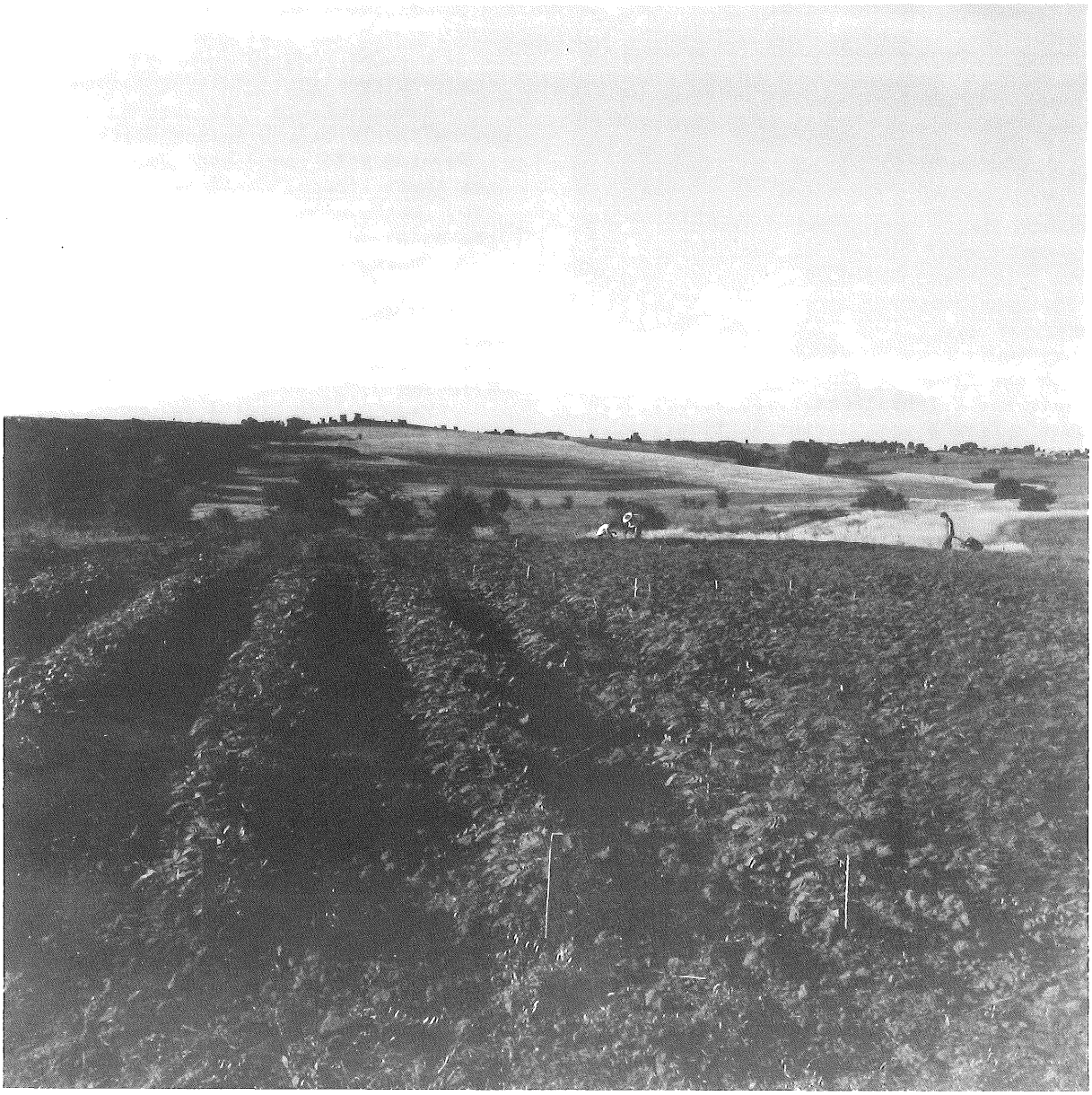
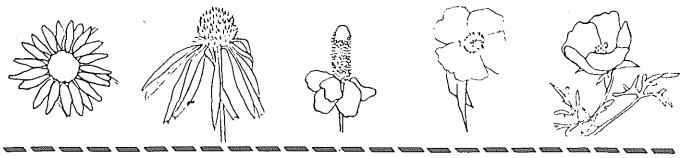


THE LAND REPORT

Number 19 Summer 1983

The Land Institute



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Summer 1983

PHOTOGRAPHS: Cary Nailing, Becky Pickett, Dana Jackson, Terry Evans, Underwood family

On the Cover

At first glance, this photograph looks like an old painting. Terry Evans took it one evening in July. She was on The Land's 160 acres, looking north over the new plots of wild senna.

At The Land

Ag Work Dominates Summer Schedule

"Who wants to pollinate today?"

"Should we mow in the Herbary, Marty?"

"I really could use some help weeding the Agrotriticum."

"Let's move that irrigation pipe over to the sweet corn today."

"Mark, do you need any help transplanting?"

"I need someone to help me take the hub off the Jacobs."

"Someone should put red tags on the Wild Senna."

"Are we finished with the barrel irrigation over on the hill?"

"What needs to be done in the garden?"

"Do we need to harvest any seed in the 4000 accessions, Walter?"

In June and the first half of July, it was usually cool when the summer crew at The Land gathered in the classroom to plan the day's work. The tasks were divided up fairly quickly. Everyone learned to restrain comments which invited discussion, even though it was difficult at first to break the pattern of the warm-up session which

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THE LAND INSTITUTE IS A NON-PROFIT EDUCATIONAL-RESEARCH ORGANIZATION DEVOTED TO A SEARCH FOR SUSTAINABLE ALTERNATIVES: AGRICULTURE, ENERGY, SHELTER, WASTE MANAGEMENT.

we have every morning from 9 to 10 during the regular term. But soon it became clear that to get the weeding, watering, harvesting and equipment maintenance done before 4:00 P.M., time must be used for work, not talk.

During the third week of July, when the temperature reached 100-105 every day, workers were allowed to choose their own hours. Some began arriving to work at 6:00 A.M., some worked mornings and evenings, and some chose to work afternoons and evenings so they could study in the morning. Communication was a problem, but by keeping a list of jobs and schedule of work times on the blackboard, we were able to maintain continuity.

This is the first summer, except for 1979 when we offered a short energy course, that there have been students at The Land. The new 43-week term encompasses the entire growing season: students began February 14 and will finish December 17. Until September, when the fall session officially begins, physical work dominates the student program. This includes regular maintenance and working in the vegetable garden, as well as agricultural research. The students must help Marty Bender and Walter Pickett take care of the 4000 accessions of perennial grasses, the Herbary, the Eastern Gama Grass plots and plots established for the plant breeding program. Individual experiments, which the students planned and planted in the spring, must be kept alive during the hot summer months. After a day in the sun weeding agrotriticum, the imagined glamour attached to the term "agricultural research," just dissolves! Still, seven students persevered this summer: Mark Böhlke, Cary Nailling, Juli Neander, Alex Stone, David Burris, Ruskin Gould, and Helen Atthowe.

Mental work is not totally abandoned in the summer. Although there are no daily classroom sessions with assigned readings, students must prepare for the weekly Thursday seminar in Agroecology. Most continue to read papers related to the biological questions involved in their particular experiments. An occasional "issues lunch" gives everyone a chance to talk over the progress of the nuclear arms freeze, the Agricultural Productivity Act, the Clean Water Act, and any other issues of concern.

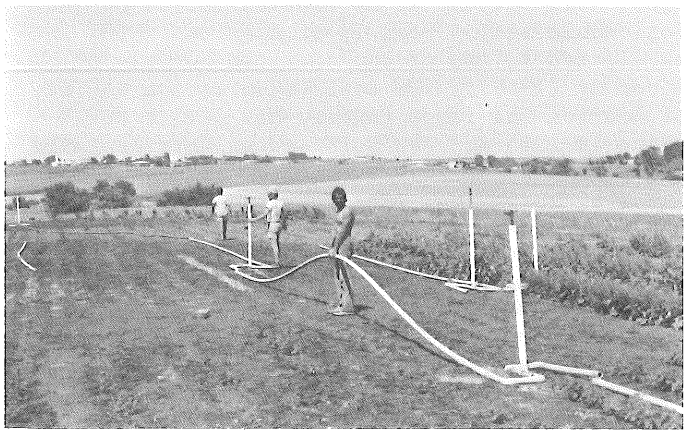
Marty, Julie and Cary at the Konza Prairie.

Three prairie field trips were scheduled during the summer months. Students visited the Konza Prairie in late June where they looked at the burn experiments. In early July, Dwight Platt of Bethel College led them through a sand prairie. After seeing the sand prairie, they drove to the Flint Hills near Emporia and camped overnight. In August, Land people will be guided on a short grass prairie field trip by Dr. Gerald Tomanak, President of Ft. Hays State University and former student of J. E. Weaver, the well-known prairie ecologist at the University of Nebraska.

Agricultural research activities have been supported this summer by the work of appropriate technology intern, Wayne Halozan, and summer employee, Scott Jackson. Wayne has spent much of his time repairing roto-tillers, mowers and tractors, but he has also been restoring an old plant setter which will probably be used for transplanting Eastern Gama Grass. Scott Jackson built a cart to haul water barrels, helped prepare the combine for harvesting seed, and worked on the barn.

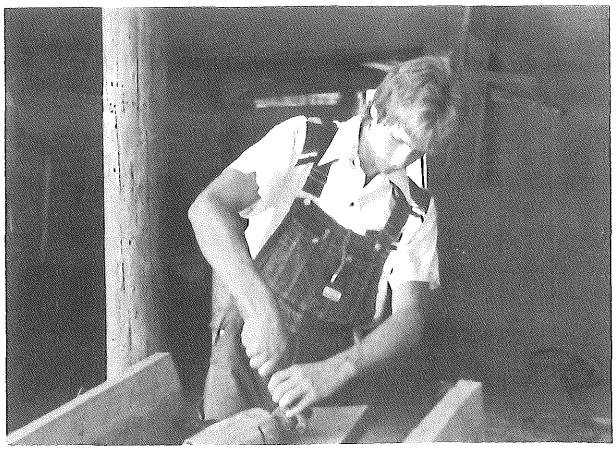
The rest of the summer crew includes Wes and Dana Jackson; Linda Okeson, administrative assistant; and Becky Pickett, lab technician.

Alex, Helen and Julie weeding Agrotriticum.



David, Marty and Mark moving irrigation pipe.

Wayne Halozan, Appropriate Technology Intern



Scott Jackson, summer employee.

1984 Agricultural Intern Program

The Land Institute will again be offering internships in sustainable agriculture for the term beginning February 13 and ending December 14, 1984. Each student will receive a stipend of approximately $80 a week for the 43 weeks, plus full tuition scholarships for the spring, summer and fall sessions.

Candidates should be graduates or upper-level undergraduates who are interested in pursuing a graduate degree. They should be comfortable studying scientific papers as well as books and articles exploring ethical, philosophical or social questions. Candidates should be persons concerned about environmental issues. Good health and stamina are necessary qualifications.

Persons interested in becoming candidates should write to The Land Institute for application information. December 1, 1983 is the deadline for applications to the 1984 program.

Bidwell Elected to Board

Orville Bidwell, professor of agronomy at Kansas State University, was elected to a three-year term on the board of directors of The Land Institute at the annual meeting on June 18, 1983. Dr. Bidwell is an elected fellow of the Soil Conservation Society of America (1968) and an elected fellow of the American Society of Agronomy (1968). The Soil Conservation Society of America has twice honored him with a Merit award in 1963 and the Outstanding Service Award in 1982. His fields of research have been soil genesis, morphology and classification, and he has numerous professional publications. Dr. Bidwell has been an encouraging Friend of The Land since 1979.

Terry Evans and Richard Courter, long-time Friends of The Land in Salina, and Dwight Platt, Professor of Biology at Bethel College, Newton, Kansas, were re-elected to second terms on The Land Institute Board of Directors.

1983
CALENDAR

Aug. 31	- End of Summer Session
Sept. 6	- Fall Session Begins
Oct. 2	- Visitors' Day
Dec. 1	- Deadline for 1984 Agricultural Intern Applications
Dec. 16	- Fall Session Ends

1984
CALENDAR

Feb. 13	- Spring Session Begins
May 26-27	- Prairie Festival
May 28	- Spring Session Ends

June 4 - Aug. 31 - Summer Session

Sept. 4	- Fall Session Begins
Oct. 7	- Visitors' Day
Dec. 1	- Deadline for 1985 Agricultural Intern Applications
Dec. 14	- Fall Session Ends

Fall Visitors' Day

Sunday, October 2, 1983 is the date set for the annual Fall Visitors' Day. Anyone interested in learning more about The Land Institute is invited to attend.

The program begins at 1:30 with an introduction to The Land's goals and activities. Tours follow. Some tours will be general, showing the overall educational-research program. Others will show specific aspects of the agricultural research. Visitors will choose which tour they wish to take.

At 3:30 P.M., Wes Jackson and Marty Bender will give a slide presentation on Draft Horses and Amish Farming, describing their summer tour in Ohio and Pennsylvania Amish country sponsored by the Draft Horse and Mule Association.

Visitors Contribute to Program

The Land has been fortunate from time to time to have visitors who contribute to the educational program. Some are invited to give special seminars; some make appointments to visit, and while here, offer to present their work or ideas to the group in impromptu class sessions.

Bruce Colman came from San Francisco to spend four days at The Land working with Wes on a book about sustainable agriculture. Bruce is the coordinating editor of a forthcoming volume, tentatively titled, Meeting the Expectations of the Land. Fourteen authors contributed chapters to be edited by Wendell Berry, Wes Jackson and Bruce Colman. The Land Institute students had the opportunity to read all of the papers submitted by the authors and discuss them with Bruce and Wes in three classroom sessions. The students' reactions to the articles, and their suggestions for the overall format of the book, were taken into consideration by the editors.

On March 30, Kirkpatrick Sale, author of Human Scale, came to The Land after lecturing at Kansas State University. He spoke about his interest in bioregionalism and the new book on that subject he is writing.

Two former Land students were invited speakers. Jim Peterson, completing a master's degree in history at Kansas State University, talked about historical efforts of farmers to organize politically, and focused especially on the populist movement of the 1890's. A former research associate, Mari Peterson, executive director of the Kansas Natural Resources Council (KNRC), and Mary Fund of the Kansas Rural Center, stopped at The Land on their way to western Kansas where they studied water resource problems. (see pg. 14). Mari talked to the students about the work of the KNRC and some of their goals, as well as Kansas water issues.

Early in May at The Land, Dr. Hugh Iltis of the University of Wisconsin gave a special Saturday afternoon seminar on the extinction of species. Four students had gone to KSU the preceding day to hear Dr. Iltis give a seminar on the evolution of domestic corn from teosinte, its wild relative. Dr. Iltis, a plant taxonomist well known for his theory on the evolution of corn, told about collaboration with Rafael Guzman at the University of Guadalajara, Mexico, to find Zea perennis, which is a surviving ancestor of corn. (Marty Bender, Land Institute Research Associate, travelled to Mexico with Dr. Iltis in the winter of 1980 to see the newly discovered Zea diploperennis in its natural habitat and collect seed. See L.R. #'s 8 & 9.)

Hugh Iltis photographing a Blue Funnel Lily

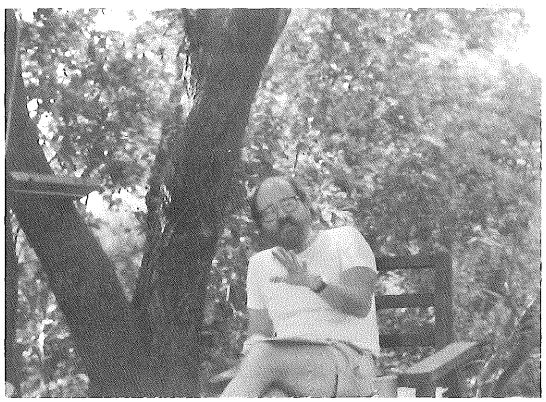
Dr. Iltis ended his seminar on corn at KSU with some strong points about the survival of the biosphere which has given us Zea perennis and Zea mays, the corn many depend upon for life. On Saturday at The Land, he discussed the threats to the biosphere through human actions. He sees that our increasing world population and consumption of resources puts in process those pressures causing extinction through destruction of natural habitats. Dr. Iltis expressed dismay that people do not want to talk about the problems of population growth or economic growth. As a taxonomist and ecologist, he kept pointing out that resource, economic, and population policies are all interrelated pressures on natural ecosystems, and we cannot afford to ignore the destructive impact of humans in the environment.

Angus Wright, Professor of Environmental Studies at California State University in Sacramento, talked to Land people on June 30 about the Green Revolution in Mexico. He explained that agricultural research in Mexico which led up to the "Green Revolution" was not "innocent," but was part of a political program. The research effort was requested by Mexicans and put forward by the Rockefeller people in the U.S. to maintain certain economic interests in Mexico. The new wheat benefitted large landholders, many who received government subsidies to build irrigation infrastructure for growing basic grains, but then turned to the production of "luxury crops" for cities and foreign export because the return was much higher.

Angus explained that Carl Sauer, geographer at the University of California, Berkeley, had criticized the Rockefeller approach, but was ignored. Sauer warned against recreating the history of U.S. commercial agriculture in Mexico. "Mexican agriculture cannot be pointed toward standardization on a few commercial types without upsetting native economy and culture hopelessly. The example of Iowa is about the most dangerous of all for Mexico," Sauer wrote.

Angus Wright will be taking a sabbatical leave in Mexico this next school year to study the use of pesticides in Mexican agriculture.

Some of the visitors gave impromptu talks at lunchtime, such as Gayle Warner and Dave Kreger, who talked about the water issues they had worked on in California with Friends of the Earth. Dave Pate and Albert J. Fritsch talked



Angus Wright

to students during lunch about the work they are doing. David is organizing a special Water Pavilion for the 1984 Louisiana World Expo., and Father Fritsch is the director of Appalachia Science in the Public Interest.

When the growing season is over, we will be much more flexible about discussion time with visitors. We are looking forward to the several days in early October when Daniel Luten, Professor of Geography at U.C., Berkley, has tentatively scheduled a stay at The Land.

MEMORIALS

Two Chinese Chestnuts were planted in memory of Robert C. Goering by his family. The trees are located near the E. F. Schumacher memorial trees, east of the apricot tree at the north end of the orchard. Other contributions in memory of Mr. Goering will be used to produce a color brochure for a self-guided tour of the Herbary.

Friends of the family of Vera Zimmer have made contributions in her memory.

CELEBRATIONS

A contribution was made to The Land Institute to celebrate the wedding of Anna Marie Rasch and David Greenbert.

Research Explained to Professors

Biologists and agronomists from Kansas State University, the University of Kansas, Emporia State University and Bethel College attended a special program at The Land on June 12. The staff at The Land invited the professors to acquaint them with their research on perennial plants and to invite their critique. They also wanted to explore the feasibility of a cooperative research effort with agricultural sustainability as its goal, and the possibility of agricultural interns continuing work begun at The Land Institute in graduate programs at the Kansas institutions where the professors teach and do research.

l. to r. - Marty Bender, Dick Marzolf, Alex Stone, Orville Bidwell, Wes Jackson, Lloyd Hulbert, Jim Hamrick, David Burris.

"I believe the time is ripe for 'pure science' and 'applied science' biologists to explore the interface between plant population biology/ecology and agriculture," Wes Jackson said in his letter of invitation.

The professors arrived at 4:00 P.M. After hearing a philosophical overview of the research efforts, they toured the research plots. The students explained their experiments and then invited visitors to ask questions and comment.

The meeting continued at The Land after dinner in a Salina restaurant. Sitting in a circle on the driveway next to the garden, to take advantage of the breeze and avoid the mosquitos, the guests discussed the direction of the research program with students and staff of The Land Institute and made specific suggestions.

Before the group disbanded for the evening, they agreed to meet again late in November at Kansas State University when The Land will have data from the summer experiments to present. In future meetings, the professors will report on aspects of their research which could be relevant to sustainable agriculture.

Those attending the program included Professors Orville Bidwell and Dan Rodgers, Agronomy Dept., K. State; Lloyd Hulbert and Dick Marzolf, Biology Dept., K. State; Jim Mayo, Biology Dept., Emporia State; Jim Hamrick and Craig Martin, Biology Dept., Univ. of Kansas; and Dwight Platt, Biology Dept., Bethel College. Two graduate students, Steve Burr (a member of The Land's Board of Directors) and Angus Wright, Professor of Environmental Studies at CSU, Sacramento, also attended.

Neighbor's Fire Burns Quarter Section

David Burris

On April 16, 1983, a neighbor's controlled burn, to the north of The Land's quarter section, became an uncontrolled prairie fire which escaped onto The Land's property, burning fifty acres. Even though it was a Saturday, we were all at The Land to plant, or so we thought at first. We all worked hard fighting the fire, but about the only effect we had was to save one of three experimental plots, designed, ironically, to test the effects of burning on the prairie.

When Wes noticed the neighbors burning their pasture, he began disking a firebreak on the north edge of the 160 where the property lines meet. However, he could see that wouldn't be effective unless all the grass litter were raked away, removing all available fuel, so he stopped disking.

The wind came up after the fire started and relentlessly pushed it across the fence line. When we realized the fire was out of control on The Land's pasture, we concentrated our efforts on saving the last of the three experimental plots by disking, shoveling and raking a fire break, and setting a back fire. Several people living along the road helped, plus fire crews and four fire trucks from two fire districts which answered the alarm. However, at the onset, two of the trucks got stuck in the mud while trying to get into position.

No one was hurt fighting the fire, and no damage was done other than the loss of two control (non-burned) experimental plots.

Prairies need fire (as well as grazing and periodic drought) to stay prairies. Burning eliminates tree competition, increases soil-available nitrogen, biomass production, and the number of forbs. But all of us at The Land were reminded that fire is a powerful force, and the danger of its getting out of control on the prairie is real.

"No"-On Principle

We knew that the rural water district, which had started out as Elm Creek District in Ottawa County, was growing by leaps and bounds. But we were surprised to discover that it had expanded into southeast Saline County and wanted to cross the east edge of The Land's quarter section to service subscribers east and south of us.

There is not enough space in this Land Report to include a feature on the role of FmHA-financed rural water districts in decreasing the number of farmers, creating urban sprawl, and converting prime agricultural land to urban uses. Look for this story in Land Report # 20.

Below is the explanation of our refusal to sign the Right-of-Way Easement which we sent to the Rural Water District # 2, Ottawa County, Kansas.

The Board of Directors of The Land Institute decided on June 18, 1983, that The Land Institute should not sign the Right-of-Way Easement requested by Rural Water District # 2, Ottawa County, Kansas.

We regret that we cannot cooperate with our neighbors, but to sign the easement would be to give approval to a project that The Land Institute has opposed on principle from the outset.

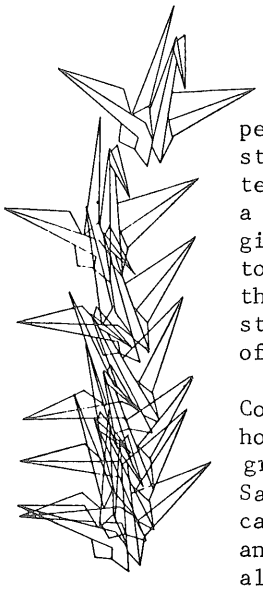
The Land Institute was established in 1976 as a non-profit, educational-research organization, dedicated to a search for sustainable alternatives in agriculture, energy, shelter and waste management. The main focus of The Land Institute is land, particularly the long-term ability of the land to support a variety of life and culture. We believe humans have the responsibility to protect the food-producing capability of the land for future generations by conserving soil and water and preserving agricultural acreage for agriculture. The research to develop perennial crops, which dominates our time and budget, as well as our other activities and programs, is an acknowledgement of this responsibility.

Federal agencies have been directed to avoid taking actions which contribute to the loss of agricultural land. However, the Farmers Home Administration, through its loans for rural water districts, has made it possible for home, commercial and industrial development to occur on good agricultural land. Ostensibly, water districts are supposed to aid rural people who suffer from the lack of good water. We support this objective as it can strengthen farming communities. However, the water districts have also been set up to service land which the owners want to turn into housing developments. The consequence is that housing developments, nationwide, have followed the creation of water districts. These districts can become quite large, as has Rural Water District # 2, as more homeowners and land developers request hook-ups. Eventually, the resulting leap-frog development patterns hurt farmers economically, because the dollar return on their crops does not rise in proportion to taxes. County services are strained as new rural dwellers require increased road maintenance, fire protection, law enforcement, etc.

The Land Institute cannot change past patterns of development in Saline County, but we believe we must promote land use patterns which preserve options for our children, who will live in a country with a shrinking energy and land base. Therefore, The Land Institute will not sign the Right-of-Way Easement.

Prairie Peace Pilgrimage

Juli Neander



On June 3, about fifty people gathered at the Trifinity statue near the Government Center in Salina, Kansas, to begin a 100 mile, nine day pilgrimage giving witness to our commitment to abolish nuclear weapons from the world. Among the walkers were students from The Land and Friends of The Land.

The Salina Center for Peace Concerns organized the walk after hosting the Bethlehem Peace Pilgrimage when they came through Salina last year. The walk was a call for the changes in ourselves and our communities that would allow us all to invest our lives in communities of peace.

Walking in the midst of passing cars, buses, and trains provoked thoughts of how our lifestyle prevents us from experiencing the beauty and the power of the environment. Walkers felt the sun, the sky, the wind, and the rain and sensed their connection to the earth.

The Native American people acknowledge the earth as mother. Their way of thinking and their understanding of themselves is rooted in their experiencing the land. The land is sacred. This belief enabled the Native Americans to develop a sustainable relationship between themselves and the earth. The Prairie Peace Pilgrimage was a call to restore that sustainable relationship.

Mainstream U.S. society does not view the earth as a "holy place." We see nature as an adversary to be wrestled with and beaten. From this belief we have given ourselves Three Mile Island, Love Canal and Titan, Minuteman, and MX missile sites. We have constructed weapons that if used will destroy the earth as a living organism.

We walked on this pilgrimage because this area where we live, which was once virgin prairie, is a sacred place. We walked because we could not stand by and watch the arms race continue preparing to destroy this sacred land.

We spent the first night at The Land Institute after an eight mile walk from Salina. From then on, we walked about twelve miles a day. Each night we were received in a small town between Salina and Wichita, where a potluck meal was provided for us. At each stop we presented our hosts and hostesses with a chain of peace cranes which Mineko Gillespie had made. The generosity of those people who met us along the way was healing and empowering.

We brought a film with us, Gods of Metal, which we showed each evening. The film addresses the buildup of nuclear weapons and how that affects all of us. The money spent on weapons is money that is not available for education, health care and other services. Many people who are protesting the production of these weapons are interviewed in the film.

The third day of the walk it rained steadily. Not far from Lindsborg a local farmer allowed us the use of his barn. He arranged bales of hay for us to sit on, brought us hot water, towels, a heater, and warm bread.

All along the way, people joined us to walk a few blocks or to offer us support in some way. One evening a man told us he had left his deathbed to come and listen to us. He donated $10 to the walk. A businessman from Wichita stopped along the road and walked with us for a while. He joined us again as we entered Newton and stayed with us for the rest of the journey. Later on as we were entering Wichita, a "street person" and Army veteran, Johnny Buffalohead, joined us.

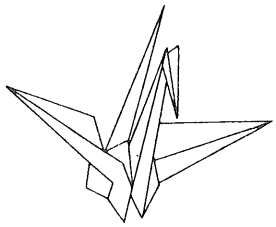
It is harder to say how we affected the people who saw us as we walked. Many cars would pass and honk or wave or flash a peace sign. The media came to interview us almost everyday. By walking we made our concerns about the arms race visible to all. Each person who saw us must have thought about why we were walking. Many people who came to share an evening with us expressed support and hope. I believe that just as they inspired us, the pilgrimage inspired them.

We held a vigil at Potwin where Titan missiles are based, ready to launch. Ironically, it was there that we saw the most diverse prairie. In Wichita we held vigils at McConnell Air Force Base, at Boeing Military Aircraft Company, at Beechcraft, Cessna, the I.R.S. offices and offices of our senators and representatives. The vigils took the form of collective prayers, time for silent reflection and the breaking of bread, a symbol of life.

After walking together for a few days, we were a very close community. Sharing meals, sleeping quarters and the patches of prairie along the roadside bonded us deeply together. We were aware of our vulnerability and dependence on those we would meet along the way. This combination of unity and vulnerability represents the strength of non-violence.

Walking required us to slow down, to take life one step at a time. It challenged the idea of racing for anything. It caused us to examine our lifestyles. We realized through experiencing such fullness how much we miss of the sky, the plants, the animals--and each other--when our lives are too busy.

There is the prairie, an ecosystem so diverse and subtly interwoven that its underlying unity is revealed only to those who take the time to stop in its midst and experience it. The vision of peace is that diverse and that subtle. But at the end of our prairie pilgrimage, we had changed in mysterious ways and had begun to see outlines of that vision.



The Fifth Annual Prairie Festival

Food and Peace

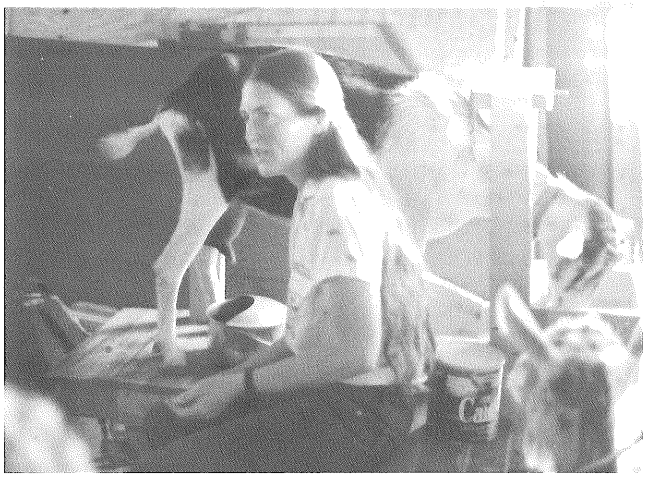
Dana Jackson

Participants began arriving Friday night, some from as far away as Mississippi. The campers set up tents amidst a thunder storm which poured down an inch of rain. An intensely hot sun dried the surface of the ground quickly on Saturday; Sunday was cool and pleasant.

This was the fifth celebration of the prairie ecosystem and prairie folk sponsored by The Land Institute, and the theme for 1983 was "Food and Peace." The invitation had promised fellowship, discussion, learning and inspiration. Because of the knowledgeable people making presentations and leading workshops, and the interesting and interested participants, this promise was fulfilled. Among those attending the Prairie Festival were persons dedicated to protecting the environment, promoting renewable energy resources, working for nuclear disarmament, encouraging organic farming and gardening, alleviating poverty and hunger, and achieving greater justice and opportunity for women, minorities, and small farms. Rather than compete for attention to their particular causes, the participants exhibited a mutual appreciation of each other's work, cooperation, and a good sense of humor.

On Saturday afternoon, a large group attended the introduction to The Land's research program. After hearing an explanation of the vision of a sustainable agriculture based on the ecosystem of the prairie, the group visited the research plots and listened to students describe their experiments. At the edge of a new plot of Wild Senna, Wes told them that The Land really could use their help weeding, and he asked everyone to stop and pull weeds for three minutes. Chuckling in disbelief, and then at the audacity of the request, they bent over and pulled weeds, discovering how long three minutes can be!

Approximately 350 people gathered in the barnyard to hear Frances Moore Lappe speak on Saturday evening. Just as I began to introduce her, a lovely, colorful balloon floated into sight and descended toward the audience. After exchanging greetings with excited people in the audience, "Whoosh," the balloonists turned on the propane heater to lift the balloon, and we waved good by. Before I could resume the introduction, a second balloon appeared, then a third, and I realized that the prevailing winds were bringing all the balloons in the Memorial Day Weekend Balloon Races over The Land. But people had come to hear the author of Food First and Diet for a Small Planet speak, so I finished the introduction, and Frances came to the microphone. As the balloons kept coming, Frances began her talk, pausing for the "Whooshes" to subside when she couldn't speak over them. She was determined to



Pat Brehm - "So You Want to Keep a Dairy Goat?"

Marilyn Jone - Cheese Making

Brenda Reid - Establishing Fruit Trees

The "More with Less" Food Fair on Saturday afternoon featured practical workshops on making cheese, keeping goats, beginning beekeeping, tofu making, home fruit and nut production and food drying, as well as discussions on diet and food co-ops. Becky Pickett and Terri Nash (below) helped about forty children make healthy snacks, popcorn, granola bars, and "ants-on-a-log."

Contd. from pg. 9

keep the audience's attention, and they responded respectfully by keeping their eyes glued on her. The balloons kept coming, but few watched, much to the astonishment of the balloonists.

Frances spoke on the topic: "Food, Hunger, Despair: Is there a Politics of Honest Hope?" As we see the economic models of capitalism and stateism (Soviet model) fail to meet human needs, we fear that perhaps there are no answers. Ms. Lappe said that to get the courage to overcome this fear, we must hone our outrage and look honestly at realities, such as that in spite of a per capita increase in world food production, there is more hunger. We must not be lulled by "development" rhetoric, nor dulled by statistics. We must develop a vision for society that will pull us along. "Can we develop economic policy directly related to our moral and ethical values?" she asked. We should look to examples around the world where organizations have gone beyond the economic dogmas to initiate new schemes of worker ownership, land reform, and health and food programs. Frances reminded the audience that the work of committed minorities changes history. She concluded with a Chinese poem:

Hope cannot be said to exist,
Nor can it be said not to exist.
It is like the roads that cross the earth,
For in the beginning there were no roads.
But when many people pass one way,
The roads are made.

Following the speech, a folk trio, The Road Less Travelled, performed songs and skits and showed slides, making connections between world hunger and high material consumption of Americans.

Although the Festival theme was "Food and Peace," prairie appreciation activities were also scheduled. Wes Jackson and Marty Bender led two groups on a hike of the quarter section Saturday morning, and Marty conducted a session on propagating prairie plants on Sunday. There was a prairie wildflower walk for children, a bird walk, and an exhibit of prairie photographs by Terry Evans to enjoy also.

On Sunday morning it was difficult to choose which of many challenging presentations to attend, such as "Hunger and U.S. Policy in Central America" with Jan and Neal Flora (K. State Univ.), or "The Ecological Effects of Nuclear War on Food Production," with Joan Ehrenfeld (Rutgers), or "U.S. Farm Policy: the Tail that Wags the Dog," with Marty Strange of the Center for Rural Affairs. Everyone gathered for the roundtable discussion on Central America at noon. Those on the panel (Jan and Neal Flora, Paul McKay (Bethel College, Newton, Ks.), Frances Moore Lappe' and David Ehrenfeld) had worked in Guatemala, Costa Rica or Nicaragua.

The concluding program began at 3:00 P.M. after the potluck lunch with David Ehrenfeld as the speaker. In his talk, "Looking Ahead: Hopes and Challenges," David took up where his book, The Arrogance of Humanism, left off.

> "I never intended to concemn human ingenuity wholesale, only to point out that human ingenuity is trapped and is floundering. Our task, our challenge, and the challenge of the next generation, is to rescue human ingenuity, and that is going to be some rescue!"

David then outlined features of the new technology that will help us rescue human ingenuity and described the kinds of social forces that might let such a new technology grow and flourish. He said that new technology has to work in tandem with artistry and craftsmanship, rather than superceding them. It should never waste resources nor be allowed to increase the amount of ugliness in the world. The new technology should be designed so it doesn't gratify or stimulate any fantasies of power and destruction, but built into it should be limits of human power and the responsibilities of stewardship.

David's hopes for social forces which might let such a new technology grow were modest. He spoke of hope for a change in the prevailing world view that dominates the planet and concluded: "It is imperative that we act as if we knew that the right kind of change were going to come in time."

Attentive audience hears Marty Strange.

David Ehrenfeld- Technology and Food

At the conclusion of the program, members of the audience were asked to carry their chairs to a truck to be loaded and returned to Salina's First Presbyterian Church. The cheerful clanking of chairs as everyone cooperated fit the mood of the audience after the talk. Food and Peace for all the world is a hope, an ideal to work for, and everyone must carry some of the responsibility.

Land students Helen, Margo & Debra load chairs.

Paul McKay, Neal Flora, David Ehrenfeld and Francis Moore Lappe'

Alternatives in Waste Management

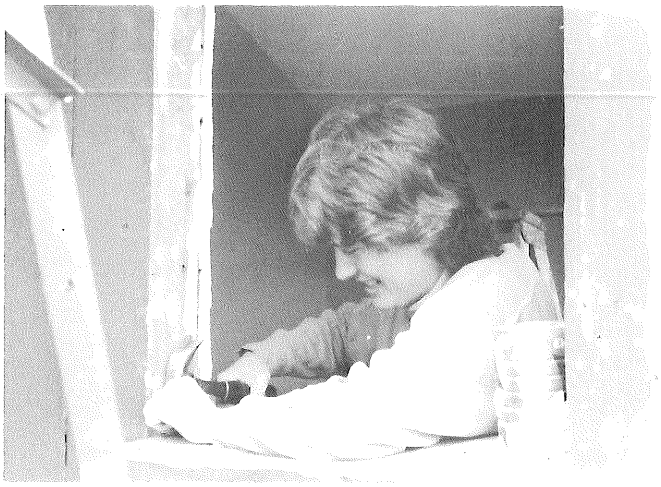
Redecorating the Composting Toilet

Debra Israel

As described in the spring Land Report, our composting toilet system here at The Land is relatively simple. However, it still requires maintenance attention. This spring Juli Neander and I opened up the barrels to see how the composting was progressing. We found barrels at various stages. We were excited to find that the contents of one was ready to spread; it's now fertilizing our fruit trees. Two other barrels are well along the way and need to be rolled more often for aeration. Some of the barrels were too wet and full to even roll, so we proceeded to add more dry matter and let them evaporate during the day. Unless they are rolled and are dry enough, very little aerobic decomposition occurs, and the composting process takes much longer. We were pleased that during the Prairie Festival people followed instructions well, so the barrel filled then should be dry enough and compost well.

Our other goal in improving the existing toilet was to make it a more pleasant place. So Terri Nash and I began an interior rejuvenation project. Though we thought it would be a week-long project, the completely redecorated toilet was not ready until just in time for the Prairie Festival! Unfortunately, Terri was unable to help with the majority of the construction work after hurting her back by falling off the toilet. That doesn't sound like a very impressive fall, but keep in mind that a 55-gallon drum is a lot higher than a conventional toilet seat! However, when visiting The Land, be sure to notice the informative and artistic posters that Terri made.

For my part, I was excited to learn some construction skills. I gained practice in hammering nails, sawing wood, hanging sheetrock and painting. Margo, our Appropriate Technologist intern who supervised the project, was patient and encouraging even when it seemed that I'd never hammer enough nails in.



Once we were working on the project, we kept thinking of more improvements to make. The completed room has a light blue interior, with black frames edging the windows and doors. We built steps up to the barrel, covered with mats for those inevitable muddy days (somehow we couldn't see convincing people to take their shoes off so the composting toilet wouldn't get muddy!) We cut out two windows for air and light, and I made batiked curtains for one of them. I also had fun making a shelf for toilet paper and reading material. We didn't neglect the outside either. Willow and Eric painted it with a fresh coat of barn red. Alex learned to use the router and made two wooden signs, one saying "WORLD HEADQUARTERS" and the other to designate it female for the Prairie Festival.

Another high point in the reconstruction was when Alex and Margo hooked up the light to the photovoltaic panel that Alex and Juli installed on the south of the classroom building. Now with windows and a light, the composting toilet can be used at any time of day! And during the Prairie Festival, that's what happened. Probably the most pleasant surprise is the lack of bad odors, as long as the lid is kept down and enough dry material added. If you do come to The Land, visit the toilet--if only to prove to yourself that outhouses don't have to be a step backwards!

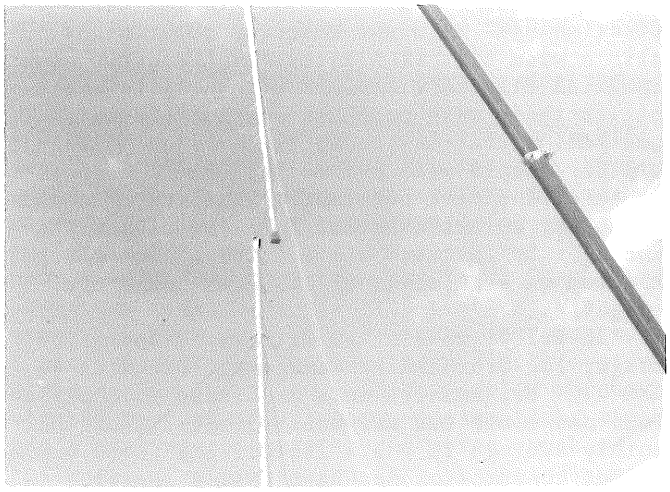
KNRC Lobbying Conference

Kansas' one approved hazardous waste burial facility near Furley, Kansas, has been a subject of controversy for six years. In 1982, it was closed because carcinogens were leaking from the site into nearby wells and a spring. The Kansas Department of Health and Environment must decide this year whether the facility should reopen.

Shirley Dienst, a Furley resident who led the fight to close down the site, will talk to Kansas environmentalists about this issue at the Kansas Natural Resources Council (KNRC) Fall Festival and Environmental Lobbying Conference on October 15 at Camp Wedeman near Augusta, Ks.

Saturday afternoon the program will feature presentations and discussion on other state environmental issues, such as the State Water Plan and the Wolf Creek nuclear power plant also. On Sunday, the 16th, the conference will set priorities for the 1984 legislative session.

This is the fourth year that Kansas environmentalists have met to coordinate legislative action on environmental issues. Previous conferences were held at The Land Institute, but organized by KNRC. Further information on this year's meeting can be obtained from KNRC, P.O. Box 2128, Topeka, Kansas 66603.



Wind Energy Reaches New Heights

Dana Jackson

Those who have been at The Land Institute in the summer months have noticed our motionless wind generators. We hope to have them back in action this fall.

The Jacobs wind generator needs a different hub, among other things. We have to keep reminding ourselves that though this is the Cadillac of DC wind electric machines, it is at least a thirty year old Cadillac. The Land was fortunate to purchase another Jacobs wind machine at a farm auction this summer. By combining the best of the two machines, we should produce one which runs well.

The Bircher Machine Shop (BMI) induction generator has never been satisfactory. We finally decided that the manufacturer would not and could not repair it, so it must be replaced. John Craft, who began working on wind energy machines at The Land in the summer of 1977 and is now employed by Winpower of Newton, Iowa where they manufacture a machine he designed, offered a substitute. He agreed to install a prototype of a new design to test at The Land. This will go up sometime in the fall, and we shall describe our experience with it in future Land Reports.

Margo Thompson, appropriate technology intern, instructs students about the active solar heating system. The photovoltaic panel can be seen in the right hand corner.

John decided that before we put up another machine to replace the BMI, we should increase the heighth of the tower. It was hard to imagine another forty feet added to the existing tower, which has been up six years, and we were afraid it would loom up and dominate the landscape. But we bought a length of pipe to make the addition, and Scott Jackson welded steps on and painted it silver. On June 29, John Craft arrived in the morning to get everything ready to mount the addition. He had engaged the crane for 3:00 P.M. and, surprisingly, he and Scott and Wayne Halozan were ready when it arrived.

First, the crane lowered the BMI. Then, with amazing accuracy, it lifted the pole and dangled it over the top of the existing tower. John secured it with bolts and then welded the two sections together. Scott and Wayne had prepared the guy wire mounts on the ground, so John was able to attach the new wires to the addition. Wayne and Scott removed the old wires the next day.

The taller tower is familiar now and is not unaesthetic, as we feared. We wonder if students will be as eager to learn about wind energy machines from eighty feet in the air as they have been from forty-five. But, as Wes quipped, "The mean lethal height is thirty-two feet anyway, so the extra feet won't make any difference!"

An Uncertain Road

Mari Peterson

Amid spring rains and garden planting, Mary Fund of the Kansas Rural Center and I departed from our fertile, green surroundings near Topeka for a two-week adventure into western Kansas. Leaving Salina on I-70, we felt the spaces open up. Our mission was different from that of our fellow interstate travelers who zipped by with eyes glazed, looking for mountains. Through our trip, Mary and I hoped to obtain a better understanding of the forces affecting western Kansas, particularly the depleting aquifer and troublesome farm economy.

Reaching Hays, we still sensed an "eastern" ambience though Hays is miles from another large town. Shopping malls with franchise stores, a university, and a community of artists gave a sense of familiarity to a town we had not seen before. With friends in Hays, we compared notes about people and places farther west and charted our course.

It was the following day, in Liebenthal, that we knew we had arrived. We pulled into the old gas station which has been converted to the "Art Station". The young woman proprietor reminisced about days she'd spent organizing markets for organic produce. Now her product is art, and her market, uncertain. I crossed the quiet highway and dropped an urgent letter into the mailbox. I heard the letter hit bottom in the empty mailbox, and at that moment my concept of time was transformed.

Mary and I pulled onto the sleepy highway and headed for Cedar Bluff Reservoir on the Smoky Hill River. Western Kansas reservoirs, built for irrigation purposes, are mostly in the northwest; and like most, this one is filled to only 10% of capacity. Many fingers of the reservoir are overgrown with grass and brush, making mockery of the mushroom-shaped picnic shelters above.

The dryness was more than a visual reality as our lips became parched and our thirst persistent. Heading to Quinter for the night, we traveled through areas of dryland farming where much of the land lay fallow, some from wheat disced under by farmers taking advantage of the Payment-in-Kind (PIK) program.

We ate supper with a family in Quinter. I heard fascinating stories of the geology and history of the area--of formerly abundant springs, Indian campsites, and fossils. That evening we visited with the leader of the American Agriculture Movement in Kansas and heard of his impending farm foreclosure and the similar fate facing others in the area. It's a lonely battle, as communication among farmers and assistance for those with loan problems are poorly developed as yet.

This discussion continued the following morning in the AAM state office in Quinter. The office manager said she receives about eight calls a week from farmers across the state near financial disaster. Though some help is available to those with problems on their Farmers Home Administration loans, there is no para-legal help for people with Production Credit Association and Land Bank problems. In a nearby community bank, 20 business and farm foreclosures are pending. By fall and winter, the office manager expected an escalation of cases as loans are renegotiated.

In Colby, we visited with Wayne Bossert, manager for Groundwater Management District #4 (GMD 4). Mr. Bossert once processed 15 applications per month for new well permits. Now that monthly average is one. The driving force behind reduced consumption has been rising energy prices, and the most prevalent response has been a switch to less water-intensive crops such as sorghum and soybeans. GMD 4 is actively pursuing public education and involvement in water management. Controls on water use seem necessary, and several measures are being considered. Mr. Bossert has urged the state Division of Water Resources to take a more active role in enforcing water quotas. The district has already implemented mandatory metering of new wells. Mr. Bossert's current emphasis is promoting conservation and assessing priority uses. The latter is difficult, given Kansas water law, since the water is appropriated to users on a first in time, first in right basis. Can low priority users have restrictions placed on their consumption? If not, how can the district enforce reductions in water use without violating appropriated water rights? This year the problem is less urgent, as Mr. Bossert expects a 50% reduction in water use caused by farmers laying irrigated acreage aside under the PIK program.

While in Colby, I visited people involved with a new subdivision called Eco Acres. Restrictive covenants bind subdivision residents to codes for minimizing energy use, including passive solar homes and lawns of buffalo grass. The concept is fairly new, and those few enthusiastic people felt relatively isolated in a community not yet attuned to the value of low energy-consuming lifestyles, but their example offered hope.

Meanwhile, Mary visited with other Colby residents and became disillusioned about their awareness of the water and farm economy problems in the surrounding countryside. One attorney was not concerned that the farms were being sold because he knew most of them were purchased by local people. Mary learned, however, that these

Mari Peterson was a research associate in energy at The Land for two years. She is now executive director of the Kansas Natural Resources Council (KNRC) in Topeka.

were local investors, not local farmers.

From Colby we headed for Wallace and Sharon Springs, crossing the Smoky Hill River twice along the way. At the first crossing we saw eight mule deer drinking from the narrow stream. At the second crossing, the bed was dry.

The sign on the highway advertising the Home Cafe with "Midwestern Cuisine" was tempting, but we were on our way to a potluck and public meeting in Sharon Springs. The program, sponsored by Mount Sunflower University, a "free university", was on the prospects for energy self-reliance, and I was the speaker. Thirty people attended, many from the local Chamber of Commerce. The rural electric co-op serving the area will soon pass on a 50% rate increase to their customers as the Sunflower Electric power plant begins operation. These people, who have already reduced their energy consumption, sought additional ways of easing the price shock. Following my presentation, the Chamber discussed such matters as the Spring Fling, unemployment and sales taxes, the need for kids to work, and ways to repair the town billboard. I sensed a cohesiveness in the group and a vitality in the town.

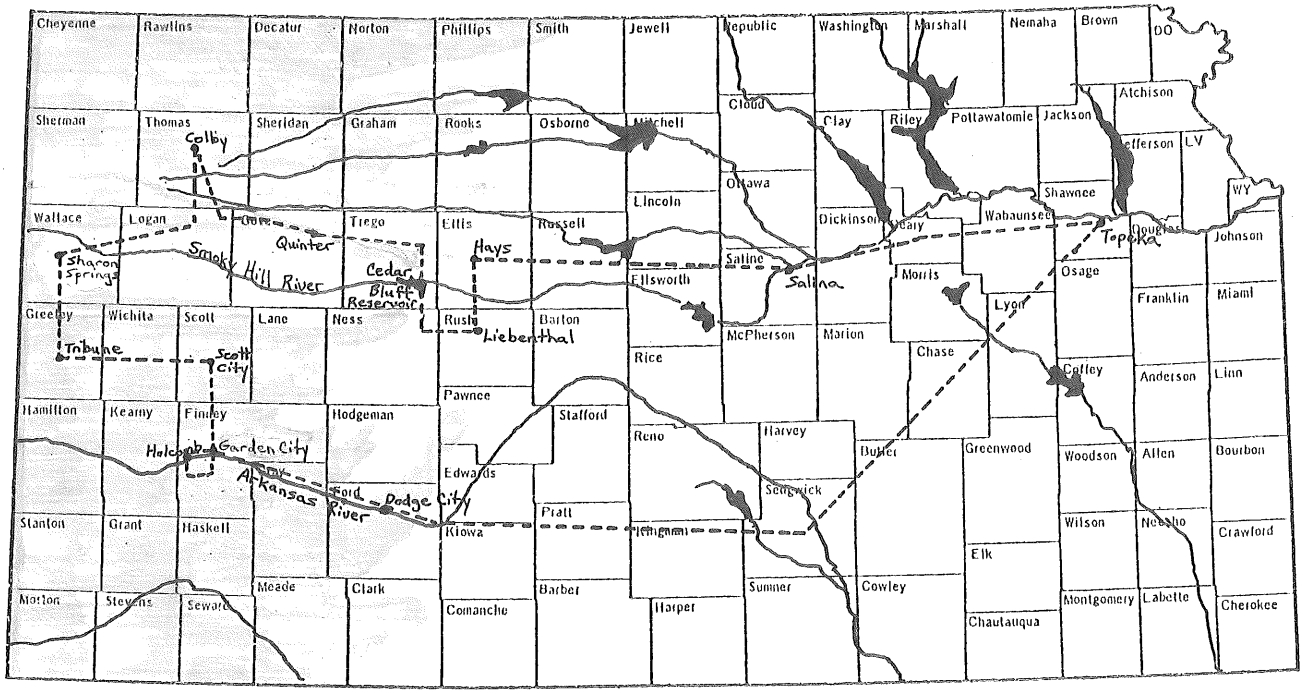
We spent the night in Wallace with a friend. She commented that in a small town, raising a family has helped her to feel more a part of the community. The free university has served an additional need of enhancing her personal growth in an area far removed from culture and new ideas.

Heading south from Wallace, Mary and I felt what we perceive to be the High Plains--vast stretches of land with sparsely vegetated pastures, "tumble weeds" blowing across dry river beds. This must be God's country; one feels small and humble here. As we approached Tribune, we came upon land with considerable irrigation. One also feels small and humble when parking the Ford Escort amid four-wheel-drive pickups at the Tribune Cafe. The talk in Tribune was about whose crops had been damaged by hail the night before.

Driving east to Scott City, we passed many feedlots and towns, such as Marienthal, which struck us as being corporate centers for corporate agriculture--far more grain storage and chemical facilities than homes.

In Scott City, we intended to see Keith Lebbin, manager of Groundwater Management District #1, but he was out on a cloud seeding/hail suppression mission as part of Operation Muddy Roads. Mr. Lebbin believes Mother Nature can be coaxed into being more gracious with a little human assistance. (His counterparts in districts #3 and #4 have accepted nature's endowment and have decided to work from there.) Mary and I visited with Mr. Lebbin's secretary, Neta. GMD 1 has the worst water depletion problems and hence was the first district formed. Partly because the region did not have an abundance of water to begin with, large segments of the district lie over areas where the aquifer is depleted in excess of 50%. The drawdown on the aquifer here averages 20 inches per year while the recharge rate is ½ inch per year. In reponse, the district has stepped up enforcement, especially with injunctions to reduce irrigation run-off.

We capped the day with supper at a greasy spoon called the Graham Cracker Cafe and caught a good night's sleep at the Chaparral Motel. Saturday morning we departed for Garden City and the 3-I show (industry, implements, and irriga-



tion.) We drove through a town appropriately named Shallow Water and across some very flat land. For those unacquainted with Kansas, this was the first flat land we saw in a week. Though this stretch was monotonous, western Kansas as a whole is very beautiful if one has an eye to grasp subtleties.

The 3-I show brought meaning to the word "BIG". Mary photographed me in the tire well of the Big Budd--the largest tractor ever used. An irrigation equipment vendor advertised, "We sell rain." We walked for half a day among irrigation and farm equipment displays, testing our ability to identify these pieces of equipment. One thing that surprised me was the number of Mennonites at the show; apparently they own large farms south and east of Garden City.

Later that day, Mary and I walked across the Arkansas River bed at Holcomb. Parched trees and dry, crusted ground on the river bed spelled a "valley of death." The only sign of the previous week's rain was the faint, dead fish odor. No words describe the experience of being in a place like this.

Western Kansas seems healthy now with busy mainstreets in many small towns and Garden City sprawling outward from the growth of agricultural businesses. But as Mary and I crossed dry river beds, we couldn't help but think of what this portends for the future of the region.

We continued to drive through the sandhills south of the Arkansas--rugged sandy hills with yucca holding tightly, patchworked by acres of irrigated corn, wheat, and alfalfa. We spotted few farmsteads, but several lots of trailer homes for hired hands.

Monday we met with Mike Dealy, hydrologist and assistant manager for Groundwater Management District #3. Last year this district began a public information program. Interest has surged with 120 people turning out at the board election this year. Mr. Dealy has noted a drastic reduction in well permit applications, with one notable exception: Kearney Feeders, Inc., applied for 44 well permits for an area south of Garden City containing one of the largest remaining stretches of sandsage prairie. Public protest ensued, even from those with large irrigation tracts nearby. The district, in response to a circulating petition, scheduled a public meeting for early May to discuss the possibility of declaring the area an Intensive Groundwater Use Control Area. If so declared, the area could be closed to further permitting with the potential for also controlling existing water use.

The Arkansas River Bed at Holcomb

While the district has the means to stop new development, it is faced with the prickly question of what to do about existing development. Percentage water allocation cuts across the board may conflict with the state's Prior Appropriations Act. But to implement a sliding scale reduction with greater restructions placed on those holding the most recent permits could "raise hell"--later users have a much higher investment cost to recover.

For two years, GMD 3 has required the installation of meters on a variety of wells. It has monitored cases of over-pumping, encouraging farmers to comply with the regulations. The greatest reductions have come from the farmers themselves who, for a variety of reasons, have adopted a stronger conservation ethic. While the district has a two year old waste water program strongly supported by the public, the farmers have reduced water waste voluntarily through the development of tailwater pits to capture and recycle flood irrigation run-off and through placing low pressure nozzles on their center pivot systems. Research of surge irrigation and irrigation scheduling is being monitored by the district for potential future application.

Few western Kansas people seem to take seriously the proposals for major water transfers and aquifer recharge projects. The aquifer has many geological "pockets," and even if a water transfer from, say, the Missouri River were affordable, there remains the big question of how that water would get distributed through the region. Someone would have to own and distribute that water, leaving the farmers in the clutches of yet another utility.

Though I am encouraged by the steps farmers are taking to reduce their water usage, beyond a point the need for some mutually agreed upon regulation is essential. The aquifer is a common property resource and, as such, is subject to the dilemma Garrett Hardin presents in "The Tragedy of the Commons." "The essence of the tragedy of the commons is that one's own contribution to the problem seems infinitesimally small, while the disadvantages of self-denial loom large; self-restraint therefore appears to be both unprofitable and ultimately futile unless one can be certain of universal concurrence." (William Ophuls, Ecology and the Politics of Scarcity.) Herein lies the responsibility and promise of the groundwater management districts.

In Garden City and Dodge City, I spoke at public meetings sponsored by the Kansas Natural

Resource Council. At the meetings I raised questions about the potential for converting irrigated acreage to dryland farming over the next few decades. Also, what will the local, post-aquifer economy be like for the cities? There are no answers to these questions now. People sense the need to plan for these inevitable events, but the road to the future is uncertain.

Leaving Dodge City, I passed the "headwaters" of the Arkansas River in Kansas--the MBPLX meat packing plant's effluent system. And I passed the great institutions of the west: John Deere Co., Caterpillar Co., the Winnebago dealer, and the voice of agribusiness, the High Plains Journal.

This region is unique in its land, its problems, and its potential. As I left Dodge City, I realized the need to return frequently to better understand how this region's future will unfold.

Hydroponic Corn: Insanity in the Sandhills

Robert Mohler

I have lived in a small town near the Sandhills in central Nebraska for over a year and a half. The town and its economy are agriculturally based. My job brings me in contact with farmers, with people in agricultural-support businesses, and with natural resources policy makers in government. I have become dismayed by the effects of agricultural development based on irrigation, especially in the Sandhills.

The Nebraska Sandhills have received some notoriety in the last few years, largely because they overlay part of the greater Ogallala groundwater aquifer, whose "unlimited" capacity is rapidly being diminished. The Sandhills are being converted, by multi-section tracts at a time, from native sand-grass prairie to center-pivot-irrigated corn fields. It's becoming fairly well known how this well irrigation is depleting the groundwater reservoirs, and how some of the nitrogen fertilizer escapes use by the corn only to permeate into and pollute the water table, and even how farming in the Sandhills soils amounts to no more than large-scale hydroponics, because "everything" the corn needs to grow is supplied into the irrigation water through the pivots. But there are more immediate consequences from Sandhills development that have equally serious and broad-range effects.

The Sandhills are piles of wind-deposited sand, but they are not homogeneous from top to bottom. Interlaced throughout the sands, in a random manner that no one has identified nor has begun to explain, lie lenses of clay. In some places, water poured on the surface will disappear before one's very eyes into the sands, and in others it will stand for years until evaporation wins the final hand. Natural selection, diversity of species and population dynamics, in the processes we call Nature, have sorted the native plants throughout these microclimates by soil type, leaving the thirstier ones where water is available, and the more xeric where it is not. To the casual passer-by, everything looks about equal. He would not suspect the stark differences that might exist only an inch beneath his feet. So the rain, when at last it comes, is used at differing rates by different plants so that they all survive until it rains again.

The developers come. They strip away the native vegetation and plant corn. And then to add insult to injury, they add water. More water. Water on the corn, water on the soils, more water than the soils have ever seen before. Ten inches, fifteen inches, twenty inches per year on all the ground, more than since before the sands themselves were carried here. In the coarse soil, the water sinks away. But on the clays, the prairie potholes where the patches of water-loving plants had been, the water puddles. The puddles grow to acres. The acres combine and form lakes. Many pivots circle wheel-deep in water for more than half their area. Pivots get stuck. Inaccessible corn becomes unharvestable.

But man has more than one machine. Bulldozers appear. Ditches are dug to drain the water away. Tile lines are laid to drain the water away. But in the Sandhills there is no "away." Every hill is as high as the next one. Every depression (they can't be called valleys) is as low as the next one. No natural drainage pattern has ever been developed in some areas. The native vegetation has always been able to handle all the water there was. But now, ditches become huge slashes through the hills, trying to find "away."

From a large farming operation comes a larger drainage operation. The problems multiply. The ditches in some places also drain adjacent lands which are still in native prairie. The high-producing native forage is deprived of its water and is replaced by less productive, water-conserving plants. The adjacent landowner's cattle now become fewer in number.

And downstream, where there is a "downstream," the waterways are constantly overflowing by waters which never came this way before, many of which originated hundreds of feet in the ground. The native, sub-irrigated meadows now become marshes. The high-producing native forage is drowned; rough sedges and rushes move in. The landowner's cattle now become fewer in number.

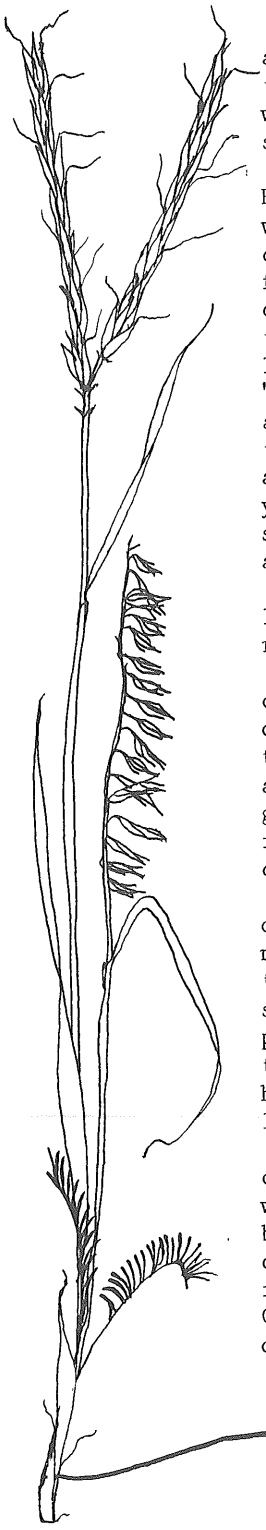
Continued on page 20.

Robert Mohler is the District Engineer for the Lower Loup Natural Resources District and lives in Ord, Nebraska.

A Sense of Place

Words of the Prairie

Ruskin Gould



It was a beautiful, cloudless day late in February. Patches of snow from a long past snowstorm still speckled the landscape, but it felt like springtime. The air was still very cold, but once out of the wind and working hard, we were soon rolling up the sleeves of our flannel shirts. This was to be a special day, one I will always remember, for I entered into a new world.

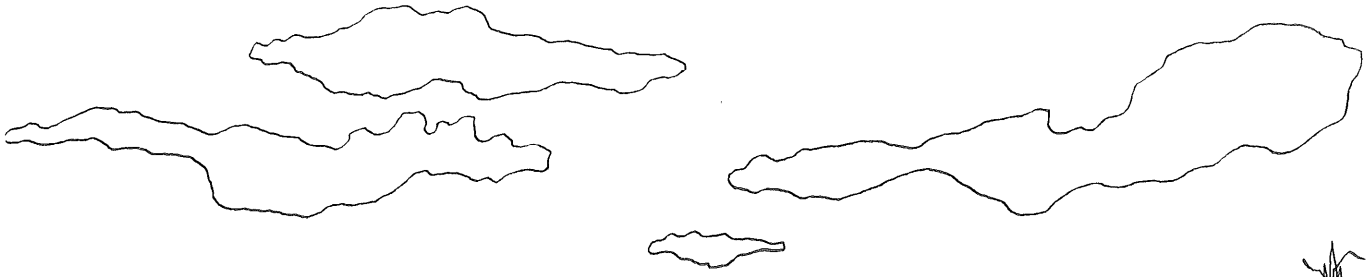
I was with a few other students working on the west border of the 160. Running the entire length of this side was an old, rusty barbed wire fence. We were trimming branches from trees and clearing out brush to make a clearly defined path on the edge of the property. Soon we would be replacing the old fence with a new one. It was getting on towards quitting time when Wes came down to see how things were going, and after looking around he called us together for a quick talk. The leaves underfoot crunched softly as we all looked out from our little shelter of honeylocust trees. I felt warm and cozy. "As you go about your work," Wes began, "take a little time out now and then and look around you." Well, of course, I thought. I had already started to do that. I rode by two sides of the 160 twice every day. The problem was, as far as I could tell, everything was dead. The prairie was one big mass of faded yellow. Sometimes I almost cringed when looking at it. How desolate things seemed. "And as you look around let this land begin to grow on you. While you are here this land is also yours."

The sun was getting very low but it shone with amazing clearness over the 160. Suddenly everything stood out for me, beckoning to be looked at and recognized. The air itself had come alive.

Within the next year I will be finishing my undergraduate degree in chemistry. From my training in science, I can quantify and categorize things, correlate and inter-relate them, and devise models and theories for them. From the massiveness of interplanetary motion to the unimagineable smallness of subatomic particles, the means to understanding such phenomena are all within my grasp. It is but a matter of discipline and time until finally the insight into the unifying concept of a given area unfolds itself before me. So I decided to learn the prairie.

Armed with sheets of paper, a handful of colored pencils, and a few books on identifying plants of the prairie, I bravely strode onto the prairie's native grass pasture on the 160. I knew there was something out there, something I could grab onto and make sense out of all this. What about the hyperspaces of interacting plants or equilibrium reactions leading to distribution patterns of plant communities? No, these were not general enough. Surely though they must be special cases of an even larger overarching principle. I had it. They were all to be explained within the Laws of Thermodynamics, the laws which defined all worldly phenomena.

Not it was just a matter of paying my dues to discipline and time. I chose my first plant community and for the next few hours began sketching and writing, describing the many things that appeared before me. But as I was busy burrowing around the ground I was quickly distracted. Hidden within the dead prairie growth of the previous year, seedlings, most no more than a half inch tall, were beginning their lives. I found them everywhere I looked. Covered by a faded yellow blanket, no one suspected they were there, millions of them.



Early one morning in March, a few of us headed off for the Kansas State University library seventy-five miles from Salina. As we sped along the interstate highway, I peered intensely at the sides of the road. Even though I was getting a bit sick to my stomach, I persevered, carefully learning the names of the plants being pointed out to me by our research associate Marty Bender. It turned out that the library was closed that day, so we spent some time at the nearby Konza Prairie. I was learning my lessons well. The various plants stood out as I called them by name, not just their ordinary names, but their Latin names, too. They rolled off my tongue and about my head; Panicum vergatum and Andropogon scoparius. Once again though, my attention was easily turned. Ragged clouds whistled overhead, pelting us with wet snow and hail as we climbed to the top of one rolling hill after another. I was wet, the prairie was wet, but the hillsides were glowing. Oranges, yellows, whites, and browns were everywhere and the smoke from these fires swirled about. As we slowly made our way back to our parked car, I wondered where all the buffalo had gone.

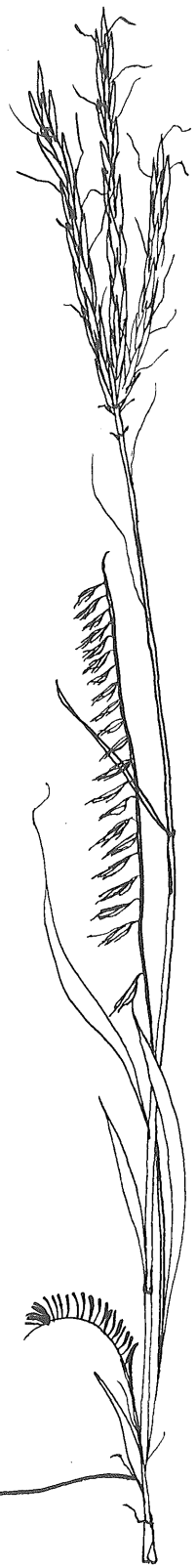
I have often seen and felt such things walking about on our own prairie pasture at The Land Institute. But here the prairie feels very small and isolated. Scattered about its borders like bomb holes from an enemy attack, are the scars and gashes of a negligent agriculture. Not far from the honey-locust trees on the fenceline is a severely eroded gully. It is a sad and ugly sight, the result of many years of wheat being grown in the field directly uphill from it. Strewn about this gully like driftwood are the remains of once magnificent cottonwoods, some well over two feet in diameter, bulldozed from around the stream that used to flow through the wheat field.

One afternoon I set out to mend some of the damage. The afternoon quickly turned into many more, but eventually the gully was neatly filled with many different logs and branches. The logs and branches would act like a net catching debris and soil and eventually fill up the gully again. It was hard work, and many weeks passed before my back felt better, but I was very pleased with the job.

Since my original taxonomy lessons I have largely remained ignorant of most prairie plant names. Or rather I should say the names other humans have decided to give them. I feel comfortable with that though, because when I walk through the prairie, the plants don't know my name either.

I did at one point try to capture the feel of the prairie on film. I ended up taking only two pictures, realizing how inadequate my efforts were. During that same day, I had sat down near the edge of one of the little streams that flows through the 160. As I watched a few hawks soaring overhead, listened to the frogs croaking, and smelled the grasses upon the wind, my normally enjoyable lunch became noticeably distasteful. As I carefully placed my orange peels and apple core back in the lunch bag, it became embarrassingly obvious that such food did not belong here. Later, after being badly unnerved by a rather close meeting with a large snake, I was more than willing to admit that I didn't belong here either.

It was by chance that I came upon the scene of a struggle between a pheasant and an owl. What remained were the beautiful feathers of the two birds. It was a strange mixture: the subtle whites and browns of the owl, and the



Terry Evans

flashy, irridescent blues, reds, and golds of the pheasant. It was not too hard to tell who had prevailed in this encounter, nor perhaps why. As I looked around more carefully, I began to find many of the bones of the pheasant. Most were perfectly cleaned of their flesh and some had been cracked open to remove the marrow. I soon found the cause of this when I discovered the neck of the pheasant partially sticking out from the hole of a small mammal. This small animal, coming across this gift, perhaps as I had, took what it needed. The bones and feathers would soon return to the earth and perhaps next year would find themselves in part of the seed of a prairie grass, to be eaten once again by a pheasant. I remained there, carefully choosing and picking feathers to take with me. I would ornament myself with the feathers in my own way, becoming one more ripple in the great circle of events that make up the life of this prairie.

On Friday evening, May 13, a violent storm flooded us with rain, over two inches in twenty minutes. On Monday after the storm, we walked around the 160, examining the outcome. The logs and branches which I had used to repair the gully with were now piles of shattered debris strewn about downstream. The largest log I had used, weighing some several hundred pounds, was over fifty feet downhill from where it had been placed. The gully itself had been gouged even deeper and longer. Up on the pasture, the prairie soil had been held fast by the web of roots, and after being in the sun for a day or so, was totally dry down to the surface. It looked a bit greener.

I have recently taken to hunting buffalo on the 160, if only in my head. Astride Twinky, Sara Jackson's pony, we have searched its every corner. And slowly I am beginning to feel more and more a part of the prairie, if only because my partner I sit upon seems a part of it. Well, and maybe because Twinky forces me to make more contact with it--rather painfully at times!

Twinky is a subtle and wise teacher. She has names for a great many of the things on the prairie. But in naming them, they do not become detached entities to float within her mind.

Julie, Margo, Ruskin, David and Wes, checking the storm damage on the 160.

They are part of a process of living, and they speak of the reality about her. Walking around, carefully selecting a flower here, or a clump of grass there, Twinky names the beings of the prairie. She defines the elements of her environment with every act. High upon a hill, Twinky gingerly steps across an outcrop of Dakota sandstone. Snorting from the effort, she muscles her way across a muddy marsh. And twitching with excitement, throwing a song to the wind, Twinky runs through the green grass. The earth accepts these acts of naming, and in turn names her. But these ways and words are Twinky's, and I have yet to find mine.

When I have brought too much of myself to the prairie, it reflects my feelings and perceptions, instead of revealing itself to me. At other times, though, the boundaries created by my senses have dissolved, and I feel that I have begun a slow journey into the midst of the prairie's reality. Then I think there is a proper place for me out there. And it will be the collections of those names which I give to the prairie, and in turn it gives back to me.

Continued from page 17.

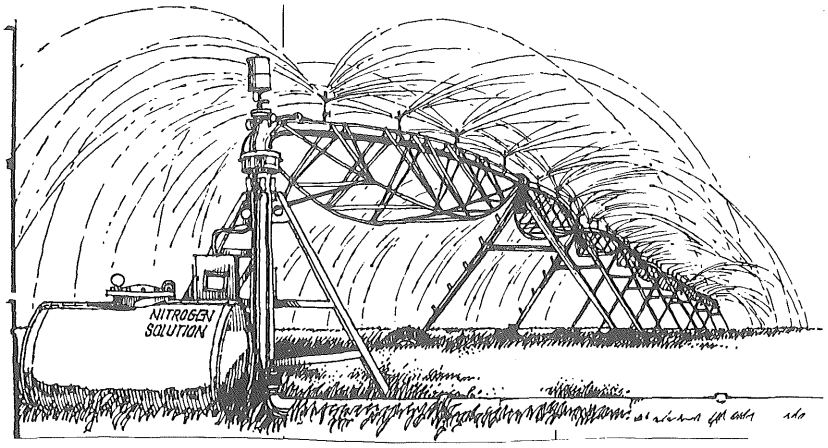
HYDROPONIC CORN FARMING - Robert Mohler

The entire plant communities, on the site and both uphill and downhill, change regimes. The Sandhills, being somewhat inhospitable to Man anyway, now move to the point of intolerability. "It's the difference between a mess and a hell of a mess," one Sandhiller said to me. "I don't understand it. They're draining off all that water, making things absolutely miserable for us, and the government comes along and says it's studying ways to ship water into this part of the country. It ought to be against the national interest to drain off all that water."

But there are no laws against it. There is no community when one neighbor lives on the land and the next one's last name is Inc. Just balance the ledger, depreciate the equipment, take the investment tax credit.

Everybody knows how big irrigation projects work. Big dams collect the water; canals carry the water out into the countryside, where it splits into laterals and eventually is spread on the fields to grow "better crops." We are all fairly aware of the grave environmental disturbances these projects cause: land flooded at the reservoir site (sometimes as much land used in the reservoir and canals as in the irrigated acres served) and unplanned water table changes. But the changes in people and the community disruption which result are less obvious.

Fields served by canals are necessarily physically sequential. Farmer B's field is farther away from the big dam than Farmer A's field. Although they both have an equal, legal right to the water that comes down the ditch, Farmer A has the first physical chance at it, both in quantity and in timeliness. The farmer



There is no community when one neighbor lives on the land, and the next one's last name is Inc. Just balance the ledger, depreciate the equipment, take the investment tax credit.

at the end of the line is oftimes dry, through no fault of his own. He still has to pay. On up the line, nightfall covers many deeds. The ditchrider cannot be everywhere at once. Farmer B thinks, "Farmer A is stealing my water." Farmer A thinks, "Farmer B accuses me of stealing his water." They develop a serious distrust in each other. Before the irrigation ditch was put in, they lived in comparative harmony. Now it's different.

A good irrigation project manager can make a lot of difference. In Nebraska, I know one manager who must be one of the most honest, hard-working, equitable men who ever walked the face of the earth. He tries to resolve disputes and give everyone an equal chance at the water. But he draws his salary from the irrigation district. The farmers have to "work" for their money. A duality develops. It is "us", the farmers, against "them", the irrigation project developers and operator staff. Although the district operation is largely set by the farmer-board policy, the operator staff is always suspected of being "on the take." The honest, manager acquaintance of mine is not a trusted man within the irrigation district. Some people outright hate him.

It's the scale of the thing that got out of hand. Dualities develop on all levels just because of its bigness. E. F. Schumacher's words ring true everyday on the streets of a small town in Nebraska.

State Water Plan Neglects Conservation

The Kansas Water Office is holding meetings this summer to inform citizens about the preliminary draft state water plan and receive comments from the public. A working draft will be completed in October, with formal hearings to be held on it in November. The final draft will be submitted to the Governor and the 1984 Kansas Legislature.

In a survey based on a one page questionnaire sent to over 500 groups and individuals known to have an interest in Kansas water resources, the top three statewide water problems were identified as (1) need for water conservation, (2) public water supplies and (3) water quality concerns.

The preliminary draft plan does not reflect the priorities of Kansans as revealed in the survey. Most of the emphasis is in the water supply section, the only portion of the plan which contains concrete financing and policy proposals.

The construction of two pipelines and the reallocation of conservation storage water to marketable status in eight reservoirs are the Water Office's recommended solutions to meet water supply shortages in the next fifty years. One pipeline is in the eastern part of the state beginning from the Kansas River, then to Clinton, Pomona, Melvern and John Redmond Reservoirs to serve expected demands in southeast Kansas. (55.5% of the water in John Redmond's conservation pool has been allocated for use by the Wolf Creek nuclear power plant.) The second pipeline is in the central area of the state beginning from Milford Reservoir and traversing seven counties to serve 12 to 15 communities. The plan recommends that the state immediately try to purchase conservation storage water in the federal resevoirs at the federal sunk cost for state water supply use.

In commenting on the state water plan, the Kansas Natural Resources Council stated that water diversion schemes should be "a measure of last resort after we have exhausted other approaches." Just because they can be engineered doesn't mean that they are feasible, ecologically or politically. The Council pointed out that conservation should be considered a source of supply, and the Water Office should develop specific policy recommendations backed by financing mechanisms for water conservation. The public has surprised utilities at their ability to use energy more efficiently, "As water prices increase and supplies diminish, the public will exhibit the same potential for reducing waste of their water resources."

After the summer meetings, the working draft should more thoroughly reflect the public's interest in conservation.

Breeding Sustainable Domestic Plant Populations

Walter Pickett

At The Land Institute we are working toward perennial crops that can take care of themselves as the prairie plants do. These crops would live and produce year after year, with little or no herbicides, pesticides, fertilizers, or tillage.

One way to do this is to domesticate the native prairie plants, selecting for higher seed yield and other agronomic traits. We are doing this, but at present most have low seed yields, and there is no developed market for such new grains. Therefore, we are also trying to make perennials of some of our current crops, such as rye, sorghum, wheat, and corn.

To make these crops into perennials, we first must get genes for perennial habit from related perennials. We don't make just any cross we can. We have made some rather wide crosses, but only after first studying the way the crop species evolved. This gives us clues as to what kinds of genetic changes each species is pre-adapted to accept. A few contrasting examples will illustrate this.

All the crops we work with evolved from perennial ancestors. Rye split off from its perennial ancestor, Secale montanum, rather recently and the two still cross readily. The hybrids are fertile and a breeder can treat wild perennial rye and domestic annual rye almost as if they were the same species. In fact, they will cross in the wild, giving us weedy, annual ryes. Other breeders, both in America and Europe, have made the same crosses that took place naturally, but they selected grain and forage-type domestic perennial ryes.

We are fortunate that Dr. Jurgen Reckin, who works with perennial grains at the Experimental Garden in Garkistrasse, Germany, has sent us seeds for four varieties of perennial domestic rye. These four rye varieties are all open-pollinated. We continue breeding them to make them better adapted to Kansas.

Domestic sorghum is unusual among domestic crops. First, although treated like an annual, it is still a perennial in the tropics. Second, our source of winter hardiness for sorghum is not its ancestor, but its offspring, Johnsongrass. It is believed to have evolved from a hybrid between grain sorghum and the wild Sorghum propinquim.

It is still easy to move genes from domestic grain sorghum to Johnsongrass. Indeed, anywhere sorghum fields have Johnsongrass as a weed, Johnsongrass is already acquiring grain sorghum genes. We could probably find the genes we are transferring, if we looked at enough weedy sorghum fields.

In rye, we are moving genes between wild parent species and its domestic offspring. In sorghum, we're moving genes between a domestic parent species and its wild offspring. With wheat, we're transferring genes between more distantly related species. However, in wheat, unlike sorghum and rye, such mating have been common in nature.

The pattern of evolution in wheat is difficult to unravel, but simple once it has been laid out. Many derived species exist. If we let AA represent all the chromosomes of one species, and BB represent all the chromosomes of a second species, then AABB is a third, derived species which is stable. Many sets of two parent species and a stabilized hybrid species have been found in the wild. Domestic wheats follow the same pattern. The Einkorn wheat, designated AA, crossed naturally with a wild relative BB to produce macaroni wheat, AABB. Macaroni wheats then crossed with another wild relative DD to give bread wheats, AABBDD. Triticale, the wheat-rye hybrid, is a logical extension of wheat's evolution.

Triticale breeders crossed wheats, both macaroni and bread wheats, with rye. The resulting triticales (AABBRR or AABBDDRR, depending on which wheat was used) have had some commercial success.

When perennial rye, instead of annual rye, is used to make a triticale, the resulting triticale is a perennial. We will produce our first perennial triticales next year. Dr. Reckin, the German scientist mentioned earlier, has offered us seed of his perennial triticales as soon as he has enough to spare.

Wheat, both macaroni and bread types, also cross with some of the Agropyron species which are called wheatgrasses. Tall wheatgrass and intermediate wheatgrass both cross with wheat as easily as rye does. The result is a perennial wheat-like plant called agrotriticum.

The sunflower genus has divided into various sections. One section of the genus evolved with a pattern similar to rye's pattern. Another section of the genus evolved in a pattern closer to wheat. The domestic sunflower will cross, with some difficulty, with either section. We are working with both sections until we become more familiar with them, but we expect to drop one eventually. However, we're no longer sure that it will be either necessary or desirable to use genes from the domestic sunflower. The perennial sunflower species may have all the genes we need for domestication.

With rye and sorghum, the original breeding system of the wild species is left intact. Both will readily cross back to the wild species and long-evolved gene systems will be maintained.

With the wheat hybrids, triticale and agro-

triticum, the complete gene systems of wheat are kept intact, and complete gene systems of other species are added, nearly intact. Since the two sets of gene systems interact, and since the two sets of gene systems aren't accustomed to interacting with each other, some of the interactions may be undesirable. But the gene systems in bread wheat have had to interact with new, foreign gene systems at least twice during its evolution. Therefore, we think it is preadapted to the addition of another set. The success of triticale supports this belief.

What started us comparing patterns of evolution with our breeding programs? Isn't it the rule for breeders to just breed whatever farmers grow? It was the possibility of producing a perennial barley that pointed out a potential problem. The problem isn't immediately obvious, and must be explained before continuing the discussion of barley.

Annuals and perennials may have different defenses against insects and pathogens. The annual species simply isn't alive part of the year. If an insect spends that part of the year on a plant of a different species, it must be adapted to two species and not specialize too much. If an insect is to specialize on one species, the insect must have a dormant stage while its host plant species is dead. However, an insect is nearly defenseless while dormant, and many don't survive dormancy.

Perennials are exposed to insects year round. They require stronger defense systems than annuals. For example, a perennial may make toxins and be poisonous to insects while young and succulent. Then it may quit being poisonous when it's older and tougher and less appealing. This would make it effectively two different plants from the insect's point of view.

The insect problem is only an example. There are also diseases to block, weeds to compete with, and droughts and winters to survive. Annuals can respond to each of these problems by making some seeds and dying. Perennials have evolved ways of surviving these problems.

There isn't always just one gene for tolerance to an insect, disease, drought, or cold. The insect illustration given might take one or more gene to produce the toxin, a switching gene to turn it on and off, and a set of genes to toughen the tissues when the plant is older. Any one of these genes is useless without the others that make up the system. Such a system might be easily maintained in a population that results from a hybrid between domestic annual rye and perennial wild rye, which are so closely related that they probably still have similar systems. It could be maintained in the wheat hybrids, triticale and agrotriticum, because wheat has had several wide crosses in its evolution, so it must not rely on systems that are easily upset.

Barley evolved differently. Even before domestication, it had stopped crossing with other species. In the last twenty years, scientists have been able to devise ways to cross barley with related species. But the thousands of years that the species was isolated would have allowed the development of easily disturbed gene systems.

We could create a perennial barley hybrid. Other scientists have done so, and most would gladly donate seed if we requested it. But we think that it would take a major program for perennial barley to become more than a greenhouse plant. It will not easily be readapted to being a perennial that interacts with nature year round.

Since the discovery of the perennial corn species Zea perennis and Z. diploperennis, it has been possible to breed perennial corn adapted to the tropics using the evolutionary pattern of corn. Corn's pattern is quite similar to rye's. However, both perennial corn species are native to Mexico, and aren't winter hardy in Kansas.

This has tempted us, and we have yielded, to try to bring genes for winter hardiness to corn from Eastern Gama Grass, a native prairie grass. Eastern Gama Grass crosses easily with corn. However, the transfer of genes between corn and gama grass may disturb the balance of genes that evolved together in corn. Corn doesn't pick up genes from Eastern Gama Grass in nature.

Corn has a better chance of succeeding as a perennial than barley. Barley is normally self-pollinated: the flowers usually fertilize themselves before they even open. Corn is normally cross-pollinated: its male flowers in the tassel drop pollen on the female flowers in the ear. With the slightest breeze, the pollen doesn't fall straight down on the plant's own ear, but rather lands on a neighbor. With barley's system, it doesn't matter if a genetic system is easily disturbed by genetic changes. Constant inbreeding keeps the same combinations together.

Delicate genetic systems had little value in the evolution of corn. If a desirable combination of genes happened to come together in one plant, they were likely to be recombined with the genes of a neighboring plant in the next generation. Only resilient systems, that remained useful while various gene substitutions were made, were important in a wild corn population.

We are reasonably sure that we can derive a perennial corn from these hybrids. At the moment, we can't be sure that the resulting corn will be in balance with its ecosystem. Its use may be limited to the relatively protected environment of gardens. We can maintain the genetic defense systems of the tropical perennial corn, but we don't know how effective they'll be against temperate region diseases and insects.

We're on safer ground when we're trying to domesticate a wild perennial. Giant wildrye (Elymus giganteus), Canada wildrye (Elymus canadensis), curly dock (Rumex crispus) and Eastern Gama Grass (Tripsacum dactyloides) and other wild species are being worked on at The Land Institute. We may add a few genes from domestic crops to some of these species, but we'll leave their genetic systems as intact as possible. When we do make additions, we'll carefully compare those plants with additions to the original species.

Without understanding evolution, the branch of applied biology called plant breeding doesn't make sense. Some knowledge of the evolution of our crops has kept us from spending much time and effort on barley. It suggested to us that we shouldn't give corn too high a priority. As we continue trying to make perennials out of our current annual crops, we will keep referring to the evolutionary history of each species.

A Living Museum

Marty Bender

One of my tasks is to be director of The Land Institute Herbary, a living museum of wild native and non-native perennial plants from the prairies, plains, and forests. Presently 55 grasses and sedges, 220 wildflowers (technically, forbs), and 25 trees and shrubs are established in five-meter rows, one yard apart. The Herbary is now about one-third of an acre in size, and we will continue to add to it. We use the Herbary for our agricultural research, and since The Land Institute is an environmental resource center for the community, we want the Herbary to be used for educational purposes. The Herbary also serves as a nursery from which we collect seeds.

The Herbary was started in 1979 with forty species established from seeds from the Plant Materials Center (USDA Soil Conservation Service) in Manhattan, Kansas. In the spring of 1980, the Jessie Smith Noyes Foundation in New York gave us an $8,000 grant from its discretionary funds for the Herbary. Since then, the Herbary has grown to about 300 species, mostly from seeds that I have collected on my vacation field trips ranging along a diagonal from New Mexico to Ohio. Since we are not able to pursue field trips to the extent that we need to for our agricultural research, I deeply encourage Friends of The Land to send us seeds of wild perennials whenever the opportunity exists, here in the U.S. or abroad.

Most of these perennials are more difficult to establish from seed than the familiar garden annuals. Some perennials have good enough germination and early growth that they can simply be planted in the ground in April and watered often initially to germinate them (most garden annuals need only one good soaking.) Some perennials, especially trees, will have better germination if they are planted in November so that they can be stratified by the cold, moist soil during the winter.

Many of the perennials have poor germination or are unable to reach the seedling stage in the environment of the Herbary. It is known that 95% of all plant mortality in natural ecosystems occurs at the seed level. So instead of planting them in the ground, we start these seeds in March in rag dolls and peat cups, an environment that is less hazardous than the outdoors. Before putting these seeds in rag dolls, some species must be treated to improve germination. For example, the seed coats of legume seeds should be nicked by placing the seeds on a sheet of sandpaper on a table and rubbing the seed hard with another sheet of sandpaper, with the seeds sandwiched between. Removing some of the seed coat allows moisture to enter the seed so it can germinate. Such treatments made us realize that many seeds in natural ecosystems must wait years for the right conditions for germination, whether it be a fire, the weather, the actions of an animal, or combinations thereof. A rag doll is a 9" X 9" square of white cotton cloth (bedsheet) in which the seeds are put along one edge, and the rag doll is then rolled up. The rag dolls are kept in a warm place (80 to 90°F), perhaps in the sun, and are watered daily to keep them from drying out. After a week, the rag dolls are unrolled to find germinated seedlings. Some perennials require as long as a month to germinate, so patience is required. The seedlings are then transferred to peat cups of dirt, and watered. When the seedlings are about two to three inches high, they are then set outside in a semi-sheltered area to harden off. So by late April, the cupped seedlings are planted in the ground and watered. The plants are not fertilized or pruned, and if there is a drought, the Herbary is irrigated. As with any garden, the Herbary requires a lot of weeding.

Some of the walkways between rows have been grassed with fescue and some with buffalograss. Both grasses invade the rows, but the buffalograss is less harmful to the perennials. I recommend that the buffalograss be started not by seeds, but by 4" X 4" plugs, each which will expand to cover a 2' X 2' square in two years. With an annual precipitation of 27 inches here, the buffalograss cannot keep out invading weeds, so it is maintained by mowing.

The plants in the Herbary are not placed in any special arrangement, such as being grouped by families, because we could not estimate how many rows should be alloted to grasses, to legumes, to sunflowers, etc. Besides, the rather random placement of plants allows us to observe

Marty Bender, adding plants to the Herbary.

interactions between species. For example, we can see how species disperse and invade rows of other species.

In the Herbary, most perennials grow much more vigorously than they do under the competitive conditions of natural ecosystems. In the bare soil of the Herbary rows, a perennial can grow from seed to three or more feet tall and bloom in its first year. But if seeds of the same perennial were sown into a grass sod, such as the prairie, it would be fortunate if a few of the seeds germinated and grew three inches tall in the first year. So a perennial wildflower that has been living for several decades in a prairie may be no larger than the same plant in its first year in the Herbary.

The prairie plants in the Herbary bloom at about the same time of year as they do in the prairie, so the Herbary has seasonal aspects similar to those of the prairie. Some spring wildflowers in the Herbary are Prairie Parsley, Fremont's Clematis, Prairie Ragwort, Blue Funnel Lily, Prairie False Dandelion, two Puccoon species, and four Milkvetch species. In order to escape the hot summer and the shade of the grasses in the summer, these plants grow to a short height so that they can reach the flowering stage quickly and set seed. During the summer, there is Pale Coneflower, Prairie Coneflower, several Psoralea species, three Prairie clover species, six Beardtongue Species, and seven Milkweed species. In the fall when the prairie grasses have reached their full height, perennials in the Sunflower family are prominent: five Rosinweed species, eight Sunflower species, five Blazing Star species, eight Aster species, and five Goldenrod species.

In using the Herbary for our agricultural research, we want to observe how each perennial might fit into an agriculture based on polycultures of perennial grain crops. Obviously, only a few perennials produce enough seed to have the potential of being bred into a perennial grain crop. Some perennials, such as legumes that fix nitrogen, will be used to sponsor the fertility of fields of grain crops. Last summer Laura Jackson helped Dr. Jim Mayo of Emporia State University test for nitrogen fixation in leguminous and nonleguminous perennials in the Herbary. Some perennials may be beneficial plants which harbor predatory or parasitic insects that would control insect pests on the grain crops. Also last summer, Dr. Lawton Owen, an entomologist from Kansas Wesleyan, collected insects weekly on the perennials in the Herbary, as a start toward knowing what insects the perennials harbor. So, such a polyculture of perennial grain crops might be a field that contains one or more perennial grain crops (bred to set seed synchronously), with about 25% of the field containing legumes that fix nitrogen for the grain crops, and with a scattering of beneficial plants that would protect the crops from insect pests.

The Herbary is also a living museum for public school teachers and students to learn the plants. Groups such as the Kansas Wildflower Society have toured the Herbary. To facilitate learning, each row has a sign which gives the Latin (scientific) name and common name of the perennial and the plant family it is in. Also, on the 80 acres of pasture within The Land's quarter section, visitors can see the natural environments for some of the perennials in the Herbary. If a group desires to tour the Herbary and/or pasture, an appointment should be made for a weekday visit. And we need to know who the visitors are, how many, how much time they wish to spend, and what they wish to learn. An individual may look at the Herbary without our assistance, but we would appreciate it if he/she would call ahead of time.

Although we and visitors to the Herbary admire the natural beauty of the perennials there, we also keep in mind the important practical value of prairie plants. We see the prairie as a standard against which to judge our agricultural practices and we seek to understand what elements in the prairie can be adpated to create a sustainable agriculture.

Weed Ecology

Helen Atthowe

"Using Weeds to Get More Food" was the title of the workshop Joan Ehrenfeld, plant ecologist from Rutgers University, gave at this year's Prairie Festival. It was an appropriate topic for The Land Institute since many agriculturalists consider the native prairie plants we use as research subjects to be weeds. Yet, as Dr. Ehrenfeld quoted Dr. J. Harlan and Dr. J. M. J. DeWet, crop evolutionists at the University of Illinois, "One man's weed is another man's crop."

Dr. Ehrenfeld began by listing some characteristics of weeds. For two reasons, an understanding of these characteristics may be useful in developing an agriculture less dependent upon irrigation, fertilizer, pesticide, and petroleum. First, understanding weed characteristics can help in managing the crop/weed

Joan and John Ehrenfeld at the Prairie Festival

balance in favor of the crop. Second, a better understanding of what it is that makes weeds so competitive may help in breeding crop plants which are as successful as some weeds are. Dr. Ehrenfeld's list of characteristics includes the following: weeds have evolved a high degree of specialization to live with a particular crop, tend to produce large numbers of small seeds which are easily dispersed and long-lived, have the ability to colonize disturbed areas, and are capable of vigorous vegetative growth. Further, weeds are pollinated by general rather than plant specific pollinators and do not depend on other plants to pollinate them. Also, unlike many conventional crop plants which have had their "ecological genes" bred out of them, weeds demonstrate great genetic variability and are generally independent of environmental control on germination and growth. Another characteristic of weeds is their ability to respond quickly (through changes in growth habit and leaf size and shape) to a particular set of environmental conditions. In fact, Dr. Ehrenfeld suggested that weeds may know more about reproduction than many crop plants. This is relevant to research at The Land where we hope to develop reproductively-successful perennials which will be high yielding year after year.

In addition, Dr. Ehrenfeld mentioned several ways in which weeds could be useful in food production. Weeds are nitrogen rich and some, such as ragweed, have chemical leachates from their leaves which seem to inhibit their own seeds. Therefore, weeds can be composted and returned to enrich garden soil.

Erosion control is another use of weeds, especially the perennial species with rhizomes. For example, in Southeast Asian rubber plantations, weeds are cultivated as nurse crops to hold the soil while the trees are too young to do so.

Weeds can also be indicators of soil quality. Weeds in the mustard group, for example, are said to be indicators of hardpans.

An important use of weeds is as a source of genetic material for improving crops. For example, at The Land we are using Tripsacum, a perennial grass, in our corn breeding program. Also, modern hexaploid wheat is made up of three sets of genes donated by three wild progenitors of wheat.

There is a growing body of evidence demonstrating that weeds may also help control insect pests. Researchers have shown that yellow-flowered weeds can act as decoy plants attracting aphids from crop plants. Some weeds may cause interference with insect colonization. It has been suggested that since aphids are attracted to bare soil, a groundcover of weeds may reduce aphid colonization. In addition, weeds may help control pests by chemical means. Ragweed exudes an odor that seems to repel aphids on collards. Finally, weeds can also provide a food source for predators of crop pests.

The virtues of weeds need to be further researched so that we spend less time trying to eliminate them at great human and environmental expense. Herbicide usage is increasing in forestry, in field crop production where minimum tillage is practiced, and on front lawns. Perhaps attempts, such as Dr. Ehrenfeld's, to understand weed ecology will help in preventing an all out war with weeds before it reaches the proportions of our war on insects.

FOE Focuses on Agriculture

Mark Bohlke

Five Land students (Ruskin, David, Alex, Debra, and Mark) accompanied Wes to St. Louis for the Midwest Friends of the Earth annual meeting April 23 and 24 at Fontbonne College. The meeting focused on conserving agricultural land and included discussions with Wendell Berry, Gene Logsdon, and Wes Jackson and keynote speeches by these three Saturday night.

On the way to St. Louis, Wes took us on a tour of the community north of Topeka where he grew up. Here, in 1946, were farms such as the fifteen acres of bottomland which supported the Gunnerson couple, five acres which supported the Carlsons, and the forty-acre Jackson farm which supported two parents and six children through the Depression of the 30's. Wes noted that industrial development, concrete roads and parking lots, and stream channelization have disrupted the community which existed there.

At the meeting, Wendell Berry spoke of the need to find examples of healthy farm communities and good agricultural practices. (The farms Wes described to us on the tour seemed like examples of what Wendell called the kinds of farms people should carry around in their heads.) Certain farms need to be picked out and used as showcases of good farming practices, and FOE decided they should help do this. Participants suggested that FOE invite farmers and agricul-

turists to attend and speak to meetings, and begin building a communications network of organic farmers and agricultural extension agents. FOE can interview farmers about the problems they perceive in agriculture and the solutions they have developed to deal with these problems, and then get the information to other farmers. For example, many farmers want to become less dependent upon chemicals, but need information from those who have been successful by using less before they make changes in their practices.

Gene Logsdon pointed out that many farmers currently don't see that they have any use for environmentalists, but if the way in which environmental problems affect farmers is emphasized, they will listen. For example, environmentalists should point out that air pollution impacts agriculture because ozone pollution causes declines in yields of 10%. FOE and other environmental groups could also work with farmers on non-agricultural environmental issues which concern them--for example, powerline fights.

Wendell Berry said that better farming has to have an urban constituency, and that conservation organizations are a logical place to begin. The connection of the urban constituency to agriculture was made by Gene Logsdon with his observation that everyone has the right to talk about agriculture because we're all eaters. Wes noted that it is hard to find urban people more than one generation removed from the farm. This fact ought to be utilized in developing an urban constituency concerned with agriculture and farmland preservation. One way urban members of FOE can support farmers and become more involved with agriculture is to help organize and support farmers' markets. Development of these markets will likely be supported by other businesses because they will help bring traffic into shopping areas.

In addition to general discussions on how to get FOE involved in farmland preservation, participants discussed some specific projects.

Gene Logsdon pointed out that agriculture is not being recorded fairly by agricultural journalists. This is due to the pressure of agribusiness to promote the agribusiness views and the general bias of publications. The group decided that FOE could contribute to the promotion of objective journalism by sponsoring an award to recognize agricultural journalists. Gene recommended that the first award be given for a story on human problems in agriculture. Wes suggested that FOE seek permission from Aldo Leopold's family to make it the Aldo Leopold award, focusing on ideals in Sand County Almanac.

Most of Saturday afternoon was spent reviewing the script for the slide show being prepared for FOE's Missouri Agricultural Lands Conservation Project. This slide show will be made available to groups interested in education about current farming practices which have caused problems such as pollution and soil erosion, and about alternative agricultural practices.

Another project to communicate the problems and promises of agriculture through FOE came up in relation to the FOE Midwest branch publication, the Midwest Earth Advocate. In addition to committees to develop the topics of water in the Midwest and Midwest opposition to nuclear power and nuclear weapons, a committee was formed to add a special section on the topic of sustainable agriculture in the Midwest.

Anyone interested in following FOE's work in conserving agricultural lands in the Midwest should contact

Friends of the Earth Midwest Office
P. O. Box 1866
Fairview Heights, IL 62208.

On the Economics of Small Farms

Helen Atthowe

Most agricultural economists get caught up in one way or another with size and efficiency issues. It is a numbers game which consists of assembling and explaining statistics. However, applying the science of economics to small farming, and thereby judging its feasibility, may be asking the wrong questions about small farming, and ultimately about agriculture.

Luther Tweeten does just this in an article, "The Economics of Small Farms" (Science, March 4, 1983). Tweeten obscures the role of small farms and good farming in America when he takes as "hypotheses to be tested" eight assertions about small farming. Tweeten forms the eight assertions in such a way as to be able to methodically refute them. These assertions include the following.

1) Small farms provide a higher quality of life than large farms.
2) Small farm operators take better care of their soil.
3) Small farms are more energy efficient.
4) Small farm preservation avoids the trauma of outmigration to cities.
5) Small farm preservation provides social and economic support necessary to maintain the vitality of nearby towns and cities.
6) Small farm preservation is essential to preserve competition and avoid concentration of production.
7) Society would be better off if publicly supported research and extension education were focused on small farms.
8) Federal government programs have hastened the demise of small farms.

Tweeten's "scientific" refutation of these eight assertions is insidious because it delineates arbitrary boundaries for our perception of what small farming is and what its future can be. For example, Tweeten stands small farming up against large farming and takes a machine-dependent, capital-intensive, production-obsessed economy as given. He does not question whether an economy of chain grocery stores, nationwide distribution, contract marketing, regional commodity specialization, and large export mar-

kets is an economy in which small farming belongs. Nor does he take into consideration how an economy, where producers and processors are often in separate parts of the country and where idle land has a cost, affects the structure of agriculture.

Tweeten's analysis can also be argued in his own terms. From the start, Tweeton identifies small farming with low income and suggests that low incomes result in negative feelings for small farmers. But, as Cornell agricultural economist B. F. Stanton points out in "Some Political Arithmetic of Large and Small" (Cornell Department of Agricultural Economics Staff Paper, June 1979, No. 79-19), the use of gross farm sales as a measure of farm size is limited, because in a period of rapidly rising prices, comparisons over time can be inaccurate.

There are those again who would disagree with Tweeten's refutation of assertion five concerning the social and economic draining of towns by farm enlargement and consolidation. For example, in "Agribusiness in the Americas," Monthly Review Press, 1980, R. Burbank and P. Flynn suggest that development of large scale corporate ownership is polarizing the rural social structure. Also, in "The Structure of Wisconsin Agriculture in 1980" (University of Wisconsin Department of Agricultural Economics, 1979, No. 39), W. Dobson, B. Schmesing, and C. Tank conclude that since larger farms often bypass local communities to buy supplies at wholesale in larger cities, the increase in the number of large farms could harm business in some rural Wisconsin communities.

Another point on which Tweeten can be debated is whether or not small farms take better care of their soil. Tweeton concludes that since large corporation farms own 20% more land "operated" with minimum tillage practices, they are taking better care of their soil. He ignores the increased amount of herbicides which must subsidize minimum tillage practices. Some herbicides take nearly a year to break down and we don't know the effect of the residues. Not enough study has been done on the effects of herbicides on microbial populations necessary for good soil health. Also as J. Timmons points out in "Protecting Agriculture's Natural Resources" (Journal of Soil and Water Conservation, 1980, 35(1) 5-11), the aggravating factors of soil erosion are increased grain exports and increased areas of cropland under production. A small farm economy, concerned more with net than gross income, and people with farmers rather than "operators," might be less dependent on increasing production and export markets. Large farms, on the other hand, are dependent on both due to the agricultural economy they function so well in.

A further disagreement with Tweeten's analysis of the economics of small farms is the evidence that federal programs have indeed hastened the demise of small farms. For instance, E. C. Pasour writes in "A Critique of Federal Agricultural Program" (Southern Journal of Agricultural Economics, 1980, 29-37, North Carolina State University) that commodity programs based on volume of production yield larger benefits to larger producers. In the case of direct government payments to farmers in 1978, for example, per farm direct payments averaged more than $2,000 for farms with sales exceeding $20,000 per year, but averaged less than $500 for farms with sales of less than $20,000 per year. Larger sales meant more government payments, thus giving the advantage to higher income farmers. Any increase in capital, especially during the "make or break" times when a farmer is seeking credit or needs to pay creditors off, is a clear advantage.

Further, Marty Strange, from the Center for Rural Affairs, suggests that a major contribution to the industrialization of farming and the demise of small farms is tax law. For example, according to Marty Strange and Chuck Hassebrook in "Take Hogs, For Example: The Transformation of Hog Farming in America" (Center for Rural Affairs, 1981), a high income investor in a large factory, using a combination of tax credits and deductions, can recover one-half of his initial investment in the facility in the first year. Marty Strange lists four policies which give advantage to high income farmers.

1) Investment credit. 10% of the initial investment in "equipment" is directly credited against income tax paid the first year.
2) Accelerated depreciation. The rate at which capital cost of new buildings can be deducted as a business expense from taxable income over the life of the facility is accelerated, allowing twice as much to be deducted in the first year, an advantage to high income investors.
3) Cash accounting. Farmers (including non-farmers with farm income) can use cash rather than accrual accounting on their tax return, allowing business expenses to be deducted in the year they are incurred, whether the purchased goods are used immediately or not. This encourages the practice of excessive spending for feed and other consumable items at the end of the year to artificially reduce taxable income.
4) Interest deduction. All interest paid on borrowed capital is tax-deductible. This means that if a taxpayer is in the 50% tax bracket, his interest rate is cut in half. Therefore, high income investors or "large farmers" have an advantage over small farmers, because the higher the income tax bracket, the more the taxpayer saves. Investment credit, accelerated depreciation, and interest deduction provisions benefit the taxpayer in proportion to the capital cost of his investment and the amount of capital borrowed. As Marty Strange points out, if a farmer's primary asset is his labor, this works against him by subsidizing his capital-intensive competition.

My final argument with Tweeten's analysis of the role of small farming in America concerns his conclusion that agricultural research and extension has the highest payoff to society by emphasizing "scale-neutral" practices. There is little "scale-neutral" research in an agriculture in which productivity is measured by how many fewer farmers are required to produce how much more of our food supply, using the products of agricultural science research. For example, at Rutgers University horticulture experiment farm, I was involved in breeding research that was essentially biological. Yet, we were breeding for a system, an economy which includes monocultures, row cropping, high investments in pesticides and fertilizer, machine soil preparation, cultivation, crop harvest, and volume production. Scale-neutral is a nebulous term, and I wonder at Tweeten's understanding of it when he talks of the "payoff" and "percent rate of return on investment" of agricultural research.

Economics has played a heavy hand in forming the structure of American agriculture. This year, large acreages of wheat are being destroyed in the Payment in Kind program to counter overproduction and an increasing number of farmers are leaving the farm due to overcapitalization. The wheat farmer I work for says he can see the difference in soil quality between his fields and a neighbor's manured fields, but cannot "afford" to discontinue using the fertilizer and equipment he fears are making his soil "hard." The economics that brought us here need to be re-evaluated. We need to ask serious questions about the social and ecological stability of American agriculture, and perhaps the time has come to ask unbiased questions about what a small farming economy is and how it can play a role in American agriculture. One thing for sure, questions about the structure of agriculture need to be asked in a broad context, recognizing social, biological, political, and economic influences, rather than in a single-minded, economic context.

Bill Promotes Research in Sustainable Agriculture

Alex Stone

Despite Secretary of Agriculture John Block's comment in 1982, that organic farming research is a "dead end," there seems to be a strong growing interest in sustainable agriculture from U.S.D.A. and land-grant university scientists, according to Dr. Garth Youngberg, head of the newly-formed Institute for Alternative Agriculture. However, scientific support alone will not create a federally-subsidized sustainable agriculture research program. Key policymakers must also be convinced of the need for this type of research, as their control over federal appropriations tightly controls federal research priorities.

One small step towards such a federal program is the 1983 Agricultural Productivity Act (APA), HR 2714 and SB 1128, introduced by Representative James Weaver (D-OR) and Senator Patrick Leahy (D-VT). The bill is a new, revised version of the 1982 Organic Farming Act, which lost in a procedural vote in the House and was not acted upon by the Senate Agriculture Committee.

This year's bill sets forth these three goals:

1) to "identify, assess and classify existing information and research reports... including, but not limited to, information and research relating to legume-based crop rotations, the use of green manure, animal manures, and municipal wastes in agricultural production, soil acidity, liming in relation to nutrient release, intercropping, the role of organic matter in soil productivity and erosion control, the effect of topsoil loss on soil productivity, and non-chemical or biological methods of weed, disease, and insect control" and to "establish a plan to carry out a program of research and education to fill those gaps."

Alex, hoeing corn early this spring.

2) to "...conduct twelve pilot research projects on farms for the purpose of examining the effects of the transition from (a) farm practices which rely on synthetically compounded fertilizers, pesticides, growth regulators, livestock feed additives, and tillage practices which fail to control erosion; to (b) farm systems which rely on

Continued on page 33.

Soil Conservation on a Family Farm

Debra Israel and Alex Stone

This past spring we had the good fortune to visit the Underwood family on their farm in Jewell County (northwest of Salina). Dewey Underwood, his wife Ruth and their four children, Dee Ann, Stede, Van and Ervine, live next door to Dewey's parents, Wayne and Ruth Underwood. We were warmly welcomed by all the Underwoods and learned from them much local and family history, as well as information on soil conservation and farming.

Jewell County, Kansas, was in one of the original soil erosion control demonstration projects in the 1930's. This was a model project, and people from all over the U.S. and from other countries came to see the soil erosion control work being done. We wanted to learn what kind of soil conservation practices are being used now in Jewell County, how it compares with other areas, and just what effect the early government project had on the area. We began by talking to the Underwoods because Wayne Underwood worked on the Limestone Creek Soil Erosion Control Project, and Dewey continues to be very active with soil conservation practices and issues, presently serving on the local Conservation District Board.

All the land Dewey farms is now terraced for soil erosion control and conservation. This entails upkeep on approximately forty miles of terraces. His terraces run into ponds, and with that water he can do a small amount of irrigation for a low energy cost. The Underwood land has cedar shelterbelts to protect soil from wind. Dewey rotates crops, rests his land some years, and uses stubble mulching to keep the soil on his land and fertile.

In 1981 Dewey and Ruth Underwood received the Bankers' Soil Conservation Award. The four criteria taken into consideration by this award are:

1) use of land according to its capabilities;
2) completeness of the needed conservation work;
3) maintenance of the conservation practices;
4) use of management practices such as proper range and pasture use, contour farming, reduced tillage and forestry practices.

The pride shown by the Underwoods in being recognized for their soil conservation work is indicative of the high value they place on being good stewards of the land. Wayne Underwood received a soil conservation award in 1962, and the plaque that shows it is hanging on their kitchen wall. Leafing through Ruth Underwood (senior)'s scrapbook we found that Ruth's sister and her husband, the Fienes, were recipients of the 1981 award in range management from the Smith County Conservation District. Still in the family, Ruth's sister's sons, Danny and Ronnie Simmelink, received the 1968 Bankers' Soil Conservation work award.

During the Dust Bowl in 1935, Congress passed the Soil Conservation Act which established the USDA Soil Conservation Service (SCS). Yet even before the establishment of the SCS, the Soil Erosion Service of the U.S. Dept. of the Interior had started soil erosion control work. The federal government's concern for joblessness created by the economic hardship of the early 1930's, as well as soil erosion, led to the formation of the Civilian Conservation Corps in 1933. Corps camps were organized across the country to demonstrate and construct terraces, dams and wells, and to educate farmers about contour farming, stubble mulching and cropping systems.

The U.S. Army, along with civilian, technical and administrative staff, ran the CCC camps. Limestone Creek in Jewell County, Kansas, had camps in Lebanon, Burr Oak and Ionia. The camps also trained staff to begin similar projects in neighboring counties and other areas of the state.

By the end of the first year, more than half of the Limestone Creek watershed farmers had signed cooperative agreements with the USDA project. The farmer had only to agree to follow a five-year cropping and farm management plan and maintain all physical structures built by the program; the Soil Erosion Service supplied all equipment, labor and maintenance. The men did all the work by hand or with horse-drawn equipment.

By 1938, Kansas farmers organized soil conservation districts, divided by county lines, which took over the direction of erosion control work. The Limestone Creek camps were phased out in 1940 due to improving moisture conditions and economic conditions. In 1941, with the beginning of World War II, the government closed all CCC camps.

Soil Conservation in Jewell County

In trying to ascertain whether the concern manifested by the Underwood family for their soil is true in general for Jewell County, we talked to John Piskac, the local district conservationist. He has previously worked in two other counties in Kansas, and he estimates that soil conservation practices are about 10% better in Jewell County than in the other two. Sixty percent of the county is in cropland, and he

estimates that one-half of it is at a tolerable level of soil loss. He thought that having the Limestone Creek Soil Erosion Control Project there in the 1930's may be part of the reason, as it gave the county a headstart on getting used to some of the new techniques being introduced. He also pointed to the fact that Jewell County has rolling land on which erosion, with its tell-tale gullies and ditches, is more obvious than on flatter land, which mainly experiences the less obvious sheet erosion.

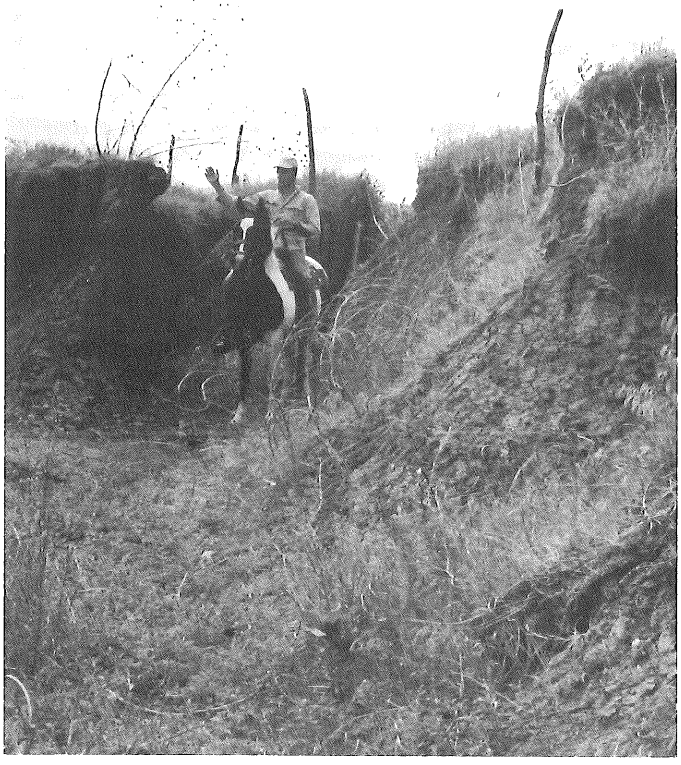
John also informed us of the current government programs available to farmers for soil conservation work. These programs are cost-sharing, whereas the original federal conservation demonstration projects were done at no cost to the farmers. The Agricultural Conservation Program through the ASCS (Agricultural Stabilization Conservation Service) will make an agreement with the farmer to pay for 60% of the cost. Under this program, the farmer is not compelled to introduce soil conservation measures on all his/her land. However, with the Great Plains Conservation Program, which is available only to farmers in the Great Plains area, all land must be completely treated with available and appropriate conservation practices and the farmer pays 70% of the cost. Right now this program is so popular that a farmer must wait two years to get into it. Twenty-six percent of Jewell County is under the Great Plains Conservation contract. A third program is statewide for Kansas, the Water Resources cost-share. These cost-sharing, soil conservation programs are in demand--the waiting lists show it. John believes that one of the results of the PIK program might be more farmers building terraces, as the land is freed up for this kind of work during the summer months when the fields are accessible to the machinery required. This year they have also had a boost in people putting in shelterbelts--over fifteen rather than the usual two or three per year. In the past twenty years, the federal money available for these cost-share projects has not decreased, but its real value has when inflation is taken into account. Similarly, John estimates that SCS personnel has dropped 20% statewide in the last ten years.

Conservation tillage is being used by some farmers now to the exclusion of terracing and some other soil conservation practices. John Piskac believes that on slopes of up to 3%, it is possible to farm no-till and not terrace and still have a tolerable soil loss level.

Soil conservation practices are a long-term investment--they may not be paid back in a monetary sense over a lifetime, but they will retain soil productivity for future generations. Some of the reasons people don't put in soil conservation measures are the costs or stubbornness and unwillingness to change. Also, with the generous use of fertilizer, it's been possible to keep getting good yields and not notice the effects of soil loss in the short term. John Menhusen, a local Mankato banker, is proud of the fact that his bank has never had to turn down a farmer asking for a loan for soil conservation. This is important, as building terraces costs over $100 an acre.

The original Limestone Creek Soil Erosion Control Demonstration Project covered the Limestone Creek watershed, the majority of which is in Jewell County. This coming December 1 will mark the 50th anniversary of the meeting in the country schoolhouse when the majority of the farmers attending signed up to be included in the project. Cooperating farmers only had to agree to participate; they were not expected to provide labor or financial input. Wayne Underwood was at that original meeting and later worked on the project as a LEM (a local experienced man). However, the majority of the Civilian Conservation and the Veteran Conservation Corps were not local people. This did create some resentment, as not all the locals who wanted a job were employed. In fact, often they went to another state to work for the CCC.

In talking to Wayne and Ruth Underwood about the community's attitude towards the SEC project, we learned that it caused quite a bit of divisiveness. In fact, Ruth's Grandmother Colson literally threw her husband and his clothes out of the house, because she was sure he was going to ruin their land with this foolish terracing and farming on the contour business.



Dewey Underwood in a "big wash ditch" before erosion control measures were established.

There was also conflict because the area was predominently Republican, and the project was initiated by a Democratic president.

The long-term benefit of the project to the area doesn't seem to be in the terraces built, although some are still in existence and more have been rebuilt, but rather in the soil conservation principles introduced to Jewell County people. They saw conservation working; ditches and gullies disappeared and water stayed on a farmer's land. In fact by the end of 1934, 335 of the 629 farms in the project area had decided to participate in the project. Wayne Underwood said that in those days they were still learning; terracing technology was young, and the terraces were sometimes hard to farm with.

We asked Dewey whether he found contour farming on terraces to be more difficult with the large equipment used today. He felt that on the contrary it is easier, because one doesn't have to turn around so many times. Terraces do have to be redesigned to accommodate the larger machinery though.

Dewey showed us around the area so we were able to get a feel for terracing systems. Terraces are built-up strips of earth following the contour of the land. As Dewey explained to us, a good system is designed for minimum water loss. He showed us an example of poor farming practices, where the pond that all the terraces drained into was being filled with dirt by the farmer, leaving the water with no place to go. Dewey also pointed out that he used to collect more water in his pond for irrigation before his neighbor realized that the water was running off his land into Dewey's pond. Then this neighboring farmer realized that he should also put in a terracing system.

The Unsettling

Driving around we also saw many old farmhouse foundations--evidence of the de-population of the area as the farms have become larger. The demise of the railroads has also caused a decline in the population of the area. We visited the "ghost" town of Esbon. It used to be a main town for grain trade, as it was on the railroad line. The movement of people away from this area has led to less viable communities. Eventually there may only be enough children to fill one school for the entire county.

Ruth Underwood comments that not only do they have fewer neighbors, but people don't stop by and visit with each other as much as they used to. The Underwoods don't feel that they can leave the farm without one member of the family staying home because crime in the area has risen and they can't afford to lose their expensive machinery. However, neighbors do watch out for each other. One of their neighbors is an older farmer who lives by himself and he drives by the Underwoods' house to get to his fields. They notice when he goes by, and if he doesn't come back within a reasonable time, they go out and look for him. While we were visiting, he lost a bale of hay on the way back from the field, and Dewey was able to help him pick it up (one of the big round bales).

A Real Family Farm

Dewey and Ruth farm between 1300 and 1400 acres. They run a diversified operation, trying to grow what would be best for the weather conditions, but if one crops fails there's something else to fall back on. Land is cropped in rotations, with rests worked in. Dewey feels strongly that one can't keep taking from the land without putting nutrients and biomass back in to replenish it. This goes along with his firm belief in soil conservation practices.

Everyone in the family takes part in the farm work. Dewey says his children will grow up knowing many skills, and whether or not they choose to remain in farming, at least they will have that choice. Whenever possible, they try to eliminate the need for the middleperson. Dewey supplies two area feedlots with grain, thereby avoiding the necessity of selling through grain elevators. In their egg business, which Ruth runs, they do the washing and candling and sell grade A eggs directly to retailers. Both Underwood couples stressed the importance of the husband and wife team in running the farm.

Besides learning firsthand about farming, the Underwood children are growing up with a sense of family and history not found in many places in this country today. Dewey's grandfather settled in Jewell County and was able to give each of his seven children a head start in farming. Many of their children also remained in the area. Ruth Underwood (senior's) scrapbooks are collections of family history. Just by living next door to one set of grandparents, and a short drive away from the other pair, they have access to an abundance of historical knowledge far more interesting than that in history books.

Dewey also sees the importance of having older family members living nearby. He relies

The Underwood family: Ruth, Dee, Dewey, Van, Stede and Erwin (in front).

on their farming experience, as well as his own, when making decisions. There are some things that he doesn't even attempt to do as well as his father. For example, choosing cattle for the herd was a skill of Wayne's, but Dewey's talents are in other areas. When we were visiting, Dewey noticed one of his calves falling down and not getting back on its feet. The calf was bloated--perhaps from eating too much rich alfalfa. Dewey (with the help of the rest of the family) proceeded to put a hose down into the calf's stomach to allow the gas to come up. It turned out that it may have been food poisoning rather than gas as what came out was liquid. Dewey did what he could and one of his sons stayed to watch the calf. After the emergency was taken care of to the best of his knowledge, Dewey consulted his father to see if he had done the right thing, and if his father's experience with calves in the past had given him any further insights into what was wrong.

The Underwood family members work together to make a living. But farming is a way of life for them, not a business. We were impressed by the Underwoods' strong concern that their land remain productive in the long term, as well as provide for their sustenance now. Soil conservation practices are seen as necessary, not just an extra expense. But this attitude has been fostered by soil conservation programs in Jewell County, and the availability of financial assistance through federal cost-sharing programs. It is fitting that the American people contribute through their tax dollars to the conservation of our most important resource, the soil.

BILL PROMOTES SUSTAINABLE AG. RESEARCH
Continued from page 29.

legume and other sod-based crop rotations, the efficient use of crop residues, green manures, animal manures, off-farm organic wastes and mineral bearing rocks, and the utilization of sound, efficient production practices including conservation tillage, conservation irrigation (including low-pressure systems and irrigation scheduling), and non-chemical or biological methods of weed and pest control." The five-year study will be composed of six crop and livestock farms (two dairy and four non-dairy) and six crop-only farms (two fruit and vegetable and four grains or cotton).

3) to ensure that the U.S.D.A. will cost-share legume intercropping for nitrogen fixation and soil erosion.

Unlike the 1982 bill, the APA has generated broad-based, bipartisan support, with fifty-eight representatives and sixteen senators as co-sponsors.

The Agricultural Research Service (ARS) of the U.S.D.A. in their program plan, a general overview of research prioities for the next twenty years, contains specific mention of the need for research in sustainable agriculture, Yet the 1983 ARS implementation plan appropriated no money for sustainable agriculture.

Furthermore, U.S.D.A. staffing in organic agriculture has been cut back. In 1982, the U.S.D.A. fired Dr. Garth Youngberg, the coordinator of the Organic Farming division of the Science and Education Administration. Youngberg was hired as coordinator in 1980 after participating on the U.S.D.A. study team that wrote the 1980 Report and Recommendations for Organic Farming. While at the U.S.D.A., he was the chairperson of the ten-scientist Organic Farming Coordinating Committee that spent over a year putting together a long-term education and research plan for sustainable agriculture. Due to cuts in Youngberg's time and pressure from the Reagan administration, the plan was never completed.

Dr. Youngberg was replaced with a four-member board of U.S.D.A. scientists, so far inactive. The chairperson is Dr. Charles Smith, a long-time U.S.D.A. soil scientist who works quarter time on organic farming. Dr. Smith sees his job as one of information collection, not of organization or planning. Unlike Dr. Youngberg, he feels that most of the U.S.D.A.'s ongoing research is applicable to the needs of organic farmers, and that, despite the numerous U.S.D.A. reports to the contrary, research geared scientifically to organic farmers is unnecessary.

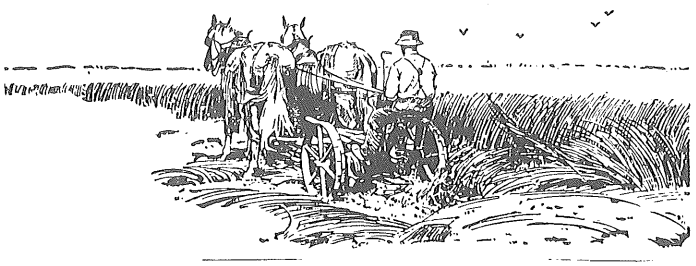
Obviously, the APA will not require the truly "basic research" needed for a sustainable agriculture such as long-term, comprehensive studies of both chemical and organic agricultural systems and long-term, comprehensive comparative studies of natural and agricultural ecosystems. Yet it will provide specific and valuable information for working farmers, and evidence of the complex transition from chemical to biological agriculture which will raise questions answered only through such comprehensive "basic research."

Proponents of the APA feel that it has a good chance for passage in the House, but a small chance of getting out of full committee in the Senate. Even if passed by both houses, the APA faces a rocky future. The bill is an authorization, not an appropriation, and even if monies are later appropriated, it will be difficult to ensure that they will be used to fulfill the true intentions of the bill.

Although it is easy to become discouraged when faced with these practical realities, it is encouraging to remember the optimism of Dr. Youngberg, who, even as he faces that daily political reality, feels that "there are enough 'closet organics' in the U.S.D.A. willing to work on wholistic research to fill an entire building." It is our responsibility to work towards a political climate that will allow the construction of that building.

Solar-Powered Amish Farms

Wes Jackson



For five days during the last half of July, I traveled among the Amish farms in northeastern Ohio and Lancaster County, Pennsylvania. Actually, this included two tours. 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, Maurice Telleen, the editor of the Draft Horse Journal, and his summer assistant, Sam Shublom, a senior at Kansas State University majoring in agricultural technology. The Pennsylvania trip was tacked on as the consequence of a long-standing invitation to Maurice Telleen by Ivan Glick to see the sophisticated horse technology among Pennsylvania Amish. Mr. Glick, an ex-Amishman, is employed by Sperry-New Holland, a manufacturer of agricultural implements.

The largest concentration of Amish, about 40,000, live in northeastern Ohio. Most of them live in Holmes and Tuscarawas Counties. The Lancaster County, Pennsylvania Amish are the second largest concentration.

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.

Most of the Ohio Amish farms we visited specialized in top quality stallions and brood mares whose colts and two year olds were for sale. Such fine quality brings top dollar and is probably a primary reason they seem to be so financially solvent, even during these rough times for farmers. But their neighbors, who might not have such fine horses, seemed to be prospering as well.

Good farming seemed to be paying off, even in country which is not prime farmland. We saw steep slopes being farmed in strips with little discernible soil loss, in a rotation which requires plowing of a strip only once every four years. On one exceptionally steep hill on the Monroe Miller farm, all dirt is thrown up hill with a plow specially adapted for such a purpose. We were all impressed with how little soil is lost from such a field, so the rotation he practices is important to understand. One year he will grow corn; and the next year, wheat, in a strip. But he plants wheat in the corn ground after the corn has been shocked. This means that the corn, stalks and all, must be carried from the field. The stalks of eight rows of corn are carried uphill and shocked, and the eight rows on the downhill side are carried and shocked down hill. In these sixteen rows where the stalks have been removed, he plants wheat in late September. He plants Timothy grass with the wheat, and in March he plants red clover. By the time the wheat has been cut the next summer, his hay meadow is well underway, and he will harvest hay from it for two years. In this four year rotation then, the strip is devoted to corn about a half year, to wheat almost a year, and for two and a half years, it is a soil-binding hay meadow. Cow and horse manures are added for fertilizer. The cash crops are milk and horses.

The Ohio Amish were in the midst of wheat harvest when we were there. Nearly all the area wheat had been shocked, and some of it was being loaded onto wagons and was headed for the barns. In the barn was a threshing machine, and outside was a tractor used only for belt power for the thresher. They put the grain into a bin in the barn or on a wagon, and the loose straw was blown into the barn to become bedding for their animals. They grow long stem wheat, because as one farmer told me, the straw was as important to him as the grain. He was surprised to learn that most of our straw in Kansas was either burned or plowed under without first being mixed with manure.

Probably the first lesson to be learned if we are serious about a solar-powered agriculture using the conventional crops, is how many people will be necessary to properly care for the land. Almost everywhere we looked, we saw lots of busy people. Scott and I had driven to Kansas City, and from there we flew to Columbus, Ohio. We then drove another 100 miles or so to New Philadelphia to join the tour. Had we driven all the way from Salina, it would have required nearly two days in the car on a transect through the prime agricultural land of our country. My guess is that in the two days of driving through the land farmed in a conventional manner, we would have seen fewer people at work in agriculture than we saw in a comparable amount of time in the Amish countryside.

Sun-powered agriculture will not arise by decree. All the recipes for running the world on sunlight will have lots of people involved, and that includes the children. Everywhere we turned there were children, either working or

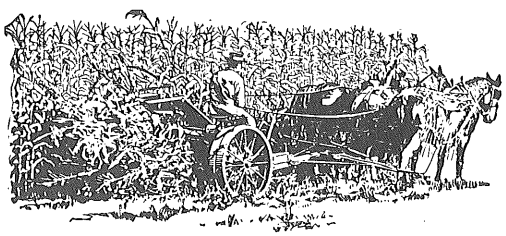
standing near their parents who were working. As we talked with their fathers about the virtues of this mare, that filly, or his favorite stud, the children stood attentively to the side, searching our faces or the faces of their fathers, always ready to "spring" into action with a quiet one to three word command given in a Low German dialect. "Spring" meant to hurry, and with this command a barefooted ten-year old boy would disappear into the barn and reappear with a one ton stallion on the end of a rope. In one case, a 35 pound child presented an 1800 pound mare for our group to see.

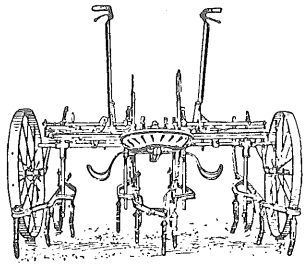
Among all U.S. farming communities, the Amish must rank at the top as far as the percentage of their total farm activity which is run on sunlight. Most proponents of nuclear power are forever reminding us how bleak it is all going to be if we don't put large amounts of energy to work for us. But the 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.

I saw no evidence of the PIK program, heard no complaints about how tough it is to make it farming, even though the average size farm must have been in the 80-100 acre range. If I remember correctly, the largest farm we visited was around 150 acres. The smallest was 33 acres, and only 20 of that was tillable.

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 the parents get old, they move into smaller quarters on the farm and are provided for.

The Ohio Amish, whose principle occupation is farming, sell high quality draft animals for very good prices. Most of them also milk about fifteen cows and sell milk. Others in the area may farm on the side, but have a cottage industry as the primary source of income. We visited buggy factories, a collar shop, and harness shops. Everything necessary to support the draft horse economy was there. Much, if not most, of the machinery used in those various shops have been invented by the owner of the shop; some is truly elegant. People with eighth grade educations have calculated gear ratios and have become informed about the various types of metals necessary to do a job.





After the three days with the Ohio Amish, Wendell Berry, Maury Telleen, San Shublom and I drove to Lancaster County, Pennsylvania. Maury Telleen had been promised by Irvin Glick that we would see the most sophisticated horse-drawn machinery we could see anywhere, and I suspect that we did. The Pennsylvania Amish do not feature brood mares and stallions, although they do milk cows. But their high value income comes from manufacturing sophisticated farm equipment adapted to the draft animal. Whether it is a horse-drawn manure spreader, a tedder (to fluff up the hay), a mower, baler, or plow, they have made adjustments to accommodate the horse or mule.

On one occasion we drove onto a farm where there was no sign of any manufacturing enterprise whatsoever. Maury Telleen explained our purpose for the visit, and the Amishman directed us to an old barn. Inside were some new plows I shall never forget. These were hydraulic plows in which the cylinders were activated by the wheels. Enough pressure would build up in the cylinder over a short distance to lift those plows from the ground with hydraulics. Such plows were most useful in rocky areas where they would push out of the ground if they encountered a large rock, but immediately go back in when the rock had been passed over. Hydraulics were also used to keep the plow going straight as the horses were making the turn, in order to avoid making furrows with curved ends characteristic of horse plowed fields. Two cylinders allowed the farmer to lift one plow and drop the other and come right back in the same furrow. The manufacturer said that he used such a plow for his garden. I walked over to the garden to estimate its length. I don't believe that it was more than 100 feet long, so the cylinders must build up very fast over a short distance.

During the entire trip I observed more "appropriate technology" (A.T.) 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 the 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.

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