. When we decided to take a real vacation in the summer of 1984 and attend Shakespeare plays performed by the American Players Theater in Spring Green, Wisconsin, we noticed on the map that the Leopold shack near Baraboo, Wisconsin, was only about an hour's drive away from Spring Green. Wes wrote to Charles and Nina (Leopold) Bradley asking for permission to make a pilgrimage there. To our delight, they not only gave permission to visit the shack, but also invited us to have lunch with them at their home.

This place is more than a private home. It is actually the Bradley Study Center, the hub of research activity for the Leopold memorial Reserve. The Reserve is a 1300-acre "private landowners' cooperative venture in wildland rehabilitation and management." It was established fifteen years ago as a memorial to Aldo Leopold and is funded by private grants and donations. ...Charles and Nina Bradley have directed the research program since 1976, and they coordinate activities for graduate students in the Leopold Fellowship Program.

During our first visit in 1984, Nina and Charles told us that the Silphium, also called compass plant because of the north-south orientation of its leaves, was again growing in the Sauk Prairie Cemetery referred to in "Prairie Birthday." Five years ago, students in the Leopold Fellowship Program instigated the idea to restore compass plant to that cemetery triangle. Those in charge of the cemetery wouldn't consider it. Then three years later, after the supervisors were familiar with the passage from *A Sand County Almanac*, they agreed to the request. Nina and the students not only planted Silphium, but also *Liatrus*, lead plant, and the main prairie tall grasses, big bluestem and Indian grass. Charles gave us directions to the cemetery after the seminar at the shack on July 13, [1985] and Wes and I, with Wendell and Tanya Berry, stopped there on our way to Spring Green. Sure enough, there along an iron fence is a young Silphium, or compass plant, its leaves dependably north-south as they are in our own plants at The Land.

The Highway Department says that 100,000 cars pass yearly over this route during the three summer months when the Silphium is in bloom. In them must ride at least 100,000 people who have 'taken' what is called history, and perhaps 25,000 who have 'taken' what is called botany. Yet I doubt whether a dozen have seen the Silphium, and of these hardly one will notice its demise. If I were to tell a preacher of the



Wes with the replanted Silphium in Wisconsin, 1985

adjoining church that the road crew has been burning history books in his cemetery under the guise of mowing weeds, he would be amazed and uncomprehending. How could a weed be a book?

This is one little episode in the funeral of the native flora, which in turn is one episode in the funeral of the floras of the world. Mechanized man, oblivious of floras, is proud of his progress in cleaning up the landscape on which, willy-nilly, he must live out his days. It might be wise to prohibit at once all teaching of real botany and real history, lest some future citizen suffer qualms about the floristic price of his good life.

The young compass plant in the cemetery will not have a prairie birthday for another couple of years. But one day, motorists coming along the highway will again see the yellow flowers behind the iron fence. I wish that many would notice the Silphium and understand its historical significance as they drive by, but I doubt that they will. Yet, it is pleasant to know that the compass plant grows there again, and that the Leopold Reserve and Bradley Study Center exist to teach "real botany" and "real history."

1984

May, 1984. The solar showers are constructed in time for the 1984 Prairie Festival.

May 27-28, 1984. The 6th Prairie Festival, "Ecology and Economics," features Dwight Platt, Arnold Schultz, and Herman Daly.

June, 1984. Arnold Schultz spends two weeks as a visiting professor in "ecosystematology."

Mid-Summer Research Report

Walter Pickett

Number 24, Summer 1985

This year, the agricultural research at The Land is distinctly different from previous years. Look down from the hilltop, and our plots in the valley are lush and green. Walk down among the plots, and the plants look vigorous, productive, and uniformly spaced. The Land's research area looks as it should.



Walter Pickett

All this did not happen by accident. This year the Research Staff built on our experience in previous years. For example, when it was time to plant in 1984, we found that weevils had destroyed much of our seed, and that mold had infected other seed. Both problems lowered germination rates and gave us problems in 1984. But we learned how to properly dry the seed, then stored much of it in a freezer, so this year we generally had good seed. Even with such precautions, the interns did repeated germination tests, identified some sacks of poor seed, and discarded them.

This year there were some improvements in experiments before they were even planted in the field. First, Judy Soule calculated how many replications we needed per experiment to get significant results, assuming the same experimental error as last year. She found that we needed twice as many replications as in 1984. Orville Bidwell and Wes Barker did soil tests so we could lay out experiments in such a way that soil variation was minimized.

Two things we have already learned are that F1 Sorghum bicolor (milo) X S. halepense (Johnson grass) hybrids will survive some winters here, that Maximilian's sunflower and Eastern gamagrass can establish themselves without any weeding and produce seed in their second year.

From a mid-summer assessment, this has been an outstanding year for research. I cannot say it is the best ever, because this year's successes are built on knowledge gained both from previous successes and failures. I can say that this year is a turning point, because several experiments which we established will run from two to five years; at least one will last longer. This means that much of the time we spent in 1985 preparing the soil, testing seed germination, laying out rows, and planting can be used for other work in 1986. Even weeding will be reduced because the year-old plants will come up early and cover the ground.

What our research staff has learned about proper seed storage, tillage, and planting will be applied again next year, with further refinement.

Shop Briefing

Weeden Nichols

Number 23, Spring 1985

Our equipment is old and odd.
Please use it gently and carefully.
We wish to preserve
both you and it.

If the job cannot be done
without bellowing
roaring
vibrating
bending
binding
breaking

please stop and consult.

There must be a better way.

Please put everything away
at the end of each day.

Please do this even if you plan
to use the same item tomorrow.

This extends even unto
placing each unused nail
with its own kind.

Never simply stuff something somewhere
just to get it out of sight.

Consult the equipment man.
Then at least he knows.

Notify the equipment man
if anything goes wrong.

He may not get to it right away.

But at least he knows.

If you do not know how
to do a job to use a tool

The equipment man may
not know either.

But together you and he can
probably figure it out.

In doing our work please do not risk
your beautiful lives or bodies
on something which may not
matter tomorrow or next week.

Before you do
please consult the equipment man.

He wants to know.



Setting up a research plot on the 160

Summer, 1984. The "big barn" is constructed using recycled materials, at a cost of \$3,000.

Fall, 1984. *Meeting the Expectations of the Land: Essays in Sustainable Agriculture and Stewardship* is published. The collection is edited by Wes Jackson, Wendell Berry and Bruce Cohnan, and includes essays by Wes, Dana, Marty Bender, Wendell Berry, and Donald Worster among other "friends of the land."

Making Connections

Dana Price

Number 25, Fall 1985

As a woman involved in sustainable agriculture, I recognize a connection between my values and my work. I find that the perspective I have developed from talking with other women is grounded in values which are basic to caring for the Earth.

Feminism and sustainable agriculture are both radical movements, searching for the roots of cultural problems and attempting to base their ideas and actions on fundamental values. Many of these values, particularly nurture, community, and wholeness, are shared. To understand women's work and women's values as experienced by feminists and farm women is to find problems and ideas to struggle with on the way to sustainability.

The amount of variety of agricultural work done by women is of itself evidence that women's concerns must be part of the development of sustainable agriculture. Women's work embodies their values and problems.

Traditionally oriented toward family survival, it always includes household tasks and generally

extends to gardening, food processing, and care of small animals. But, as Joan M. Jensen writes in "The Role of Farm Women in American History" (*Agriculture and Human Values* Vol. 11, No. 1), "Women do and did almost every type of work when necessary." Women plow, plant, harvest, nurse sick animals (and people), keep finances, and contribute off-farm earnings to the farm's economy. Certain groups of women have done large amounts of field work, particularly immigrant, poor, Black, and

migrant workers. While Thomas Jefferson extolled the virtues of the (male) yeoman farmer, his farm work was done by Black slave women.

In the Third World, women's agricultural activities are critical to subsistence. But limited access to land, capital, and education threatens their ability to continue producing food. Title to most land has been transferred to men, as assumed heads of households, through resettlement schemes and land reform. Women have difficulty obtaining credit to purchase needed equipment. Extension services usually assume that men are the producers and address only the homemaking role of women.

And women represent only 19% of the world's higher level agricultural students. In Africa, where women grow 80% of the food and contribute two-thirds of all agricultural labor, they make up 17% of this student body.

In both the Third World and the U.S., industrialization has pushed sustenance into the economic margin. Women may respond by

seeking paying jobs, even doing "men's work." But with few exceptions, men do not do "women's work." In a study cited in the *New Internationalist* (No. 150), American men who felt they were contributing a fair share did 10% of the housework.

Nurture is the basis of women's traditional work. But the industrial economy, which runs on the production and consumption of excess commodities, esteems profitmaking more than homemaking. Nurturing within the



Dana Price, Martin Gurskey and Ann Zimmerman fertilize the garden

1985

May 31-June 1, The 7th Prairie Festival, "Patterns and Traditions for a Sustainable Society," features Gene Logsdon, Nancy Paddock and Gary Snyder.

June 21, 1985. A windstorm causes extensive damage to the Jacobs and Windcraft generators.

household cannot directly generate a profit. So home activities are compressed into the subordinate maintenance role of the housewife. The separation of production leads to consumerism as the household satisfies fewer of its own needs.

Nurture is concerned with health and health with sustainability. Wendell Berry emphasizes that a good farmer must also be one who nurtures. Nurture and exploitation are incompatible. Just as our society has left women the maintenance role of feeding, comforting, and cleaning up, so we have taken for granted the Earth's service in growing our food, absorbing our wastes, and covering our scars. But women and the Earth are depleted when we exploit without responsible concern for long-term sustenance. The results range from the feminization of poverty to pollution to soil erosion. Environmentalism and feminism teach that we all must nurture, and so come together.

Farm women, despite their isolation, have extended networks of support for their families and each other into community institutions. Rural women were responsible for their churches' nurturing functions, moving them toward greater concern for community welfare. They were instrumental in establishing and teaching in rural schools for little compensation. And rural women's history of political activity is extensive, as Joan Jensen relates. The first women's political conference, at Seneca Falls in 1848, was called by Quaker farm women. Rural women formed farmers' alliances and abolitionist, temperance, and suffrage organizations. They joined the Grange when it became one of the first national organizations to admit women, and moved the Populist Party to be the first to advocate female suffrage. The nation's first woman mayor was elected in a small Kansas farm town.

Like its people, a farm cannot be healthy in isolation; it requires a viable rural community for exchange of skills, products, and ideas. Associated with the current crisis in agriculture is the undermining of farm communities. Centralization, sponsored by cheap fossil energy, closes rural businesses and banks, and funnels farm income into large cities and agribusiness interests. Sustainability will depend on revitalized communities to keep resources within rural areas. These communities will be essential to the discovery and teaching of ecological methods appropriate to each area's agriculture. Without them, women's networks of support cannot exist. Nurturing and sustaining are fostered by a community of people and land. Together they reflect an underlying value of connectedness or wholeness.

The strength and challenge of any movement lies in its ability to make connections among people, ideas, actions, and cultural patterns. Women's groups have learned that "the personal is political." Similarly, the personal is ecological. The chemicals sprayed on the land are the food I eat; my consumption contributes to the eroding soil, the mined mountain, the polluted air. Only if we humans are concerned with ourselves as part of our

ecosystem can we understand how to practice sustainability. Our rejoining with the Earth means a concern for nurturing and recycling rather than extracting and dumping.

It is when I experience my connection with the Earth that I appreciate the fullness of my womanliness and my humanity. I see feminism and sustainable agriculture as complementary approaches to uniting people and the land.



Wes with Bess and Loyd Wauhob at the Wauhob Prairie dedication, 1986

Fall, 1985. The Land Institute acquires a 50 year lease and purchase option from Bess and Loyd Wauhob on 8 acres of unplowed prairie north of Water Well Road.

Fall, 1985. *The Bland Retort* is privately published by interns. It describes life at The Land Institute, which studies "primitive living at an industrial pace."

Successful Farming—Organically

Carol LaLiberte

Number 25, Fall 1985

Chemical-based agriculture began its forty year takeover of farmland in the United States at the end of World War II. John Vogelsberg, a farmer from Marshall County, Kansas, joined the wave of enthusiasm for this new trend in agriculture. Unlike most farmers, it took John only a few years to evaluate his so called "improvements" and to realize that chemical agriculture really brought him more and more costs. So John returned to the farming methods of his father and grandfather—crop rotations, small fields, and no chemical fertilizers or pesticides—and he has worked with variations on the organic theme ever since.

In the early Seventies when farmers were convinced that capital-intensive agriculture was profitable and sophisticated and were persuaded to invest in larger equipment, John continued with his time-honored farming methods and smaller equipment. Now with the onslaught of the farm debt crisis, John and his son Joe still farm organically, relatively unaffected by the crisis. All aspects considered, mindful farmers might wonder what style of farming is truly profitable and sophisticated, or if



Joe Vogelsberg, lifetime sunshine farmer

these are even the right measures by which to judge a farming system.

Like all other aspects of the Vogelsbergs' farm, the rotation is a flexible one, responding to factors such as soil fertility and marketing needs. In the same manner they deal with insects, disease and weeds. John and Joe were clear to emphasize that they do not intend to eliminate pests; rather, they maintain a tolerable level of pests, in balance with beneficial flora, and fauna. They have insects



Jim French describes the farm he runs with his wife Lisa. The Frenches are involved in numerous sustainable farming efforts in Kansas, including serving on the Sunshine Farm Advisory committee.

of all kinds, both desirable and undesirable. Most ears of corn have worms, but then so does the corn of many conventional farmers. Insects often only damage border rows, and the interior of the fields remains undamaged. There are weeds as well, but conventional farmers aren't immune to them either. The inevitable truth is that pest problems will continue whether or not farmers use pesticides.

Instead of the typical "extermination approach" to insect control, the Vogelsbergs use various cultural techniques. The red clover/alfalfa combination is a way to control alfalfa weevil. The red clover assures them of a hay crop even if the alfalfa is damaged extensively. It is also a benefit because it grows better than alfalfa on poor soil and is, therefore, good for rehabilitating fields which are in transition from conventional to organic methods....

The Vogelsbergs' crop system is also integrated with their livestock. They keep around 100 head of cattle and 200 hogs. After corn harvest, livestock glean the leftover cobs from the fields. This simple measure makes use of the entire crop and most importantly serves to spread manure directly on the fields. The cattle are mostly pasture-fed, but both the hogs and cattle are fed corn grown on the farm.

The Vogelsbergs are glad to see more universities develop research programs for integrated pest management, crop rotations and other organic methods. I was pleased to learn that more and more neighbors are interested in how the Vogelsbergs farm and are asking for information. The Vogelsbergs cannot, of course, impart their skills for proper farming, skills developed through time and commitment. However, all farmers can experiment with the principles and basic methods which they follow. Joe said he expects to see even more farmers take an interest in organic farming.

1986

May 31-June 1, 1986. The 8th Prairie Festival, "Soils and Seeds: The Sources of Culture," features Orville Bidwell, Francis Hole, Gary Nabhan, and Karen Reichhardt.

October 11, 1986. The Land Institute celebrates its 10th anniversary with the dedication of the Wauhob Prairie and an evening concert by the Paul Winter Consort.

Our Role in the Evolution of a Land Ethic

Dana Jackson

Number 29, Spring 1987

We named this organization "The Land Institute" when we incorporated in 1976 because it was to be a school at The Land. When Wes and I purchased the property in 1970, we referred to it as "the land." (I have since been amazed to find out how many other people first referred to their country places as "the land"!) While we were building our house, we explored the river, and nearby fields and became acquainted with the plant and animal inhabitants. Out of a growing sense of place, we made "The Land" a proper name.

However, in 1976, we did intend for the title of the organization to imply more than the place where we started a school. It seemed important then to be reminding and teaching any who would listen that all physical resources for life came from the land. American confidence in human cleverness and invention was leading us to believe we could get along without nature, and our society was bent on destroying the long term ability of the land to support a variety of life and culture.

An "institute" has been defined as an institution for advanced education, or "an organization for the promotion of some estimable or learned cause," (*Webster's Third New International Dictionary*). Our program for agricultural interns and search for sustainable agroecosystems qualifies us for the first definition. But we are not promoting land, per se. We are promoting an estimable cause, a right human/land relationship, although we cannot define precisely what that is.

Aldo Leopold tried to describe that relationship in memorable essays about land in *A Sand County Almanac*.¹ ...In searching for a way to help people connect more responsibly to land, he used the expression "land community" (p. 240). ...The evolution of a land ethic depends upon making decisions about land use based on whether an action tends "to preserve the integrity, stability, and beauty of the biotic community" (p. 261). "A land ethic changes the role of *Homo sapiens* from a conqueror of the land-community to plain member and citizen of it. It implies respect for his fellow-members, and also for the community as such." (p. 240).

At The Land Institute, we will observe the bicentennial of the U.S. Constitution and the centennial of Aldo Leopold's birth by stimulating discussions about land, here among staff and students and in the larger community. We want to influence the cultural concept of land. Aldo Leopold recognized the need for such mental engagement (p. 263).

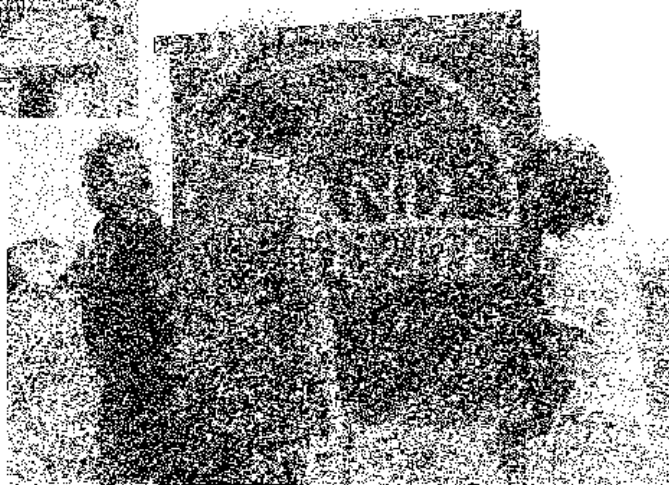
The evolution of a land ethic is an intellectual as well as emotional process. Conservation is paved with good intentions which prove to be futile, or even dangerous, because they are devoid of critical understanding either of the land, or of economic land-use. I think it is a truism that as the ethical frontier advances from the individual to the community, its intellectual content increases.

To engage in this intellectual process, The Land Institute is aptly named!

¹ All of the quotations are taken from the following edition: Aldo Leopold, 1966. *A Sand County Almanac*, N.Y.: Ballantine Books.



Jess Ennis, Doug Dittman and Bruce Kendall raise the sign with the new logo, 1987



October, 1986. The new Land Institute logo is adopted, replacing the windmill with prairie roots. It is sketched by Ann Zimmerman, and completed by Danielle Carré.

October, 1986. The Land Institute purchases the neighboring Krehbiel house and nine acres, and sets up new offices.



Soil and Nuclear Power Plants

Dana Jackson

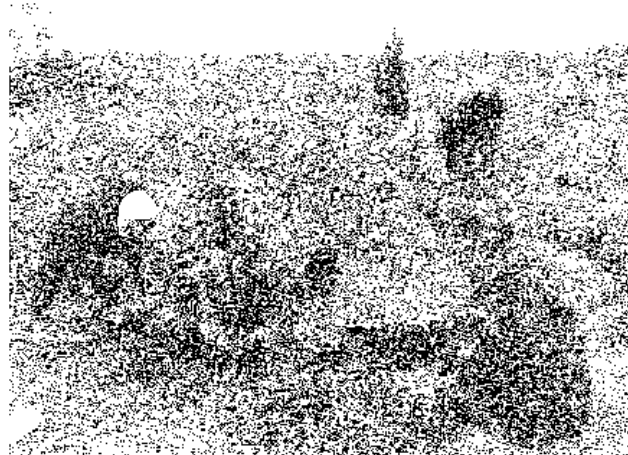
Number 27, Summer 1986

We still do not know the full impact of the Chernobyl nuclear power plant accident. Official announcements by the Soviet government have gradually admitted that the loss of lives and health will turn out to be much more than first estimated. Neighboring nations have discovered that the radiation pollution in their countries is worse than they thought.

After the Chernobyl disaster, the nuclear industry hastened to assure the American public that it could not happen here. But the Nuclear Regulatory Commission (NRC) admitted on November 1, 1982 before the House Sub-committee on Oversight Investigation that the chance of a major reactor accident occurring in the U.S. by the turn of the century is about 50:50.¹ Energy expert Amory Lovins believes a nuclear accident is quite possible in the U.S.:

The tragedy at Chernobyl was not a surprise. The release of roughly 2,000 Hiroshima bombs' worth of fallout from a nuclear meltdown was just the kind of event we've long sought to prevent. A broadly similar accident could occur in any U.S. reactor, with or without containments—which are meant to contain small accidents, not big ones. ...[A]ny technology in which “no act of God can be permitted” is unsafe in the hands of fallible people and imperfect institutions.²

The United States certainly has its share of fallible people and imperfect institutions.



Evaluating perennial sorghum crosses

Kansas has a nuclear power plant just fifty miles south of the state capital in a rich agricultural valley. The NRC lists the Wolf Creek Plant among the top nine most “worrisome” in terms of operations and safety records of the 100 or so nuclear plants in the country. The NRC has estimated that a major accident at Wolf Creek would result in 1,000 early deaths, 3,000 early injuries, 3,000 more eventual cancer-related deaths, plus cause \$105 billion in property damages (1980 dollars).³

Does that estimate of \$105 billion take into consideration the loss of agricultural land, of four inches of topsoil in the Kansas River Valley? Many farmers carry hail insurance, but they cannot buy insurance coverage against a nuclear accident.

We may someday develop our prairie-like agro-ecosystem and prevent soil erosion. But we could lose the soil if a Chernobyl-type nuclear accident occurred.

Amory Lovins points the way to a sustainable energy policy, a necessary part of a sustainable agriculture:

[W]e do not now and never have faced the choice between nuclear risk and freezing in the dark. ...[I]t's cheaper to save electricity than to make it, even if constructing and decommissioning nuclear plants were free. Least cost energy policy is the simplest way for any nation to avoid another reminder that we all live near Chernobyl.⁴

¹ Alan Noguee, “Chernobyl: It Can Happen Here,” *Environmental Action*, 18:1, p.13.

² Rocky Mountain Institute Newsletter, May 6, 1986.

³ Stevie Stevens, *Nuclear Awareness Network*, June 1986.

⁴ Rocky Mountain Institute Newsletter.



1987 intern Perri Butler

1987

February, 1987. Thom Leonard moves The Grain Exchange from its birthplace at the Abundant Life Seed Foundation in Washington to The Land Institute.

May 30-31, 1987. The 9th Prairie Festival, “Citizenship and the Land Ethic,” features Donald Worster, Charles and Nina Leopold Bradley, and Angus Wright.

The Grain Exchange

Thom Leonard

Number 29, Spring 1987

Traditional crop varieties of indigenous peoples, adapted to meet the unique requirements of culture and place, have been selected and bred by agricultural peoples over human and plant generations since the dawn of the agricultural era. Modern plant breeders have drawn on the resultant rich and diverse genetic information in developing modern agronomic varieties. Our agricultural gene pool is diminished when "advanced" high-yielding varieties are introduced to areas of indigenous agriculture, displacing traditional varieties (land races) with profound effect on both local agriculture and the diversity and amount of genetic information in the system. In addition to making the local agroecosystem more vulnerable and dependent upon inputs, the loss of locally adapted land races results in less material available for future plant breeding.

This issue of genetic erosion is usually addressed in the context of peasant cultures in remote places being overrun by the rampant spread of industrial society or of multinational, agrichemical seed corporations supplanting traditional land races with modern, chemical-dependent proprietary cultivars. How much genetic diversity has been lost right here along the tributaries in the Kaw River system, first when native farmers were displaced with the westward immigrant movement and again when advanced cultivars, varieties of corn belt dent, were introduced? Locally adapted varieties of both native and early immigrant farmers have been replaced by hybrid varieties with chemical and water responsiveness. ...This pattern has occurred throughout agricultural America. Part of the work of The Grain Exchange is to collect as many of these cultivars that still exist as family heirlooms or local favorites and make them available through a seed exchange.

Miguel Altieri, during his April visit to The Land Institute, spoke of the importance of in situ preservation of traditional agroecosystems, both to save complex traditional farming patterns from which we may design sustainable agriculture systems, and to preserve



Bruce Kendall and Doug Dittman change the barrel in the composting toilet

not just the existing genetic diversity of locally adapted varieties, but also the milieu of which they are a dynamic part. One of the goals of The Grain Exchange is to foster the growth of a diverse and dispersed agriculture in which cereals and other staple seed crops play an important part. In growing traditional varieties, suited to our local conditions and needs, we may begin to create in situ genetic preservation within the borders of the First World.



Jake Vail, Rob Fischer, and Thom Leonard in classroom

Prairieland Food Cooperative Thriving

Paul Rasch

Number 34, Fall 1988

Long-time subscribers to The Land Report have been kept abreast of changes which have occurred in the history of the Prairieland Food Co-op. ...Born out of idealism and the interest in whole foods awakened in the 1960s and 1970s, the Prairieland Food Co-op not only has survived, it has become a stable food buying alternative for health-conscious people of Salina.

The Prairieland Food Co-op began in 1977 when a benefactor gave The Land Institute a special grant to assess the degree of local interest in starting a food co-op in Salina. The results of the survey were encouraging, so a steering committee was formed and eventually a buying club began operations. Within two-years, membership had grown sufficiently to take another big step, and the club established a storefront... [After four years]...there was a low turnover of food on shelves, membership was lagging, and finding enough volunteers to staff the store had become a serious problem.

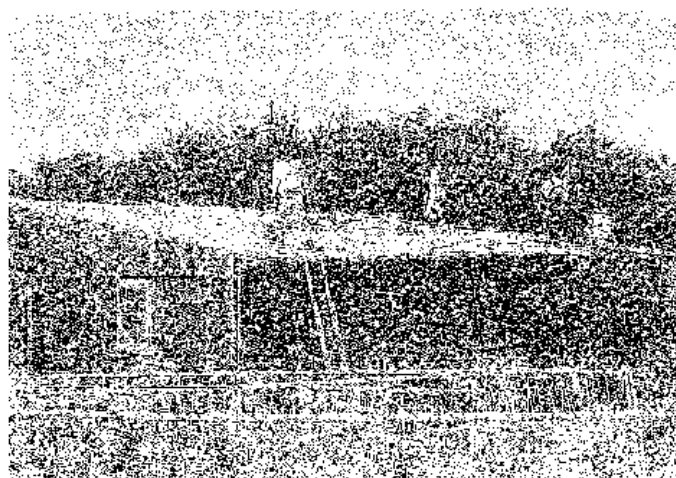
Since the return to a buying club format, the co-op seems to have found its stride. ...The food co-op membership changes modestly from year to year, but stays consistently at about 25 households. ...[T]he co-op is no longer dependent on Land Institute membership and sales for survival. Even without Land interns ordering in the winter months, there are enough households who buy that the minimum order is always reached.

The success of the Prairieland Food Cooperative has been due to a group of die-hard Salinans who have slowly and quietly gone about the important business of making the ideal of "economics as if people mattered" a bit more of a reality. Through years of trial and error, their determined efforts have made the difference.

July, 1987. The Land Institute purchases 72 acres of bottomland on Ohio Street. Over the next several years many new research plots are established on this land.

July, 1987. *Altars of Unhewn Stone: Science and the Earth*, by Wes Jackson is published.

July 12, 1987. A windstorm blows down the Windcraft generator and removes half of the classroom roof.



Repairing the classroom roof after the 1987 storm

Energy Choices

Paul Rasch

Number 33, Summer 1988

The oldest and most visible landmarks of The Land Institute are the two wind generators which have provided us with electricity—and problems—over the past ten years. At present, neither wind generator is operating. The Windcraft was blown down in a 100 miles-per-hour wind in July 1987, and the Jacob needs a new set of batteries. Rather than rebuilding the Windcraft and buying new batteries for the Jacob, as we've done in the past, we're taking a hard look at their utility and the costs of repair and maintenance, trying to decide how to meet our energy needs responsibly and economically.

Likewise, how to meet our energy needs nationwide and around the world is a matter which warrants close attention. ...The "energy crisis" of the Seventies seems to have given way to an "energy glut" in the Eighties, but the fact remains that energy resources of the earth are limited and being depleted at a rapid rate. Consumption of oil in the U.S., which declined from 1973 to 1985, is now on the rise again.¹ At existing rates of consumption, known oil reserves in the U.S. would last less than eight years if we had no imports to rely on.² Small wonder that we are so eager to protect "our interests" in the Persian Gulf.

Even if we somehow disregard the inevitable end of oil, a new energy crisis is now looming large: environmental degradation due to fossil fuel consumption. With alarming consistency, report after report is linking fossil fuel use to air pollution caused by ozone production, global warming due to increased carbon dioxide in the atmosphere, and acid rain caused by high levels of sulfur dioxide and carbon dioxide in the air. ...Unlike the distant notion of energy scarcity, the environmental problems

associated with our voracious appetite for oil are very immediate and show no signs of waning with shifts in political or economic policies.

This is not to say that nothing has come of our decade-long concern over scarce energy. Most industrialized countries accomplished significant reductions in energy use through a combination of technical advances and cutbacks at the personal and institutional levels. ...Yet for all that energy efficiency offers in reducing our reliance on fossil fuels, in itself it is no solution. However much we are able to cut back our energy demands, we will always need a supply of energy. In a livable future without fossil fuel, this means the use of alternative, renewable sources of energy.

In the aftermath of the 1973 oil embargo, a host of options were explored in the attempt to find renewable sources of energy, including technologies employing solar, wind, hydro and geothermal. Government subsidies, eager business people and a curious public aided the efforts to develop these resources. Numerous businesses sprang up, some less scrupulous than others, to meet the demand for solar collectors, wind generators and other energy devices covered by federal and state energy tax credits. At first, many of these energy systems were crude

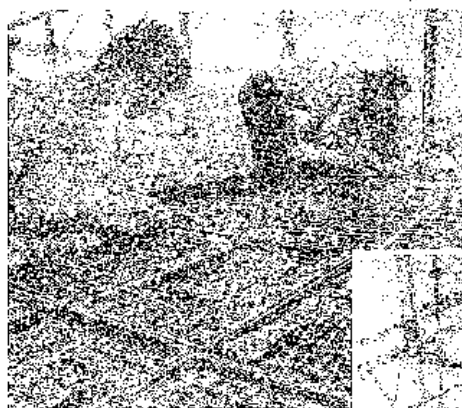


Building the greenhouse



July 22-23, 1987. Robert Rodale is a visiting teacher at The Land Institute, and presents a public lecture at Kansas Wesleyan University.

September, 1987. The Land Institute begins presenting performances of *Planting in the Dust*, a dramatic monologue by Minnesota poet Nancy Paddock. "*Planting in the Dust* is a one-woman, one-act drama in which Annie, a young farm woman, reveals her connection to the land and the satisfaction of farming it right."



Jake Vail and Karen Findley seeding peat cubes

and rather unreliable, but as the years of experience mounted, the technologies became sound social and economic investments. Unfortunately, just as many of these energy technologies were being established, the tax credits were pulled out from

beneath them, and all but the most firmly established of the companies folded. A few years later and we find ourselves no less in need of renewable energy technologies, but with few businesses involved, little repair capability for the technologies that were installed, and negligible research and development in that area.

Probably no technology better typifies the boom and bust nature of alternative energy systems than wind generators. Once used extensively to power farmsteads across the rural U.S., these devices enjoyed a strong resurgence in the 1970's and early 1980's. In the decade following the oil embargo, over 10,000 wind machines were installed worldwide, but by 1985, wind turbine sales had dropped sharply as country after country reduced or eliminated subsidies.³ In California, however, where the Public Utilities Regulatory Policies Act has been vigorously supported, some 16,000 wind machines now provide over 1,400 megawatts of capacity, (the equivalent of a large nuclear power plant) at costs equal to or less than that for conventional generators.⁴

At first many of these wind machines were unreliable, but they have become very dependable power production units, running 80-98% of the time that the wind is blowing.⁵ They can be installed in a fraction of the time required to plan and build a larger coal or nuclear facility, thus allowing utilities greater flexibility in their planning. When repairs

are needed, the machines are efficiently taken care of by trained mechanics available through the economies of scale, unlike our situation at The Land. And the power produced by these machines coincides very nicely with the peak demand created by summer air conditioning.

Above all, these machines produce electricity at a fraction of the environmental costs of their fossil fuel and nuclear-fueled counterparts. All of these factors weighed together point to a promising future for wind power, or at least they did until the end of the energy tax credits in 1985. ...Ardent fans of the free market may herald the ending of the energy tax credits and even the subsequent "thinning out" of businesses and technologies inspired by the Carter-era incentives. Such an attitude ignores the brutal fact that our energy resources are indeed finite, and that alternative, renewable sources of energy are necessary components of any realistic planning for the not-so-distant future. As a nation we can ill afford to wait until our resources dwindle further to explore advancements in both conservation and renewable energy technologies. ...The myopia which has so successfully lulled us into a return to bigger cars, faster speeds and fewer wind generators will come to an end one way or another. The choice we have is to wait for another "energy crisis" or to plan for a future of moderate needs and imaginative designs.

The future of the wind generators at The Land Institute, like the future of our country's energy policy, is clouded with uncertainties. With so many other demands on our financial resources, we have decided for now not to invest any more time or money in the wind machines. Like the federal government, we can put out of our minds the inevitable energy crunch and the return of climbing energy prices. Years down the road, we may well wish that we had allocated more of our scarce time and money to the search for sustainable energy systems.

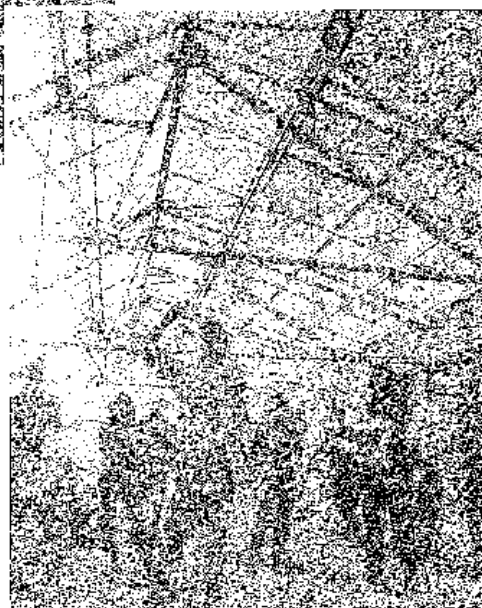
¹ Christopher Flavin and Alan B. During, *Building on Success: The Age of Energy Efficiency*, Worldwatch Paper 82, March 1988, p. 12

² Michael Renner, *Rethinking the Role of the Automobile*, Worldwatch Paper 84, June 1988, p. 21.

³ Cynthia Pollock Shea, *Renewable Energy: Today's Contribution, Tomorrow's Promise*, Worldwatch Paper 81, January 1988, p. 36.

⁴ Shea, pg. 38.

⁵ Shea, pg. 39.



Paul Rasch leads a tour of the greenhouse



Henry Geiger, long-time editor of Manus, visits the Land

1987. A new greenhouse is constructed south of the Krehbiel house.

November, 1987. The classroom building is remodeled. The active solar heating system and the solar greenhouse are removed, and the classroom expanded.

Kansans Talk to Annie

Donna Freeman

Number 32, Spring 1988

While performing the play *Planting in the Dust* by Nancy Paddock for The Land Institute, I've traveled to Kansas towns I had never even heard of. I've had the opportunity to meet many different people, including farmers (male and female), teachers, writers, and feminists, and I've even shared a midnight supper with Dominican sisters. I've performed on stages under conditions that we sometimes thought would be impossible.

Live performance—a new show each time it's presented! Each performance becomes alive because of the stage setting, the kind of audience watching the play, and how people respond to the lines. After the play, when the people in the audience feel they know Annie, they want to tell their stories to her—not to Dona, the city actress—but to Annie, the woman who understands and experiences the same every-day problems, the woman who shares the same love of the land. They especially want to tell her their dust bowl stories.

People all across the state have shared memories of black clouds rolling in, or red clouds depending on where they lived at the time. Wet towels and sheets hanging from windows and stuffed under the doorways to keep the blowing dust out were common recollections. One couple told me of the birth of their first child the very day the storm hit. They were afraid the child would suffocate from the fine dust creeping in around the wet sheets at the windows. Fortunately they lived close to town, and the man went in for blocks of ice. They set a block of ice in front of an electric fan, and the gentle moist breeze that was created kept the dust from covering the baby. The man didn't tell me about the difficulty of driving into town. Modest about his efforts, he just said, "Well it took awhile." Nor did the woman convey how difficult the delivery was, or if she were ever frightened of the storm or of being there alone during such a crucial time of her life.

... The people across Kansas are indeed friendly, warm, and ready to talk about their love of the Kansas soil. ... There is one farmer (I would say in his seventies) who has seen the play three times. ... The last time I talked to him after a show, he appeared weary. ... His eyes were moist and it was hard for him to talk. "I've farmed the same land my father and grandfather farmed. I love that



Donna Freeman as Annie

piece of land and have struggled to keep it good and rich so I could pass on to my children. They're all grown up, left the farm and got children of their own. None of them want it. No one wants the farm. Not a one of them is interested in coming back to the land. I've no one to leave it to, no one."

There are so many other stories of people's problems and struggles I could share, just as they have been shared with me, and the thread that runs through every one of them is their undeniable love of the land, the deep connection they have with the soil. In the play, Annie reminds us that "we borrow our lives from it." She tells us that "this soil is made up of all the bodies of all the things that have ever lived and died in this place over millions of years. And it's the whole life of all the years to come, too." Performances of *Planting in the Dust* reinforce the respect for soil that many rural people have, and it teaches others who have not thought much about it that soil is not to be taken for granted. Through Annie's emotional description of life on the farm that has been in her family for four generations, and her poetic expression of our dependence upon soil, The Land Institute takes a powerful message about land stewardship to Kansas communities. I'm thankful for the opportunity to help present that message.

1988

January 30, 1988. An energy caucus, moderated by Mari Detrixhe is held at The Land Institute "to revive the discussion among Kansas environmentalists about renewable energy sources and public policies which encourage efficiency and solar technologies."

Prairie Patterns and their Relevance to Sustainable Agriculture

Jon Piper

Number 33, Summer 1988

By now, the environmental and social problems associated with large-scale industrialized monocultures should be familiar to most readers of *The Land Report*. These problems include high levels of soil loss, pesticide and fertilizer contamination of soil and groundwater, utter dependence upon finite fossil fuel resources, loss of cultural knowledge, and the depopulation of rural communities. Reliance upon extensive monoculture grain farms arose this century in large part from the availability of inexpensive fossil fuels that favored mechanization and labor efficiency. Within agricultural universities, research to maximize production (yield/area) through specialization and massive inputs took precedence over guaranteeing sustainability of harvest into the indefinite future.

On the Great Plains, the native prairies, which had developed and endured for millennia, were turned quickly beneath the onslaught of American settlement. The settlers replaced the array of native grasses and forbs with such alien species as wheat, soybean, and sorghum introduced from other continents. Agroecosystems in North America were then modified to accommodate the biological requirements of these new crops.

Referring to agriculture on the American continent, Wendell Berry has stated, "We have never known what we were doing because we have never known what we were undoing."¹ Indeed, the prairie ecosystem existed as a complex web of interdependent relationships among plant, animal, and microbial species. Critical nutrients were garnered, retained, and recycled efficiently by the prairie's biota. Generations of prairie grasses, thriving during the moist springs and hot summers, then drying in autumn and winter, accumulated thick mulches of leaves and stem that gave rise to deep dark soils. These rich prairie soils have made the highly productive Great Plains granary possible. But the prairie's value to agriculture exists not only in its death. In fact, the future of North American agriculture may depend even more upon our recognizing and appreciating the dynamic patterns that characterize the prairie's life.

The grasslands of the central United States are composed predominantly of warm season grasses, which display their maximum growth from May through August. Within these plant communities there are also sizable components of ephemeral early spring wildflowers, and perennial legumes and composites that flower throughout the growing season. Prairie plants have been growing together for thousands of years, adjusting their growth patterns, partitioning environmental resources, and coexisting successfully. Most prairie plants form associations with soil fungi, called mycorrhizae, that contribute to nutrient accumulation and efficacy of nutrient transfer from decomposing matter to living roots.

These mycorrhizal associations are probably vital in providing soil phosphorous to the grassland community. Many plants have ecological roles we have yet to define.

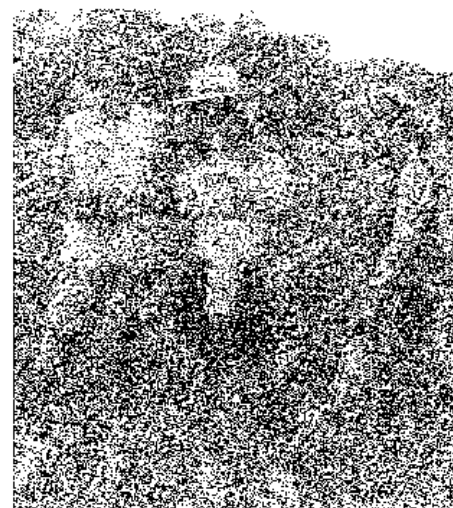
The plant species remaining in contemporary prairies are those that have adapted to the sometimes harsh and unpredictable climate of the Great Plains. In Kansas, annual temperature can range 140° F and change 70° F within a 24 hour period.² Summer deluges, though sporadic, can be devastating.

Dominance of the native vegetation by grasses has resulted from a history of periodic fire, drought, high winds, and large grazing mammals. Where these factors are eliminated, prairie degrades to scrubland or woods.

Obviously, understanding the plant community that has been tailored to the Great Plains environment is crucial to our efforts to devise an agriculture that exists in harmony with nature. The agriculture we envision, modeled on the prairie, would be composed of herbaceous perennial seed crops grown in mixtures. These mixtures will take advantage



Jon Piper leads a prairie walk



Jake Vail, Jennifer Delisle and Beth Gibans

March 30, 1988. The Land Institute sponsors a plantbreeding and agroecology seminar entitled "Elegant Solutions Predicated on Place," featuring Gary Nabhan, Steve Gliessman, Stan Cox, and a letter from Nebraska cornbreeder Albert Arens.



Jon Piper and Thom Leonard

of differences among species in growth period, nutrient use, and water requirements. We will incorporate into the design of perennial polycultures various principles of ecosystem function discovered in studies of the prairie ecosystem. Thus we will address nutrient

cycling, ecological succession, long-term stability of yield, and biological management of insects, diseases, and weeds within agroecosystems. The herbaceous perennials we are developing for polyculture, eastern gama grass, wild rye, and Illinois Bundleflower, have either been derived from native prairie or are analogous to species occurring in native prairie.

Among our most important, and most difficult, tasks, is perceiving what the prairie can teach us about ecosystem-level agriculture. Three years ago, we embarked on a series of explorations by asking such questions as: 1) What level of plant growth is sustained by the prairie year after year? 2) When are different types of plants actively growing and what are their roles in the grassland community? 3) What are the properties of composites, nitrogen-fixing legumes, and cool-and warm season grasses? 4) How does prairie vegetation change from year to year?

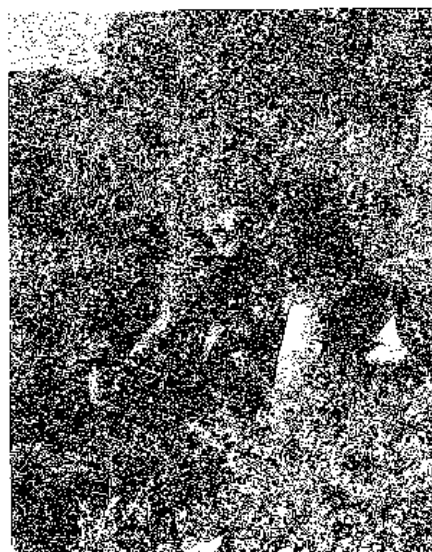
In 1986, we began measuring plant biomass on three prairie sites at The Land Institute. These sites represent a gradient from steep and shallow to level and deep soils. On dates in spring, mid-, and late summer we have sampled aboveground vegetation within twelve randomly placed 1/2 by 1/2 meter wooden sample frames. The spring date coincides with a flush of ephemeral forbs that flower and set seed while most grasses are just emerging. The late summer sampling corresponds to the flowering period of the dominant tallgrasses, and represents peak biomass on the prairie. During each one-to-two-week sampling event, a small army of staff and interns clips all aboveground plant growth within sample frames, and sorts the material by species into paper bags. Following this tour de force the plants are dried to constant weight in a laboratory oven, then weighed to the nearest hundredth of a gram. We then examine the data thus produced to help address the questions outlined above.

Some consistent patterns have already begun to

emerge. For example, there is an inverse relationship between productivity of a site and plant species diversity. This means that the richest soils tend to be dominated by one or a few species whereas poor sites appear to provide more available niches and can support a wider variety of plant species. Secondly we have noted that the highest proportion of legumes occurs on the least fertile site. Legumes appear to be favored where soil is poor and tallgrasses cannot dominate. Thirdly, we have found that annual plant growth on our prairie is similar to, and sometimes exceeds, that of rain-fed grain crops on the Great Plains.³

Beyond the important data gathered in this study, these sampling periods offer excellent opportunities to bunker down and look closely at the prairie. One can begin to appreciate the sometimes subtle differences that distinguish plant species. An observer may see for the first time the characteristics of prairie soil surfaces, numerous nearly invisible seedlings or the myriad insects constantly milling about. In that quiet and distraction-free environment one is surrounded by the music of the prairie: the stiff grasses rustling in the constant breezes, the buzzing of insects, the songs of the dickcissel, western meadowlark, savannah sparrow, and bob-white quail.

Aesthetic arguments aside, perhaps one of the most



Beth Gibans—Intern, Intern Coordinator, Development Assistant, 1988-1992.

pragmatic reasons for preserving prairie is that it must serve as our only standard by which to judge agricultural practices in the future. Thus, the ongoing work here and on the Konza Prairie near Manhattan, Kansas, may turn out to be as important to agricultural science as it is to ecology. Biological patterns inherent in prairie ecosystems will appear even

more valuable as we discover the principles of sustainable agriculture for this region.

¹ Wendell Berry, 1987. *Home Economics*. North Point Press, San Francisco, CA. Pg. 147.

² O.J. Reichman, 1987. *Konza Prairie: a Tallgrass Natural History*. University Press of Kansas, Lawrence, KS.

³ Details of the studies and complete species lists can be found in *Land Institute Research Reports* 3 and 4 (1986 and 1987)

Spring, 1988. The Land's Harvest, an organic marketing gardening project is established at the new land on Ohio Street by Danielle Carré and Brad Burritt. The project continues in full swing for two years, and in a reduced, privatized form until 1994.

May 28-29, 1988. The 10th Prairie Festival, "Health, Beauty, and Permanence," features J. Stan Rowe, Conn Nugent, and David Orr.

The Land's Harvest

Danielle Carré

Number 33, Summer 1988

"Hell, a guy could grow anything in this dirt!"

So we were challenged by an old vegetable farmer concerning our new organic truck farm on The Land's 72 acres along South Ohio Street. The soil ...is productive and easy to work. If it were the only variable in our operation, we would have a relatively easy time turning a profit.

By late June we had most of our crops in and we were irrigating full-time; even so we had a hard time keeping up. The heat also kept the peppers and tomatoes from setting fruit and killed much of the corn pollen. ...Cucumber

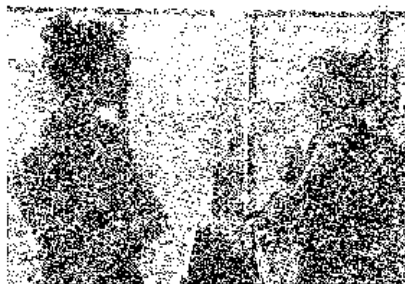
mosaic virus and bacterial wilt are both vectored by cucumber beetles, and the latter hit us hard. We sprayed Rotenone to control the beetles..., but many melon plants were infected. We continuously pulled out the infected plants, watching much of our melon crop wilt away.

The farmers' market, new in Salina this year, provided our best outlet early in the summer. Unfortunately, there were too few producers to supply the many eager customers who showed up in the beginning.... Folks did come back to the market when the corn and tomatoes came on and the produce supply increased.

Although there has been a good response to fresh produce in Salina, many people are unconcerned about whether or not their produce is sprayed with chemical pesticides. ...We provide information regarding our production methods, and we hope the public will start requesting organic produce. A related problem is the consumer's unwillingness to pay a decent price for fresh local produce. They come to

the market expecting extremely low prices, as if we were selling extra zucchinis from a backyard hobby garden. We need to educate the public that vegetable farming is

serious, hard work. We also need to educate consumers that when they buy from local farmers, ... most of the money stays within the region.



Danielle Carré and Senator Nancy Kassebaum



Danielle, Brad Burritt, Ian

Marketing The Land's Harvest

Brad Burritt

Number 34, Fall 1988

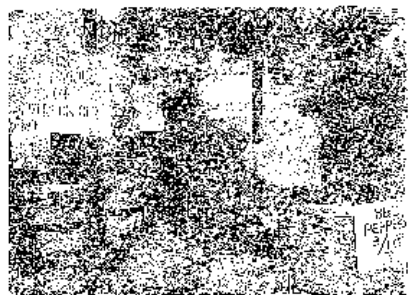
None of our experiences in the first season of The Land's Harvest have stuck in our minds as firmly as our marketing experience. This aspect of our project excited and frustrated us the most, and it is the one that will shape the project's future.

Looking back on the season, our difficulties and successes of developing retail ventures seem typical of small vegetable farmers I've heard or read about. First a bit of background on retail versus wholesale marketing: Retailing, on the one hand, supposedly requires more time and resources to sell each unit of produce than wholesaling, but compensates by bringing a higher return on each unit. And while the cost of selling each unit in a wholesale market should be lower, the return on each unit is lower and therefore more produce must be sold to realize an equivalent profit.

In our circumstances this season, we found that retailing actually cost less per unit sold, except when we were able to move large numbers of melons through just a few wholesale outlets. Another advantage of retailing was our ability to promote our produce as being very fresh, local and unsprayed. However, in dealings with wholesale contacts, we were unable to have our peppers and broccoli labeled as "local" when stores were running specials on the California-grown equivalents of these vegetables and didn't want to change labeling and risk confusing their customers. The produce manager of one of these stores seemed willing to carry our broccoli alongside that from his warehouse until he actually saw it. I am convinced that he reneged because our broccoli was so much better looking and he feared he could not sell the store's.

Beside allowing us to better promote our organic produce, retailing also enabled us to educate the community regarding other work of The Land Institute. Once we engaged people in a discussion of organic production techniques, it was then easy to offer some ideas about our work with perennial polyculture in general.

Next year The Land's Harvest will most certainly be smaller and more integrated into The Land Institute's whole farming operation. We may sell to a few wholesale outlets, but mainly we will focus on retailing. Since our retail sales accounted for only about half of total revenues this year, we will need to be creative in expanding retail markets in the future. One idea we've had is to publish a newsletter for potential and known customers to let them know what will be available. Another idea is to open a stand on the property where we are growing the vegetables.



Sara Goering and Danielle at the Salina Farmers Market

1989

Spring, 1989. An art gallery is constructed at the back of the Krehbiel house garage.

Spring, 1989. The herbarium is redesigned with the help of Ivalee Barnard for low-maintenance educational and aesthetic functions.

Drought and the Prairie

Colin Laird

Number 35, Summer 1989

Since the autumn of 1987, the Great Plains region has received less than the average amount of precipitation. By the end of last year, Kansas had experienced its second driest year on record. In Saline county alone the rainfall was 65% of normal for 1988. Instead of the average 27.8" of rain per year, the county saw only 18.14" of precipitation.

All of the talk this spring about the poor condition of the winter wheat crop due to the drought made me wonder how prairie plants were doing in comparison. By just looking from a distance at wheat fields and native prairie near The Land, it seemed, to a suburban New Yorker such as myself, that the wheat looked better than the prairie. The wheat fields were all green.... In contrast, the prairie was still brown, just as it was in February. But from up close, one could see that the wheat plants were turning brown at their bases, indicating that some of the leaves were dying. The soil in the wheat field was gray, dry and powdery. By giving a little tug, I could easily pull a wheat plant out of the ground. In seeing the small roots I could understand why the plants were dying. Only moisture in the few top inches of the soil surface was accessible to the plant. During the fall, winter and spring, there had been little moisture, and the roots of this annual plant developed poorly.

While transplanting eastern gama grass into a restored prairie for one of the experiments this year, [we] were surprised at what we found in the prairie soils—moisture. When we took out some of the leaf litter ...we found a cool, firm, dark, and moist soil.

By removing some grasses, a task only accomplished with a sturdy shovel, we found plant roots permeating the soil to the point that the soil and roots were almost one and the same. It was strange to find the soil so moist, but these soils had been covered all year long, protected from the drying sun and wind.

The prairie soil was protected from wind erosion during the drought, unlike



Cindy Hurlbutt and Beth Gibans in class

soil in the wheat fields. The March 14 dust storm, the worst since the 1950's, destroyed 160,000 acres of crops and

ground cover. The winds of the Great Plains can pick up soil particles and deposit them far from their site of origin, expose plant root systems, uproot plants, damage plants by sand blasting, and actually cover plants with soil. It only takes winds of about thirteen miles per hour at one foot above ground ...to start to move bare soil. The key word here is "bare."

Most of the prairie plants are perennials while our grain crops are annuals. For the annual plant, there is no provision for a bad year because [it has] to produce seed to ensure a new generation the following year. In contrast, a perennial plant's resources can be allocated to its own survival first.... During a drought, the perennial can hold back and wait for better conditions [to produce seeds], using its deep, extensive root system or large tap root to reach moisture at low levels in the soil. ...And while the perennial prairie plant protect[s] itself, ...it also protect[s] the soil.

[T]he prairie's response to drought is ...an ecosystem response and not an individualized species response as is

the case with wheat and other monoculture crops. In the prairie there are multitudes of different plants and plant species responding to the environmental conditions. The chances are much greater that within that diversity some plants will be able to survive.

The prairie offers some lessons for agriculture if we are willing to observe and learn.



1989 interns Nancy Baumeister, Colin Laird, Jake Vail, Pamela Cabbage, Bernie Jilka

May 17, 1989. Dana Jackson receives a Chevron Conservation Award for "outstanding contributions to the conservation of natural resources."

May 26-27, 1989. The 11th Prairie Festival, "The Global Environment: A Prairie Perspective," features speakers Paul Gruchow, Donella Meadows, and Rafe Pomerance.

The Marriage of Ecology and Agriculture

Number 36, Fall 1989

Paul Sears, who will be ninety-eight years old in January, was not able to attend the symposium in Salina. To show his support and to contribute to the ideas for discussion, he made a videotape... Paul Sears chuckled as he responded to the question: Was it inevitable that agriculture would have to recognize ecology as a partner in the conservation of our land?

"Yes, I think it is true—and you might almost characterize it as a shotgun wedding—because we've got to the point ...where the knowledge we could get from just trial and error, practical experience, isn't sufficient."

Professor Paul Sears has long known that humans need to apply the wisdom of nature to agricultural systems. We walk in his footsteps as we try to develop an ecological agriculture.

The following two articles are excerpted from talks given at the symposium

Nature as Measure

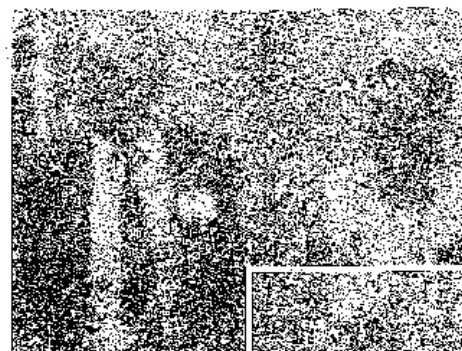
Wendell Berry

Number 36, Fall 1989

Excerpts from What Are People For? by Wendell Berry. Copyright ©1990 by Wendell Berry. Reprinted by permission of North Point Press, a division of Farrar, Straus & Giroux, Inc.

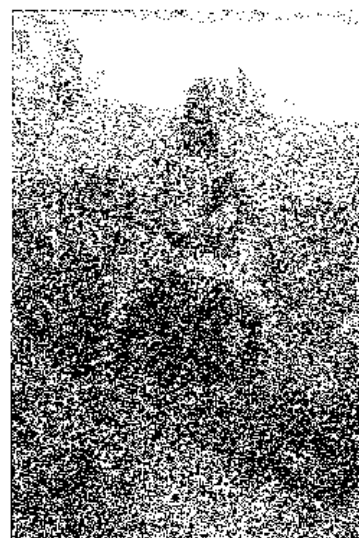
Industrial agriculture, built according to the single standard of productivity, has dealt with nature, including human nature, in the manner of a monologist or an orator. It has not asked for anything, or waited to hear any response. It has told nature what it wanted, and in various clever ways has taken what it wanted. And since it proposed no limits on its wants, exhaustion has been its inevitable and foreseeable result.

On the other hand, an agriculture using nature, including human nature, as its measure would approach the world in the manner of a conversationalist. It would not undertake to impose its vision and its demands upon a world that it conceives as a stockpile of raw material, inert and indifferent to any use that may be made to it. It would not proceed directly or soon to some supposedly ideal state of things. It would proceed directly and soon to serious thought about our condition and our predicament. On all farms, farmers would undertake to know responsibly where they are and to "consult the



genius of the place." They would ask what nature would be doing there if no one were farming there. They would ask what nature would permit them to do there, and what they could do there with the least harm to the place and to their natural and human neighbors. And they would ask what nature would help them to do there. And after each asking, knowing that nature will respond, they would attend carefully to her response.

Farming in this way, though it certainly would proceed by desire, is not visionary in the political or utopian sense. In a conversation, you always expect a reply. And if you honor the other party to the conversation, if you honor the otherness of the other party, you understand that that you must not expect always to receive a reply that you foresee or one that you will like. A conversation is inimitably two-sided and always to some degree mysterious; it requires faith.



October 20-22, 1989. The Land Institute sponsors a symposium on "The Marriage of Ecology and Agriculture," dedicated to Paul Sears. Participants include Wendell Berry, Donald Worster, Donella Meadows, Jack Ewel, David Ehrenfeld, David Pimentel, and David Orr among others.

Cautionary Thoughts on a Marriage Proposal

Donald Worster

Number 36, Fall 1989

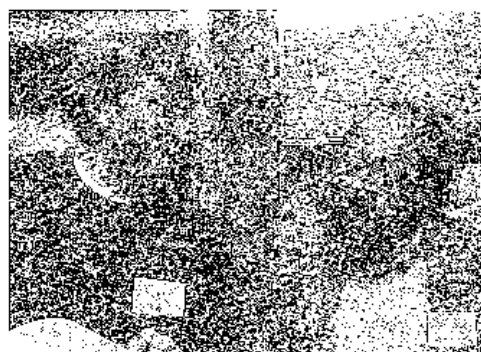
We have been called together to witness a proposal of marriage—not the marriage itself, which is still only a distant possibility, but an offer of marriage and that made by only one of the parties, the science of ecology. The other party, agriculture, is only barely represented here. We don't really know what he thinks about the idea, or if he thinks at all about it, or even whether he is the marrying kind. The rest of us, including this historian, have come in support of the proposal but must confess to being a little nervous and uncertain as to whether the marriage could work.

Who is this potential groom, agriculture, and what is his past? A very complicated fellow, he is the farmer in the field, of course, but also the rural banker, farm implement manufacturer, pesticide salesman, international grain merchant, and food processor. He is modern agribusiness in all its manifestations. ...The first and most difficult task is to convince this fellow that he needs a mate. Before he will come to the altar, he must be brought to understand that his life is incomplete as it is, that in fact he is a mess, that he needs to reform himself if he has any hopes of surviving, and that the proposed marriage with ecology can be the first step toward that reform.

[I]s this American agriculturalist, long devoted to his freedom to play around in the grain and wool markets of the world, now chastened and mature, ready to enter into the bonds of matrimony?

The bride to be, or that wants to be, is the science of ecology, or more accurately, is a few ecologists who have a feeling for agriculture and want to see it saved from itself. They are like a young earnest schoolmarm, full of piety and learning, eager to land their husband and make him a pupil, teaching him all the virtues of reverence, responsibility, and scientific reason. A historian must admire the intention but wonder about the bride's preparation for marriage. Can this good soul succeed in her desires?

Ecology promises to bring to the marriage an informed, expert understanding of how nature works, a knowledge that agriculture does not have on its own but needs from others. ...But the knowledge offered by ecologists is deceptive in one vital respect: it does not afford a general or comprehensive measure of what it means



Marty Bender
and Donald
Worster

to be successful or unsuccessful in agriculture. Science is excellent in addressing particulars, but vague and indecisive in recommending general policies for a society to follow.

Agriculture in the United States has been deeply embedded in the history of the market economy over the past several centuries. It cannot be expected to go abruptly in new directions without confronting and dealing with that history and that economy. The science of ecology, on the other hand, despite its impressive knowledge, represents neither omniscient authority nor deep historical understanding.

Does the ecologist fully realize what she is up against in the case of the groom, and does she have a realistic sense of her potential as tutoring wife?

I hope the marriage takes place and soon, even if it has to be arranged by others instead of coming from a spontaneous romance. What is needed in that marriage, I must add, is a shared dedication to a larger ideal than each other. Both bride and groom, before they take another step, ought to agree on a common moral principle: that nature is a pattern and a set of processes that we humans did not invent and must respect. ...Nature is a whole greater than we can understand or manipulate.

A marriage that does not begin with that common understanding by both parties is likely to flounder soon. ...A marriage that only united two narrow ways of seeing would produce more, not less, blindness. We would not find such a union very promising.

On the other hand, a marriage that brought together

these two talented parties in a common search for that principle of order, a marriage that was informed by a broader moral discourse, is one that looks auspicious. Such a union might one day bring forth a child better than any we have known.

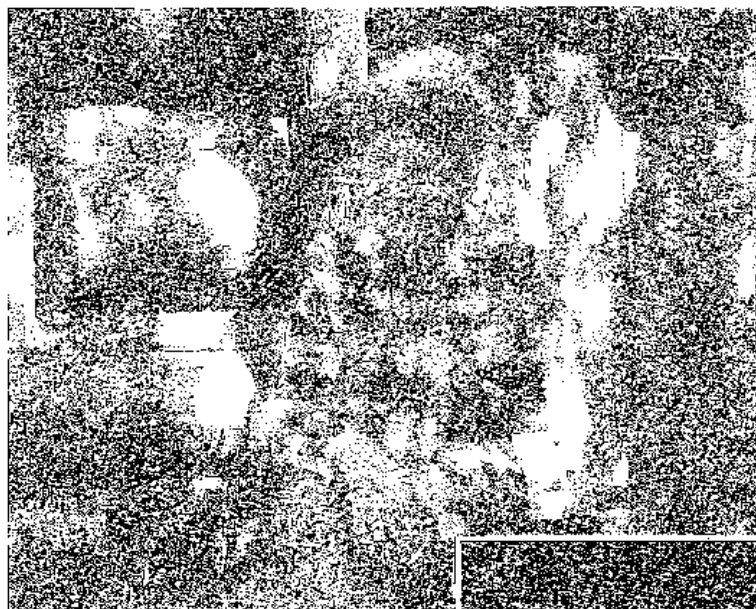


1989 interns Ed Orris, Brooks Anderson, Colin Laird, Ray Epp, Jake Vail, Nancy Baumeister and Beth Gibaus in background.

March, 1990. A woodlot is planted at The Land Institute, primarily to fuel the greenhouse wood furnace. Windbreaks are also planted at the 72 acre field along Ohio Street and Water Well Road.

April 22, 1990. Land Institute staff participate in various 20th Earth Day tours, prairie walks and talks everywhere from Salina to Chicago.

1990



Lost in the Garden

Dana Jackson

Number 38, Summer 1990

It's three o'clock in the afternoon, and after sitting at my desk for two hours, editing an article, sorting the mail, answering phone calls, I am restless and fidgety. It's time to move the water sprinkler in the garden and get some exercise.

A blast of 98° F hot air greets me when I walk out the east door of the classroom and step into the herb and flower section of the garden. As I stare dejectedly at the multitude of grasshoppers leaping from the defoliated yarrow to the oregano, my eyes catch some clumps of crabgrass and bindweed near the birdbath by the pink and blue delphinium. I pull them up and notice the scraggly rotting stems and foliage of borage sprawling over the calendula. Soon a pile of hollow brown stems and large rough cucumber-scented borage leaves cover the small pile of weeds on the path. I need a wheelbarrow to haul them to the compost pile.

On my way to get the garden wheelbarrow, I notice how profusely I am sweating and remember that I left the office to move the water sprinkler. I must disconnect the sprinkler in the cantaloupes to attach it to a hose that will reach the next section, the watermelons. Several times I

turn the water on and off until the rain wave breaks at just the right place. My shirt gets wet as I jump back and forth to adjust it. Immediately I feel refreshed, cooler.

I notice that the okra next to the melons still could use some thinning, so I pull up a few of the foot-high, itchy plants to leave a spacing of nearly two feet between individual okra plants. Will the wilt kill the okra this year? It still looks good, though there are a few yellow leaves close to the ground. I hope we get enough okra to make okra pickles.

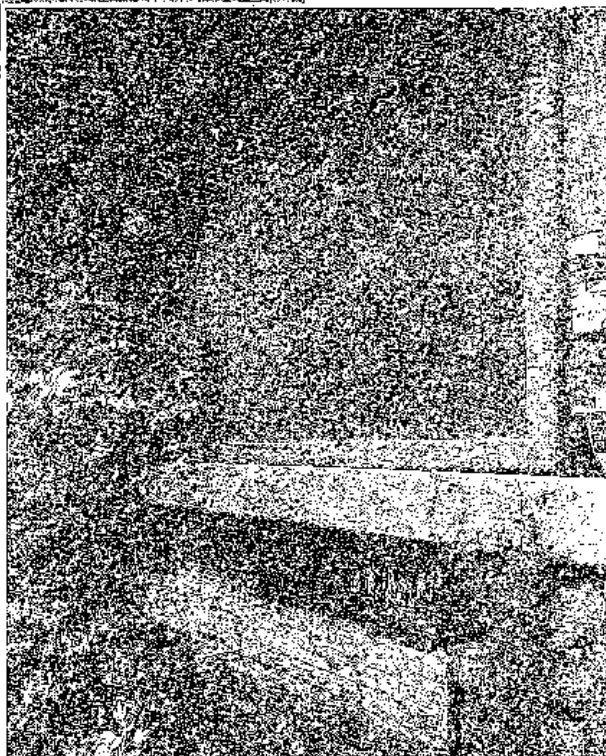
Wilt is such a problem in this garden. I wonder if it has affected the cantaloupes much? I've already pulled up one wilted watermelon plant. I walk back to the cantaloupe patch, pausing to look at the honeydew melon plants on the way. These took for-

ever to germinate. I wonder why the melon seeds in the compost that we spread on the bed of leeks germinated so vigorously and soon covered the bed with volunteer cantaloupes and watermelons. One of the interns did not know that sprigs of grass-like leeks had been transplanted there, and he mulched the bed as if it had been intended to be a melon bed. Well, it really wants to be a melon bed, I thought. We'll plant leeks next year.

The cantaloupes still look fairly healthy. Some leaves are drying up and look wilted near the main stem, but I don't see any cucumber beetles yet.

Oh, yes, I need to get the wheelbarrow to pick up the pile of borage plants and weeds back in the herb garden.

On my way back with the wheelbarrow, I pause to look at the garlic and onions. It's about time to harvest them. In fact, I could use some garlic for dinner tonight. I leave the wheelbarrow and go back to the tool shed to get a spade. I don't want to risk pulling stems off the garlic bulbs even though the soil is soft, so I push the spade down by a garlic stem and lift a bulb with nice large cloves. The exposed earth smells good. One clove will fit just right into the garlic press. I dig another, and another. Might as well dig up all the garlic bulbs in this bed. Might as well put them into the wheelbarrow and take them to the porch for storage.



June 2-3, 1990. The 12th Prairie Festival, "The Future of Prairie Communities," features Frank and Deborah Popper, Susan Witt, Paul Nachtigal, and Marty Strange.

1990. Wes and Dana Jackson are named Pew Scholars in Conservation and the Environment.



I remember the red paper-covered wire that I've taken off loose heads of lettuce and spinach purchased at the grocery store in the winter. If I get those from the drawer in my kitchen, I can tie up the garlic by the stems and hang bunches on the west porch by the interns' kitchen. They can take garlic home or use some here when they cook lunch.

The smell of garlic is wonderful, especially if you have a garden producing shiny purple eggplants, basil, onions, tomatoes, and red Italian peppers. Thinking about the combination, I can almost smell olive oil. Land people use a lot of garlic. We must remember to save some cloves to plant this fall.

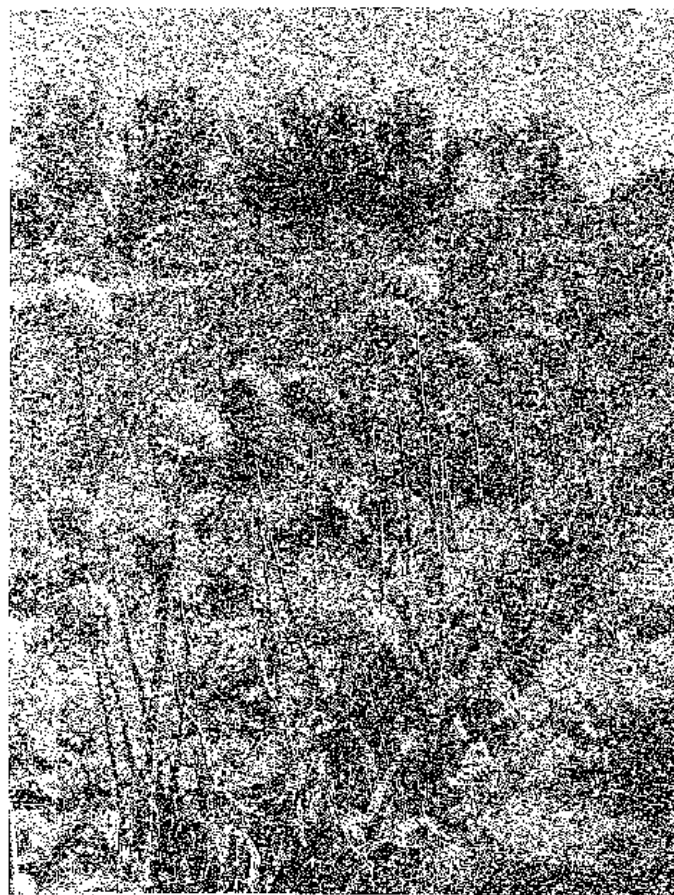
When the wheelbarrow is empty again, I remember the pile of weeds and borage and again aim for the path. A few armloads and I have the wheelbarrow filled, so I push it back toward the compost pile. There's the spade I used to dig garlic. Since we expect everyone to put away tools, I'd better scrape the spade and return it. While in the tool shed, I separate and straighten a jumble of hoes by the door.

Finally, the weeds are dumped on the compost pile and the wheelbarrow pushed back to its storage spot. The sprinkler isn't watering one hill of Crimson Sweet watermelons thoroughly enough, so I adjust the sprinkler one more time before going back into my office. I don't mind getting a little wet, but the spray hits me in the face, catching me by surprise.

I walk through the tomatoes back toward the building. The indeterminate Early Girls are branching out through the concrete wire cages, and they will soon flop out into the path, so I start pulling the branches back into the cage. My arms and hands turn green. There's an

orange tomato—and another, and another. It won't be long now until we can have plenty of table tomatoes. Oops, bare stems tell me that a tomato hornworm is at work here. Hornworms look so much like tomato plant stems—I have a hard time finding the busy glutton. When I do, the monster—almost a half inch in diameter and nearly two inches long—clings to the stem as I pull him off. I quickly drop the wiggling hornworm on the ground, step on him, and look the other way as I grind digested tomato leaves into the straw mulch.

On down the path is the cucumber patch with a row of blooming leeks in the middle. Thom Leonard casually asked in March when we were cleaning up the remains of last summer's garden, "Why don't you leave a leek or two to bloom?" I decided to leave the whole row. Now four foot-tall stalks rise out of Pickler and Straight-Eight leaves. Are those grapefruit-size lavender blossom balls on top real, or are they Dr. Seuss book illustrations? The honey bees and wasps hovering around testify that the flowers are real. I pick three large, too-mature yellow cucumbers and discard them on the path, as the blue truck pulls up into the parking lot. Four interns jump out of the back—finished for the day hoeing research plots at the farm on Ohio Street. Finished?! That means that it must be past 4:00 P.M. How can it be? I just left my office a few minutes ago to move the water sprinkler!



1991

Spring, 1991. Mike Hamm, Professor of Nutritional Science, Rutgers University, spends his spring sabbatical leave at The Land Institute.

April, 1991. Thom Leonard opens the Great Plain Bread Company in Salina. The bakery remains open until the end of 1993. Thom now bakes at Wheatfields Bakery in Lawrence, Kansas.