THE LAND REPORT

Summer 1984

Number 21

Contents

Summer 1984

On the Cover

The 1984 experiments required more land, so we plowed up part of the wheat crop and established research plots. We extended the irrigation system to this area, as evidenced in the photo by the white plastic pipe standing ready for the hot, dry July days. Terry Evans photographed the students weeding their experiments one morning during the last week of June, before wheat harvest.

At The Land

Second Group of Ag Interns Establish Routine

Janine Calsbeek

It's 9 a.m., a harsh but sunny April day and the bicyclists have just arrived, breathless after the ride from town against the wind. Kirk cranks open the greenhouse shutters (his task for the week) while the rest of us find chairs in the circle. We settle down for the "warm-up," a 45 minute wide-ranging discussion. What would happen if the world had unlimited energy? How do people's values change? How should universities be structured? Should we initiate a protest against Burger King for cutting the Central American rain forest? What is the work load for the afternoon?

Our days have begun this way since we ten interns arrived in February. We are here from all across the country and Canada, graduates (or nearly so) of the following colleges and universities: Paul Adelman, Oberlin College; Mike Berghoef, Calvin College (Michigan); Janine Calsbeek, Northwestern College (Iowa); Martin Gursky, King's College (Pennsylvania) and Pennsylvania State University; Tony Martin, Davidson College (North Carolina); Dana Price, Stanford University; Kirk Riley, Michigan State University; Heidi Schmidt, Montana State Univer-

The Land Report

is published three times a year by

THE LAND INSTITUTE
RT. 3
SALINA, KANSAS 67401

Editor.....Dana Jackson
Arts Associate.....Terry Evans
Circulation Manager..Linda Okeson
Printed by Arrow Printing Company

Contributing to No. 21: Paul Adelman, Mike Berghoef, Janine Calsbeek, John Craft, Martin Gursky, Debra Israel, Dana Jackson, Wes Jackson, Kelly Kindscher, Tony Martin, Weeden Nichols, Dana Price, Kirk Riley, Ann Zimmerman

SUBSCRIPTION RATE: $5.00

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

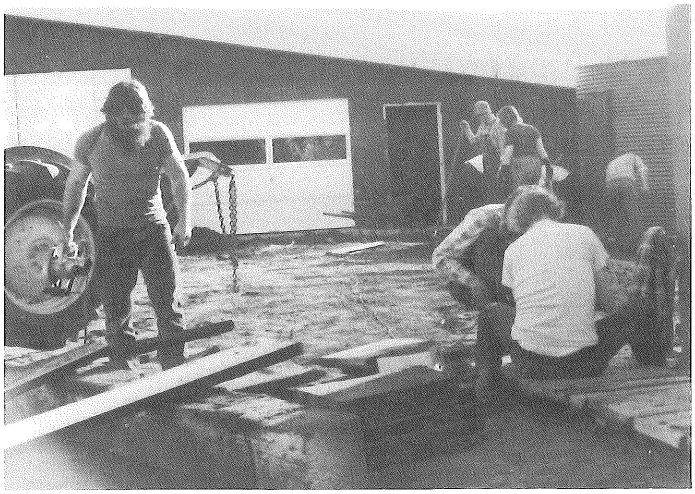
sity; Russ Wysong, Manchester College (Indiana) and Antioch International (Ohio); Ann Zimmerman, Kansas State University.

We are the second group of interns at The Land in this new 43-week program which is scheduled to coincide with the growing season--February to December. We differ from former Land students in that four of us are married, and our Land Institute "family" includes children: Marcus Gursky, 13; Angie Martin, 4; and Naomi Berghoef, 1 year. Half of us have been out of college for several years, and one has a master's degree. Some of us have taught school, a few have worked overseas, and others have been farming.

Each day this spring, after the 9 a.m. warm-up session, we discussed assigned readings for a couple of hours. Herman Daly's Economics, Ecology, Ethics, E. F. Schumacher's Small Is Beautiful, Donald Worster's Nature's Economy and Wes Jackson's New Roots for Agriculture have been part of the curriculum, along with a multitude of readings on population biology, ecology, genetics and agriculture from textbooks and scientific journals. These papers relate to the basic biological questions which The Land's research is trying to answer.

Occasionally professors from our research advisory group have given scheduled seminars (see page 7) and visitors have given impromptu talks about their work. Special guests this spring included a farmer-professor from India, a couple from Germany, two journalists, an evolutionary biologist, and several environmental activists.

Following the 9:00 to 12:00 a.m. class session comes lunch--a brown bag from home, a quick stir-fry with fresh greens from the garden, or once in a while a potluck at the Jacksons' home. After lunch, someone takes a turn milking Brownie, while the rest of us may invade the garden to pick off potato bugs. Then it's to the fields with the hoes, rakes and rhizomes.



Building the boardwalk to the barn.

Actually, in the early spring we spent many afternoons sprucing up the place--painting the barn, building a shed for the recycling and burn barrels, laying a railroad tie sidewalk, rewiring the barn with the guidance of Paul Krumm, and helping John Craft repair the wind machine. We also burned the Eastern Gama Grass, put more native perennials in the herbary, and planted the large vegetable garden. For the benefit of city slickers in our group, we spent an afternoon at the Farm Expo in Salina and attended a local farm sale. We also put together a display for the Sunrise Presbyterian Church's Peace Fair in March. Several of us wrote a statement about how sustainable agriculture could contribute to world peace to hand out at our booth.

Regular maintenance jobs (cleaning the kitchen, the greenhouse and the barn, checking oil in the pick-up, repairing tools, hauling in wood, rolling compost barrels, weeding the garden) are rotated each week.

In late April when the ground dried up, we plowed under parts of the wheat cover crop and began planting research plots. Spring was wet,

Dana Price and Martin Gursky pitch manure around base of fruit trees.

Mike Berghoef, Tony Martin, Russ Wysong and Dana Price laying our experimental plots.

Weeding the Herbary

so we (especially Wes and Walter) were nervous about having to continually postpone field work. But the ground was finally dry enough, and staking plots, discing, tilling and planting took priority over other work.

In the midst of planting came preparation for the Prairie Festival, and we became busy making signs, painting trash barrels, constructing toilets, etc. Former student Den Berry and his friend Frank Jenkins from Kentucky arrived May 20 to help us, and Donna Gursky, Patsy Martin and Willow volunteered their labor during the last hectic days prior to the Festival. We all put in one extra long day mowing and weeding the Herbary. Paul Adelman didn't realize the fruits of his efforts as he left on May 24 to attend his commencement at Oberlin College and missed the Prairie Festival. But the rest of us had the satisfaction of knowing that The Land looked good, and participants at the Festival appreciated our preparations.

An intense day in late June: most of us are weeding and thinning, Russ and Martin are adjusting the irrigation pipes, Walter is pollinating Eastern Gama Grass, and Heidi is roaming a plot of sunflowers with her notebook, collecting data. Each intern is responsible for one or more of the 40-plus experiments, and must care for the plants all season, analyze results and eventually write papers. During the two weeks following the Prairie Festival, we had class every morning with visiting professor Arnold Schultz, but now class is held only occasionally--both mornings and afternoons are for field work. It's getting hotter, so there is talk of working early and late rather than 9 to 5. In addition to the interns, the summer staff includes Dana and Wes Jackson, Walter and Becky Pickett, Linda Okeson, Marcus Gursky and Sara Jackson, and often volunteer Deana Davis.

A little after 5 p.m., Ann and Tony amble in, singing a new blues tune. Mike picks the last of the peas and some beets for supper. Becky hunts for her children, Sherri and Wendall, who are spending days here all summer; today she finds them climbing a tree to get a kitten. Dana Price pops some strawberries into her mouth and swings onto her bike. It'll be a sweet ride home, for now the wind is at her back.

Paul Adelman and Walter Pickett marking plots.

1985 Ag Intern Program

The Land Institute will offer ten internships in sustainable agriculture for the term beginning February 18 and ending December 20, 1985. Each student will receive a stipend of approximately $90 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.

Persons interested in becoming candidates should write to The Land Institute for application information. December 1, 1984, is the deadline for applications to the 1985 program.

Calendar

Sept. 11	-	Fall Session Begins
Oct. 7	-	Visitors' Day
Dec. 1	-	Deadline for 1985 Ag Intern Applications
Dec. 14	-	Fall Session Ends

1985

Feb. 18	-	Spring Session Begins
June 1-2	-	PRAIRIE FESTIVAL
June 3-Sept. 6	-	Summer Session
Sept. 9	-	Fall Session Begins
Oct. 6	-	1985 Visitors' Day
Dec. 20	-	Fall Session Ends

Special Spring Visitors

Partap Aggarwal of Rasulia, India, visited class in February, and inspired us with his gentle spirit. Formerly a professor at Colgate in the U.S., he and his family decided to return to India. They soon became part of the Friends Rural Centre, along with 12 other families, most from the villages. The group lives on 45 acres, farming about 30 without chemicals and another 5 without tilling, in the Fukuoka tradition. The Centre also works with biogas plants, dairy cows, spinning wheels and an oil press.

"We're not experts," said Partap, "and that's our strength, I'm convinced." Their aim is to inspire small farmers to think for themselves and to look to nature as their teacher.

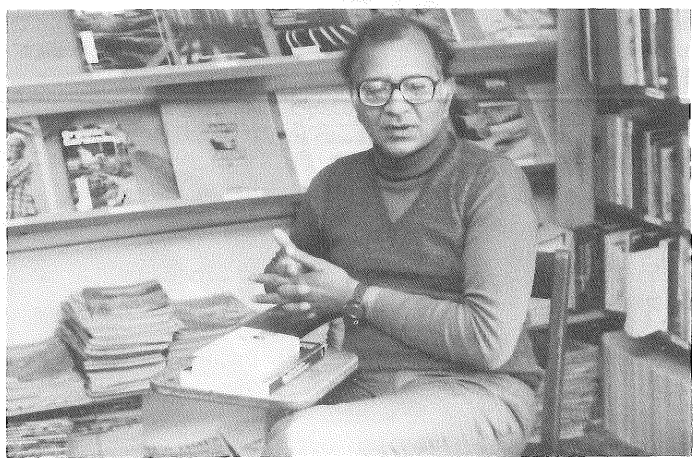
James Risser, Washington Bureau chief for the Des Moines Register and twice Pulitizer Prize recipient, visited briefly in March; we discussed journalism, agriculture, and Washington, D.C. Risser has written a group of articles on environmental crises on the farm and more recently, a series on organic farming.

We traveled to Kansas State University in April to attend a lecture by G. L. Stebbins, evolutionary biologist at the University of California, Davis. The next day, he found a couple of hours to squeeze in a tour of The Land, and hear about our research.

Mari Peterson of the Kansas Natural Resource Council and Mary Fund, Kansas Rural Center, joined us May 2, discussing Kansas water problems and citizen involvement in environmental issues.

On May 22, Harris Rayl, editor of The Salina Journal, explained his editorial policy. He attempts to make people aware of interdependence--how their actions affect the environment, their neighbors, and the larger community.

Later in the month, Reed Zars, formerly of the Powder River Council in Wyoming and now a law student, told of his experiences trying to protect the environment in an area where energy resource extraction is big business. "Anybody can read the law," he said, "you just have to be creative (to win the case)."



Partap Aggarwal

Janine Calsbeek

Gardening Workshop Begins Season

Janine Calsbeek

March 17 was a bit chilly and damp, but that didn't stop about thirty people from dreaming of sunshine and fresh peas at the Green Thumb Gathering. The workshop on organic gardening, held in the classroom all day, dealt with methods of growing and preserving vegetables, fruits and herbs.

The program included Chris Seitz of Salina telling about her Garden Calendar column in Organic Gardening magazine, and Dana Price showing the solar growing frame, which still contained last fall's planting of spinach. Other highlights were Walter Pickett's explanation of the Seed Saver's Exchange and Tony Martin's description of quick compost, made of layers of dry material, green stuff, and manure, and turned every three days.

Gardening tips came from everyone who participated. These were included:

--Soak carrot seed for early germination and plant with coffee grounds to discourage carrot fly and carrot maggot.
--Celery likes muck and lots of water.
--Plant tomatoes deep (especially if they're "leggy") and remove bottom leaves.
--Save tomato seeds by first blending in blender with water for a few seconds to remove gel, then dry them.
--Plant nasturtiums with potatoes to discourage Colorado potato beetle.

Dana Jackson, Martin Gursky, Heidi Schmidt, and Janine Calsbeek also led workshop sessions.

Fall Visitors' Day

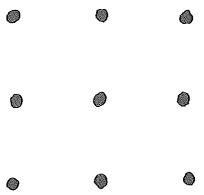
The annual Fall Visitors' Day will be on Sunday, October 7. Anyone interested in learning more about The Land Institute and meeting the students and staff is invited to attend. The program will begin at 1:30 p.m. and conclude approximately at 4:30 p.m. It will include both tours of projects and a lecture/discussion. No pre-registration or fee is required.

Arnold Schultz is Visiting Professor

Janine Calsbeek

Arnold Schultz took over the small solar office for two weeks after the Prairie Festival, serving as our visiting professor. He presented a brief version of "Ecosystemology," a popular course at the University of California, Berkeley, where he is professor of ecology. Schultz teaches that we must think differently to study complex systems, such as whole ecosystems. Our problem is that the tools we have for thinking are more for analysis than synthesis.

With puzzles and pictures, Arnold showed how our thinking is often linear and restricted. For example, solve the nine dot problem. Using four straight lines, and only four, connect these nine dots. The lines themselves must be drawn without taking your pen off the paper. If you succeed, try it with three straight lines. Someone has calculated that fewer than 10% of Americans can do the four-line problem. Why is it so difficult? See page 9.



Another limitation in thinking comes when people think by reducing. In Arnold's fable-essay, "The Raisin Bread Culture," he tells of a world made of loaves of raisin bread, where reductionist thinking is carried to an extreme. Scientists developed disciplines like raisinology, nut science, cinnamonics, and pastronomy, but when the bread began to mold, they didn't know why. The scholars wouldn't attempt to study the whole loaf, or even vertical slices, but continued to look at extracted parts. The government finally suggested that citizens get used to moldy bread, and eventually the civilization collapsed.

Schultz believes there are ways to get beyond the blocks to thinking, and to study an ecosystem as a whole. He showed slides relating to his ecosystem research in the Arctic tundra and in the California Pygmy Forest. Instead of just looking at certain organisms within the system, or the interaction of some of the organisms, he stressed that one must go outside the system and look at all the factors involved. We looked at the prairie ecosystem with Arnold when we camped overnight in the Flint Hills near Matfield Green, Kansas. In the morning we explored the tallgrass prairie and its diversity, then discussed succession and sustainability.

How do we develop tools for synthesis? We need analytical tools, but also need to "unlearn" some of our reductionist thinking. We need to look at all interactions, but to avoid getting lost, we need to selectively ignore some relationships (e.g., Newton ignored astroids, cosmic dust, etc., when he hypothesized that nine planets revolve around the sun). We must find a balance of content, generalist thinking, and trial and error. And we must not overlook what ought to be. To move from the population level to the ecosystem level in agriculture will require researchers and farmers with these broad thinking skills.

Ecologist Hired

Dr. Judith Soule will begin employment at The Land Institute on September 1, 1984, as Research Associate in Ecology. Her responsibilities will include both teaching and research. She currently holds the position of Research Specialist for the Michigan Natural Features Inventory.

Judy Soule received a B.S. in 1975 and a Ph.D. in 1981 from the College of Natural Resources, Department of Zoology, Michigan State University. She is a member of Phi Beta Kappa and Sigma Xi honorary societies. She studied under a National Science Foundation Pre-Doctoral Fellowship at Michigan State and in the summers at the Rocky Mountain Biological Laboratory, Crested Butte, Colorado. She is a member of a number of professional societies such as the Ecological Society of America, as well as the Michigan Audubon Society and the Nature Conservancy.

"Ecological Consequences of Dioecism in Plants: A Case Study of Sex Difference, Sex Ratios and Population Dynamics of Valeriana edulis Nutt." was the title of Dr. Soule's dissertation. On April 12-13, she visited The Land and presented a seminar on the research she did for her dissertation.

Dr. Soule has co-authored papers about the patterns of resource allocation in plants which

were published in the American Journal of Botany and the Bulletin of the Torrey Botanical Club. The study of the allocation of resources in plants is relevant to The Land's research into the development of cropping systems based on mixtures of perennial plants. An important aspect of the reproductive strategies of plants is the allocation of resources to various organs or functions within an individual. A major question in reference to perennial crops is whether an increase in seed yield (an allocation of energy to seed production) will be at the expense of the root system (energy taken away from root development).

From June 11-18, Judy represented The Land Institute at the Conference on Sustainable Agriculture and Integrated Farming Systems at Michigan State University.

Judy, her husband and two children will move to Salina in late August.

Weeden Nichols to be Fulltime Operations Manager

The Land Institute has hired Weeden Nichols, Salina, as our full-time Operations Manager. He will be responsible for maintenance and repair of buildings and equipment, new construction, and some teaching.

A retired officer from the U.S. Army, Weeden currently works for the State of Kansas, Division of Employment. He will begin work at The Land on August 1.

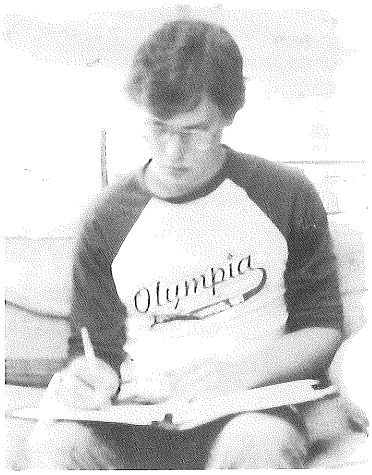
Weeden has a B.A. in Economics from Park College, Parkville, Mo., and a B.S. in Accounting and Business Administration from Marymount College.. He received an M.A. in Public Administration from the University of Oklahoma.

Weeden is active in the Salina Mennonite Church, the Salina Peace Coalition, and Amnesty International. He is a Friend of The Land.

Weeden and his family built their own log home east of Salina. They maintain a large garden and raise a few beef cattle.

Weeden (left) meets Martin and Russ

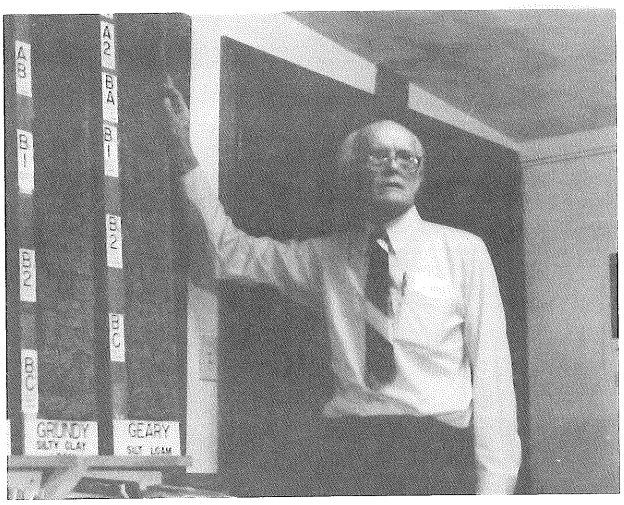
Seminars Enrich Program



Kirk Riley

The Land Institute Research Advisory Group, comprised of professors from the University of Kansas, Kansas State University, Emporia State University and Bethel College, was formed in 1983. Members volunteer their time to attend two meetings a year, one at The Land in early summer to view the experiments and critique design, and the other at Kansas State in December to hear students present papers on their results. During this spring semester, several of them presented seminars at The Land about their research and how it relates to our work. The seminar program has enabled us to consider outside opinions and, in the process, learn about some of the latest developments in many fields, including population biology, plant ecology, population genetics, and physiological ecology. While the research of each professor is usually very specific in nature, examining one question or species, the results they bring and the method they use can often be applied to many different questions.

The first seminar speaker of the 1984 Ag Intern Program, on February 23, was Orville Bidwell, professor in the Agronomy Department at Kansas State, a soil morphologist, and member of The Land's Board of Directors. Dr. Bidwell began by discussing five factors that influence soil morphology: parent material, climate, topography, time and organic activity. A change in any of these factors, he said, can have a profound effect on the ability of a soil to support certain plant species. Dr. Bidwell also showed soil profiles taken from various places in Kansas. Over time a soil stratifies into zones, or horizons, which are visible in a soil profile. The greatest level of organic activity occurs in the top or A1 horizon, giving that layer its characteristic dark color and high level of soil carbon. In addition to carbon, this "top" soil houses the nutrients, mainly nitrogen, phosphorus, and potassium, upon which plant growth depends. Stressing the importance of topsoil, Dr. Bidwell stated that if the A1 horizon is eroded down to the next horizon, the B1, and then reseeded to tallgrass, it would take "thousands" of years to revert to A1.



Orville Bidwell

Dr. Bidwell's work is especially important to us in that the hallmark of a sustainable agriculture must be the ability to minimize soil loss, and eventually to accumulate soil, i.e., a net soil gain, as is seen on the prairie.

On March 1, Lloyd Hulbert, plant ecologist at K-State and director of the 18,000 acre Konza Prairie, introduced us to prairie ecology, with special emphasis on the tallgrass or true prairie. He explained that the tallgrass prairie once stretched from Texas to Canada, but now exists only in patches, most of it having been plowed over. All three major types of prairie can be found in Kansas: tallgrass to the east where rainfall is highest, shortgrass to the west where rainfall is least, and midgrass in between.

The Konza is a tallgrass prairie reserve near Manhattan, Kansas. Dr. Hulbert explained that researchers at the Konza hope to determine what makes a prairie a prairie. They are asking: Are grazers necessary? (They plan to add native grazers--bison elk and pronghorn--to see how their grazing differs from domesticated grazers.) How often should burning occur? (Parts of the Konza are burned at specific intervals to answer this question.)

On March 22, Craig Martin, a physiological ecologist from the University of Kansas, spoke at The Land on photosynthesis and water relations. Dr. Martin explained that plants can be separated into three basic photosynthetic pathways, based on the number of carbon atoms in the first important molecule of the pathway. The first pathway to evolve, the most common, is the C-3, which begins with a three-carbon molecule. The C-3 pathway began under anaerobic conditions on the primitive earth and is seen in plants with (relatively) slow growth rates. Plants that use the C-3 photosynthetic pathway include wheat, rice, soybeans, mosses, ferns, cool-season grasses, and all trees.

The next pathway, the C-4, requires more energy than the C-3, and is seen in plants with faster growth: corn, sugar cane, milo, warm-season grasses, and most weeds. C-4 is thought to be an adaptation to a warmer climate as plants of this pathway can tolerate higher temperature than those of the C-3. Interestingly, plants of the C-3 pathway fix atmospheric carbon dioxide less efficiently than C-4 plants and operate optimally under higher carbon dioxide levels. Hence, with increasing atmospheric carbon dioxide (the so-called greenhouse effect) C-3 plants will be at an advantage over C-4. The importance to agriculture of this differential response to atmospheric carbon dioxide will become clearer, probably within the next twenty years.

Jim Mayo, prairie ecologist from Emporia State University in Emporia, Kansas, spoke April 3 at The Land, on nitrogen cycling in plants. Dr. Mayo's work has been primarily with Big Bluestem, Little Bluestem, Indian Grass and Switch Grass, all prairie species. He has found that some grasses fix nitrogen through rhizosphere bacteria. Root samples which cause acetylene to turn to ethylene indicate the presence of nitrogen and nitrogen fixing bacteria.

Dr. Mayo further told of his work with Johnson Grass, a perennial sorghum, and one of the species we are working with at The Land. Johnson Grass, he said, grows best in a soil rich with nitrogen in nitrate form--as is found in farm fields where ammonium nitrate fertilizers are used. On the prairie, however, soil nitrogen is predominantly in the form of ammonia, unfavorable to Johnson Grass, explaining why Johnson Grass is not a bothersome weed.

Sorghum is a very important crop in Kansas. Farmers plant one-tenth of the state, over five million acres, to sorghum, Dan Rodgers, pro-

Craig Martin measures photosynthesis in Heidi's plot of Maximilian's Sunflowers.

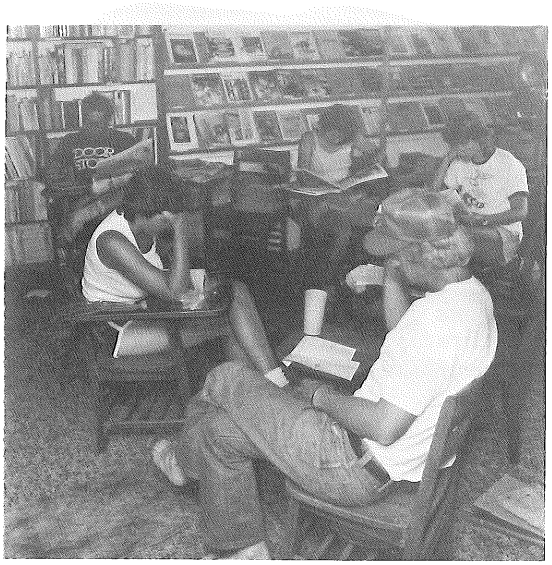
fessor of agronomy and plant breeder at K-State, told us during a seminar April 19. He explained that sorghum causes much of the erosion seen in Kansas, but it takes less irrigation than corn; as a result it has replaced corn as the primary feed grain grown in the state. He told us about sorghum's interesting life history; it was grown in Africa for thousands of years prior to its introduction to the New World. In Africa, each tribe would select for certain traits based on local conditions, which helped maintain outstanding genetic diversity in the crop. In the U.S. today nearly all sorghum is derived from two African strains. Both yield well but have lost the diversity necessary to withstand pests. Dr. Rodgers stressed that plant breeders need to select for resistance to more than one gene at a time, as a pest usually has no trouble overcoming a one-gene change.

Dr. Rodgers also discussed research on drought resistance in sorghum. Sorghum has striking resistance to drought stress, both before flowering, when the plant shows vigorous early growth under stressful conditions, and after flowering. Dr. Rodgers ended his seminar by stressing the need for universities to fund research on something other than increasing yield.

On May 3, Jim Hamrick, a population geneticist from the University of Kansas, wound up our spring seminar program with a talk on the distribution of species and genotypes, and the effects of distribution on genetic structure. Populations and species, he said, are not distributed at random, but rather show a patchy or clumped distribution. Correspondingly, the frequency of certain genes are also distributed non-randomly.

To illustrate his point of non-random distribution, Dr. Hamrick showed slides of Avena barbata which exhibits great genetic diversity in a very small area (30' x 30'). He listed several mechanisms to explain non-random distribution: Founder Effect (the colonization of an area by one or more new species), the mating system of the plant (whether outcrossed or selfed), the method of seed or pollen dispersal which correlates with the genetic mobility (the distance over which the seed or pollen is distributed). Species that can move genes over but short distances show high variability between populations, but low variability within populations; species that can move genes over great distances show high variability within, low variability between. It became clear through Dr. Hamrick's talk that an understanding of mating systems, and the distribution of species, can yield important information on how genetic structure changes.

The students and staff at The Land gained much from the presentations of members of the Research Advisory Group. We appreciate the time and effort they contributed by driving to Salina to give the seminars. We look forward to future meetings with members of the group, and future opportunities to learn from them.



Lunch and reading go together for Paul, Deana, Heidi, Russ and Ann (l.to r.).

Prairieland food cooperative

In February, the Board of Directors of the Prairieland Food Co-op in Salina voted to phase out the storefront and become a buying club. The decision came after months of discussion and a survey of the membership in January.

The Land Institute got the co-op started in 1977 as a buying club. The storefront for members opened in January 1978. Sales and membership grew at first, but declined in the 80's. To cover expenses, the mark-up was high, which meant that the non-competitively priced items stayed on the shelves too long, and food quality was low.

The new co-op structure has resulted in dramatic improvements in prices and food quality. Members who were paying a 75% mark-up, then working four hours a month to get a 20% discount, now work the same four hours a month and pay only a 15% mark-up over cost. The gross sales in April and May were the highest since December 1981.

The change has erased the option of working and buying only occasionally. Members must attend ordering meetings and order at least six times a year, must help package food or do clerical jobs and help clean up. There are still problems to work out, but Prairieland is more truly a food cooperative now.

The Nine Dot Problem

Most people, in trying to solve this problem, will assume that the lines must not extend beyond the square marked by the four corner dots. But that is an assumption not expressed in the rules. In the case of the three-line problem, a different assumption is usually made--that the dots represent mathematical points with no dimensions.

Synapsis

Tony Martin

I

No one knows just how it happens.
Diffuse threads of genetic material condense
Chromosomes take shape.
They grope around in the nuclear dark
Bumping into strangers until
They recognize their own.

Then they embrace - or nearly so -
In what even textbooks call "an intimate pairing"
Gene for gene down the length of their bodies
Like white-faced mimes playing mirror games
Eye to eye
Nose to nose
Hand to hand.

It isn't always easy.
The mirror may show a mutant clown
With an extra arm
Or a foot for a hand
An inverted thigh
There may be more than one clown in the mirror.
But still they recognize their own.
Homologues twist and bend,
Buckle and loop
To accommodate each other.

Then the crossovers -
Clowns swapping elbows, noses, heads
Till spindle threads pull them apart.
They bow to one another as they move
to the poles and the cell wall
Closes between them like a curtain.

A curtain call and the gametes are formed
Then pollen - egg - zygote - seed,
Some seed falls on good ground
And the dance goes on.

II

We come together to sing.
Diffuse threads of culture condense into music.
We tune our guitars
Thumb through song books
Shout out requests until
We recognize our own.

Then voices and instruments join
In a synapsis of sound.
Word for word
Note for note
Beat for beat.

It isn't always easy.
We bend and twist the lyrics.
Our voices loop and buckle
And break into laughter to accommodate
The abberations:
Inversions, deletions,
Duplications, translocations.

Still we recognize our own.
This pop-culture polyploid -
Linked and spread by electronic rhizomes
from California to the New York Island -
We hold in common.

Incredibly we know these songs.
We are not slaves or miners or cowboys or sailors.
Yet we sing swing low and sixteen tons
Yipee-ay-aye and up she rises.
We share no religion
Yet we sing Amazing Grace and Kumbaya.

We dance in multivalent rings
Kicking and stomping our legs
Now like dance hall girls,
Now like Russian Cossacks,
Hassidic Jews,
Clowns.

We crossover.
We are pulled to poles.
Who can say what may be linked
To the words and tunes we trade.

We are making gametes,
Making seed.
Transmitting and transforming
Ancient patterns of
Sound, word and deed.
From which may grow new
Songs, poems, cultures.

Prairie Festival 1984

Dana Price

The music began Friday night as Land students present and past met friends and participants who were already arriving. This evening and throughout the Festival, ideas and discussion mixed with art and celebration.

The Prairie Festival is an exciting opportunity for people who are working on issues of common importance to meet each other. There is thoughtful intent behind each smiling face as people active in the peace movement, the struggle for peace and justice in Central America, bioregionalism, organic farming, conservation and solar energy, and the environmental movement gather at The Land the last weekend in May.

This sixth annual Festival had the theme, "Ecology and Economics." Broad enough to unify the various concerns brought by participants, this theme offered a serious challenge: how, within the natural order, to create a human system harmonious with itself and with the environment.

Ecology and the prairie ecosystem were emphasized Saturday. To introduce this theme, Dwight Platt, Professor of Biology at Bethel College, discussed the many factors important to this ecosystem in his talk, "What Makes a Prairie a Prairie?"

Dwight Platt's description of the prairie was a background for the rest of the day's activities. In the morning, many participants had tours of The Land Institute or visited the Prairie Raptor Project which Maure Weigel, in association with the Smoky Hills Audubon Society, directs. Prairie raptor photographs by Terry Evans and sketches by Dick Courter were exhibited at The Land all during the Festival.

The afternoon program, "Prairie Experiences," offered several ways of enjoying and appreciating prairie. Jack Walstrom, representing the Kansas Wildflower Society, led wildflower walks. Mike Martin, Kansas Chapter of the Sierra Club, talked about "Prairie Outings; Where To Go and What To Do." Jan Garten, Conservation Chair of the Northern Flint Hills Audubon Society, showed slides of an important and endangered wildlife area, Cheyenne Bottoms. Carol and Wendell Mohling, The Prairie Center, Olathe, Kansas, and Bill and Jan Whitney from the Prairie Plains Resource Center, Aurora, Nebraska, talked about Prairie Education.

The Land Institute agricultural interns with Wes and Walter led a tour of the experimental plots and discussed the Agri-Prairie Project, our research to develop a sustainable agriculture based on the prairie.

The last event of the afternoon featured Terry Gips of the International Alliance for Sustainable Agriculture who showed slides of traditional and modern sustainable agricultural ecosystems around the world.

Ecology and Economics

In the evening program, our two speakers began the challenging task of integrating ecology with economics. To do so, we humans need to change our way of thinking, to understand the natural world and our relation to it in greater than human terms. Arnold Schultz, Professor of Ecology at the University of California, Berkeley, offered a different perspective in "Thinking Like An Ecosystem."

Can ecosystem thinking be incorporated into the human economic system? An economist must think of the interaction between the natural world and the human economy, but few have recognized this or achieved the synthesis. So we were especially fortunate to have Herman Daly, Professor of Economics at Louisiana State University and author of steady-state economic theory, at the Festival. Daly's subject on Saturday evening was "Alternative Visions of the Economic Process."

Following Daly's talk was the eagerly awaited Bluestem Songfest. Musicians and folk with songs to share gathered around a fire, and the south barnyard was filled with smiling, singing and dancing late into the night.

What Makes a Prairie a Prairie?

The next few pages demonstrate the serious teaching which took place during the Prairie Festival. From transcriptions of tapes, we have summarized major points in speeches by Dwight Platt, Arnold Schultz and Herman Daly relating to the theme, "Ecology and Economics."

The word "prairie" meant "meadow" or "grassland" in the language of the French explorers who used it to describe the vast grasslands of central North America. But Dwight Platt explained that prairie is more than a grassland. Much of what once was prairie has been replaced by wheat fields and brome pastures, but even an assembly of native plants does not of itself make a prairie. The prairie is an ecosystem, and could not exist without the interaction of the physical environment with the biotic community of plants, animals, and microorganisms.

The biotic community is a product of evolution and interrelationship while the physical environment is characterized by limited and unpredictable rainfall, temperate climate, periodic fire and soil.

Prairie soil, a product of rock, weathering, and the biota, is a buffer against any environmental stress. A large proportion of prairie biomass, and much of the dynamic, is underground. Soil protects plants and burrowing animals from drought, extremes of temperature and fire. Since moisture is a limiting resource, the soil is filled with stratified root systems.

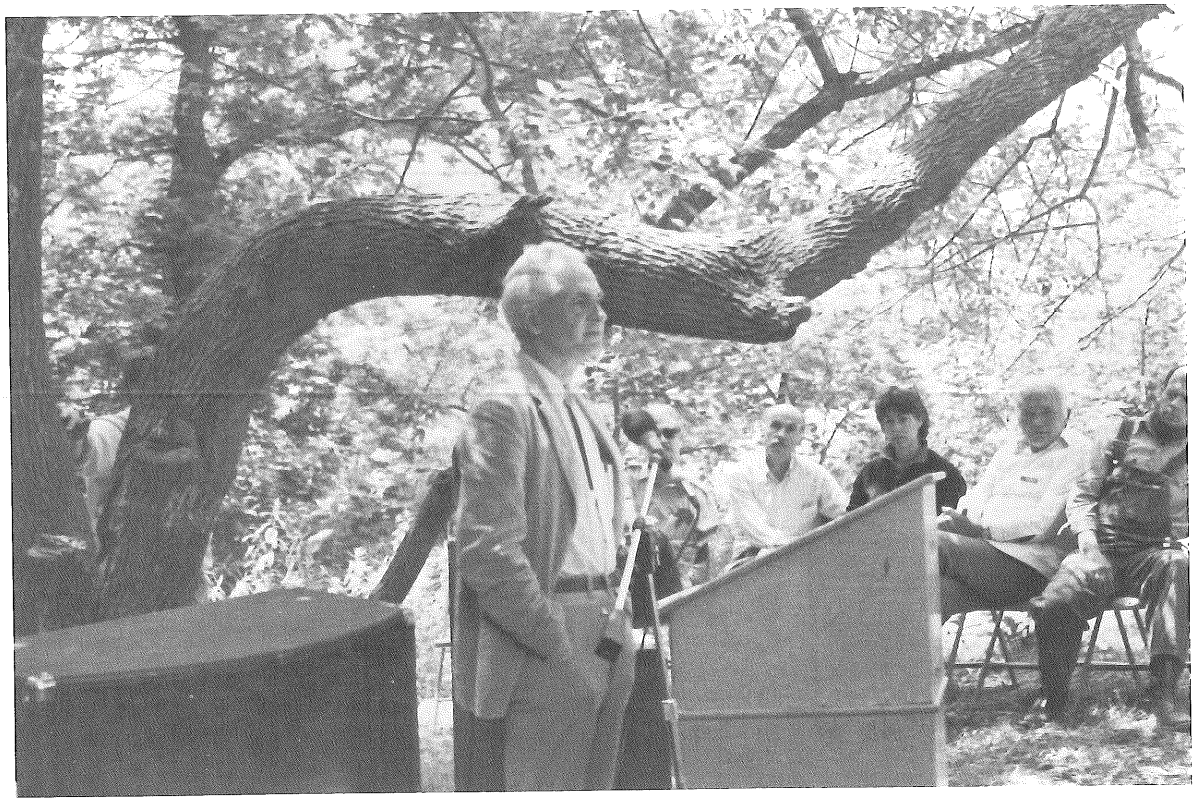
A natural prairie differs from a man-managed grassland in diversity, composition, and patterning. In a prairie, forbs are as important as grasses. Diversity extends from plants to animals and microorganisms. Without nitrogen-fixing bacteria or mycorrhizal associations with fungi, many plants would not thrive.

The composition is sensitive to subtle changes in the physical environment and biotic relationships. Variation in rainfall, frequency of fire and grazing intensity cause natural fluctuations in composition from year to year.

The pattern of the prairie is a mosaic based on soil and topography, while that of a man-managed grassland is a grid based on management practices. The prairie is also a temporal mosaic of variation over a season, promoting efficiency in use of the environment and solar energy rather than maximizing yield of one harvestable product.

Today we have grasslands modified in varying degrees. The most important characteristic making a grassland a prairie is its sustainability in the absence of human management. But paradoxically, a remnant of prairie in an environment modified by people cannot be preserved without management. Such a prairie will not be complete without fire and grazers, which must be reintroduced.

We must learn to distinguish prairie from agriculturally influenced ecosystems. The prairie must be preserved as a part of our natural heritage and of the diversity of the biosphere.



Thinking like an Ecosystem

We humans usually see ourselves as the only things that think. We have thought about ecosystems either from the teleological view that sees Nature as purposeful or goal-seeking, or from the mechanistic view in which events in Nature occur strictly on a cause-effect basis.

Do ecosystems have goals? Survival is a goal that an ecosystem, left alone, can manage. But in the context of the human goals of security, profit or comfort, ecosystems don't do so well. In the long run, for humans to be able to manage land well, we must think like an ecosystem, with an ecosystem's goals.

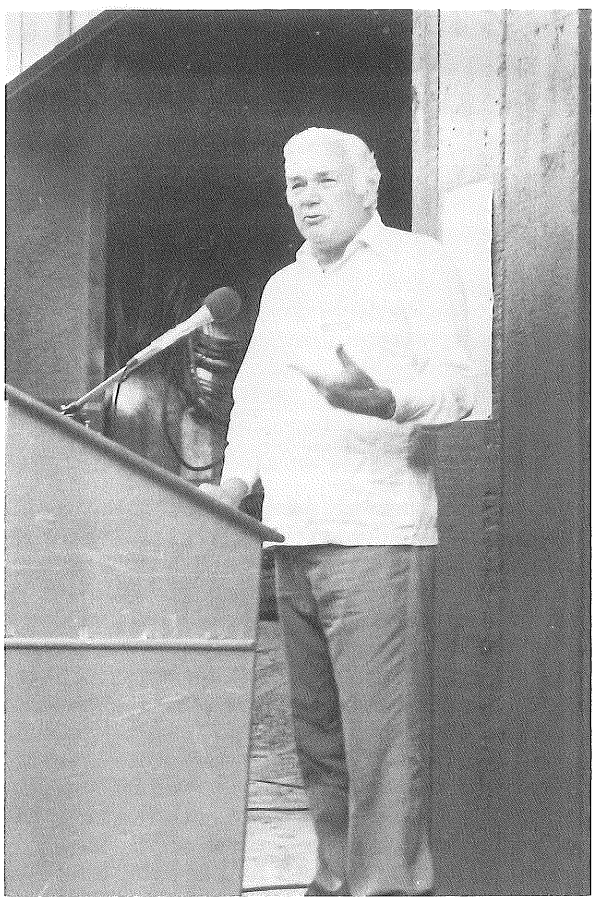
In thinking like an ecosystem, the first thing to consider is the distinction between that which is inside the ecosystem's boundary and can be controlled, and those environmental givens which are outside the boundary, such as climate and government regulations. The ecosystem must make internal changes to accommodate these givens.

In making adjustments, the best strategy is to have several strategies. For example, to keep all components in balance, an ecosystem needs to control populations. Several strategies in the form of negative feedback controls are possible, such as predation and reduction in quantity and quality of food. In the human agricultural and health systems, we remove these negative feedback mechanisms without substituting controls, and this causes problems.

Also important in maintaining balance is periodic harvest. Ecosystems give signals indicating how much to harvest, but they are subtle. Human managers of forests, rangeland, and game still have not determined how to apply these natural signals to crop for sustained yield. Ecosystems want to diversify the products for harvest. Although ecologists debate the relationship between diversity and stability, we know that the original natural ecosystems were diverse compared to the ones installed by humans. We should wonder at the wisdom of reducing an ecosystem to the making of a single product.

Humans seeking to understand ecosystems should note that an ecosystem must think in terms of wholes, interrelationships, and synthesis of its parts. This is difficult for scientists, whose tools are all analytical. We must also think about the difference between cooperation and competition. Scientists think of relationships as competitive, but the ecosystem more likely views them as cooperative parts of the whole.

Equity is also important; the ecosystem must be equitable to all components. People must be considered as part of the ecosystem. Most ecosystems, and all those we consider important, include people. We are most concerned with agricultural ecosystems, with people using the products.



Dr. Schultz, admitting a human bias, concluded that this might not be exactly the way an ecosystem thinks. But we humans should always ask how an ecosystem really does think and what it needs for good, sustainable management.

Alternative Visions of the Economic Process

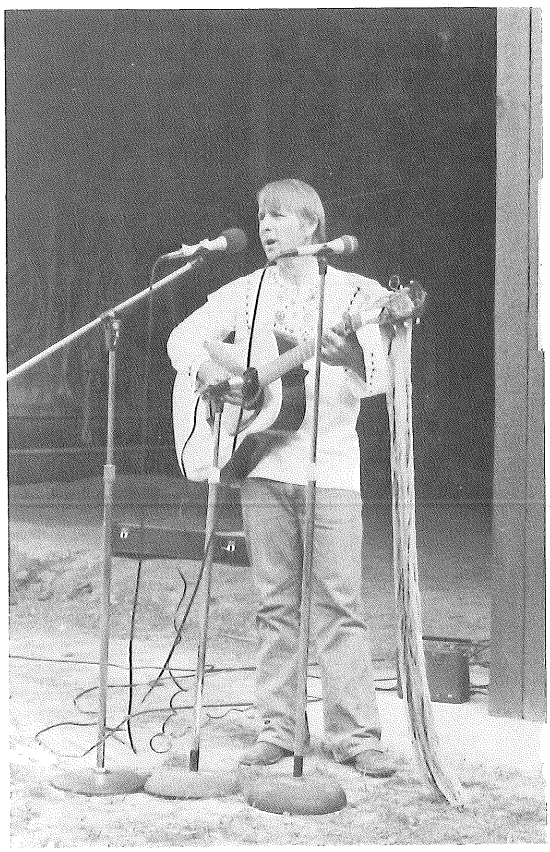
Herman Daly discussed three ways which have been proposed for integrating ecology and econonomics: "Economic Imperialism," "Ecological Reductionism," and the "Steady-State Subsystem."

Under economic imperialism, the economy expands to include the environment. The natural world becomes a relation of utility. Everything has a price, with value based on the wants of present people, weighted by the present distribution of wealth. Wants are assumed to be infinite, and activity which leads to their satisfaction continually expands.

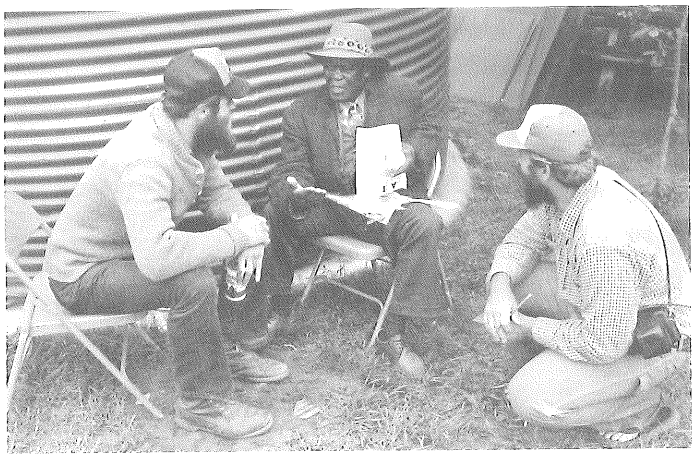
Ecologists have criticized this system, saying that it does not adequately evaluate value flows outside the economy and across its boundary with the ecosystem. Daly argued that there is no justification in economic theory for allowing the market to determine the level of throughput. However, once resources are brought into the economy, the market can allocate them among uses.

Ecologists have looked for other ways of comparing the value of natural services with that of services within the economy, ways which are consistent with the laws of thermodynamics. Some then propose the "maximum power principle," in which everything is to be valued based on the amount of energy it contains. However, in the history of economic thought, theories which base cost on a single factor have always been found wanting. Furthermore, the proposed model is entirely driven by necessity and chance, with no room for human purpose or will. Freedom is viewed as a source of random mutation to be selected on the basis of maximum power. This is not a good way to approach the human economy, since it implies that policy doesn't make any difference.

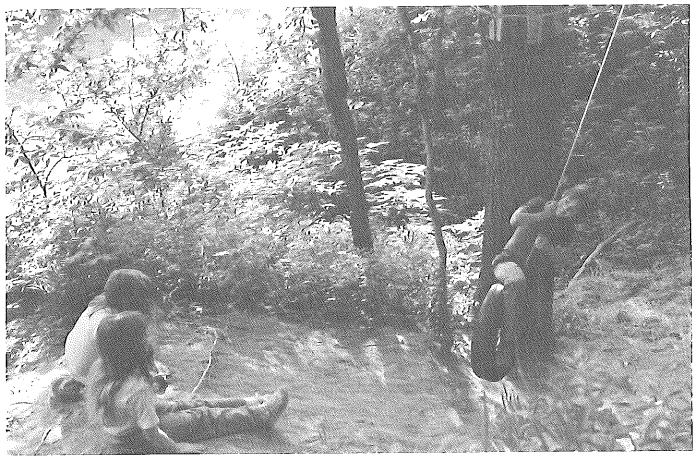
Economic imperialism and ecological reductionism are both committed to monism: the former recognizes only individual wants as the source of value; the latter, only energy. Respect for the facts of chance and necessity on the one hand, and self-conscious purpose on the other, suggest that a hypothesis of dualism would be more workable. Keeping the boundary between the economy and the environment, we can acknowledge their similarities in following natural laws, and the differences generated by human purpose. To keep the economy within the ecosystem's capacity to regenerate, we must back off from the policy of continual growth and create a steady-state economy which is constrained in scale.



Mike Mattson entertains Saturday evening crowd.



Robert T. Mazibuko, 81, from Natal, South Africa, came to the Festival with Terry Gips. An educator-agronomist, he founded the Africa Tree Center in 1978 and has been responsible for the planting of 13,000 trees. His presence was an educational bonus for participants who conversed with him.



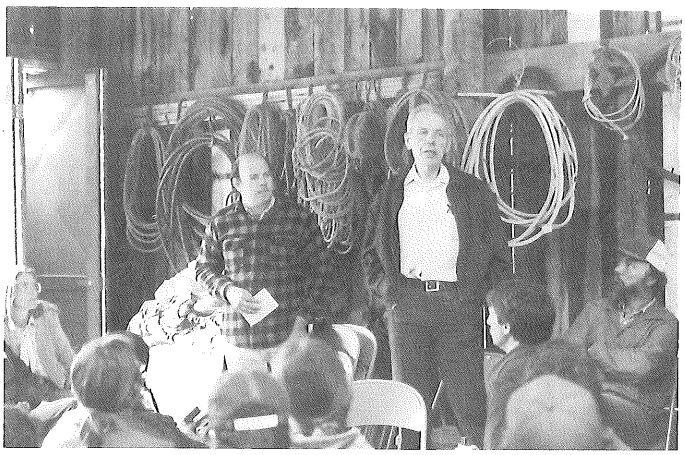
A favorite place during the Festival.

Ann Zimmerman performs Sunday afternoon.

Sunday morning, rain interfered with early activities and taught us that some of our wet-weather plans need improvement. Moving several talks into the barn kept everyone out of the rain, but the drumming of rain on the roof made it impossible to hear. Fortunately, the rain tapered off as the morning session got underway.

The Sunday morning program had two themes: The Cost of Our Economic System and "Recognizing the Biophysical Basis of Economics." In the first part of the morning, participants listened to Marty Strange and Harold Breimyer discuss how the economic system, through particular tax laws, encourages the wasteful use of depletable resources in agriculture and hurts people in small farming operations. Mary Fund and Marsha Marshall talked about the use and abuse of water; Paul McKay and Howard Snider addressed problems of U.S. involvement in Central America, and Weeden Nichols discussed how our economic system defines and shapes our concept of "national security."

A wide range of speakers addressed topics related to the second theme of the morning. Population, energy and soil were recognized as biophysical bases of our economic system in sessions led by David Orr, Mari Peterson and Wes Jackson. Dwight Platt and Arnold Schultz explored the significance and questioned the usefulness of the expression "ecological capital." Action in recognition of biophysical bases was described in sessions on Land Stewardship by Ron Kroese, On-Going Bioregionalism by Peter Berg and Judy Goldschaft, and in workshops on Seed-saving by Walter Pickett, and Thrifty Living by Martin and Donna Gursky.

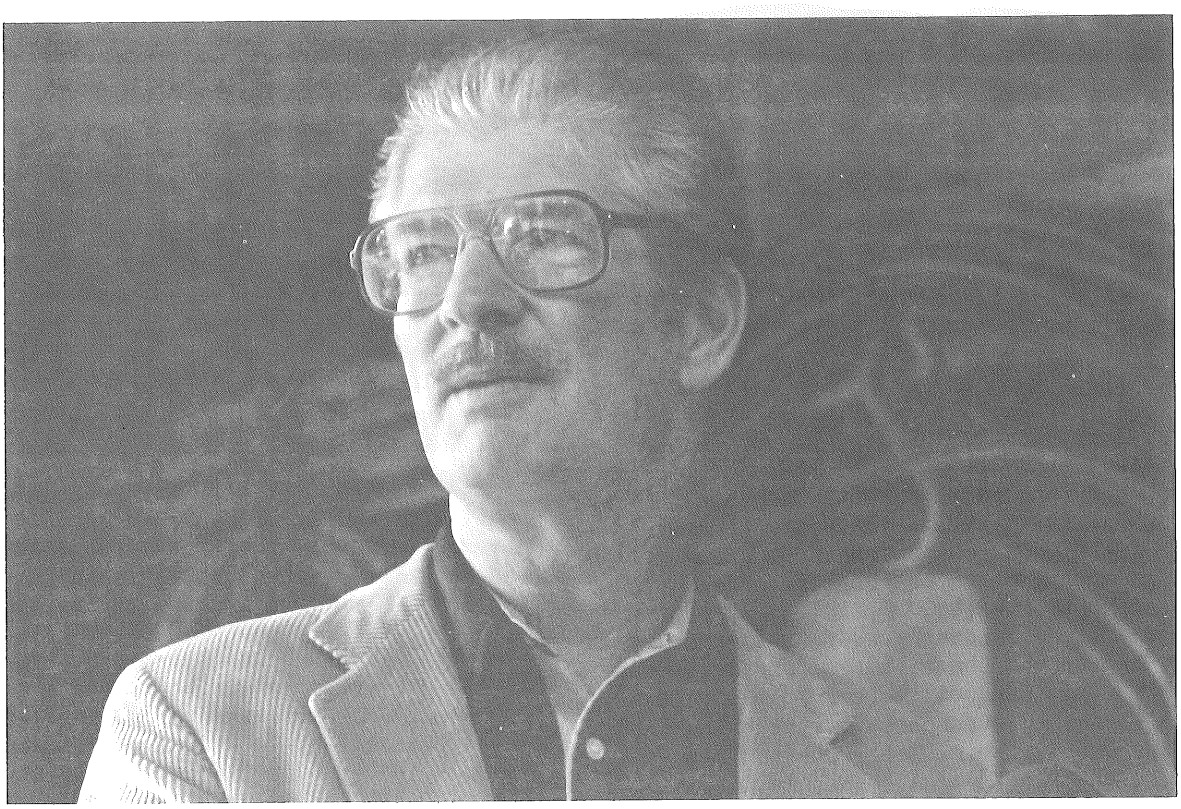


Marty Strange and Harold Breimyer.

Though the rain had stopped, tables for the potluck lunch were set up in the barn to avoid the mud. For the first time in six Prairie Festivals, rain had forced events inside; and for the first time, we had enough space in the thrice-expanded barn to accommodate the crowd!

Herman Daly concluded the Festival with the afternoon presentation of his strategy for recognizing the biophysical basis of economics, the steady-state economy.

Because of rain and mud, children's activities took place in the greenhouse. Patsy Martin taught a singing game, "Riding the Bus" to Abe Krumm, LaRita Craft, Sophie Grace and Angie Martin (l. to r.).



Towards a Steady State Economics

Herman Daly began by describing the current situation in economics with a Stephen Crane poem about a man pursuing the horizon. This man is like an economist "chasing the assumption of infinite wants along the road of infinite growth," and those who recognize this as futile are ignored or labelled prophets of doom.

A situation of no growth can arise either by the failure of a growth economy, or by the success of a steady-state economy (SSE). These are as different as an airplane, which must move forward or fail, and a helicopter, which, not being so constrained, can hold its position.

A SSE is not a new idea. John Stuart Mill spoke of a "stationary state" over a hundred years ago. Most of humanity's time on earth has been at a near-steady state, with rapid growth dominating only the past two centuries.

In a SSE, the population of people and of artifacts (physical wealth) is held constant at a level which is sufficient for a good life and sustainable over a long future. The rate of matter and energy throughput is as low as possible, leading to higher life expectancy for people and higher durability of goods. Throughput, since its end product is waste, is a cost--the cost of maintenance and replacement of goods--and should be minimized.

A growth economy, by contrast, virtually maximizes throughput because this flow is intimately connected to GNP (yearly production of goods and services). A steady state is <u>not</u> defined as no growth in GNP, which is not an important measure of wealth in this case; nor does it imply constant technology or a fixed distribution of wealth.

A SSE is both necessary and desirable. Over time, the natural constraints of finitude and entropy limit growth. The larger ecosystem, of which the human economy is a subsystem, operates as a steady state. Its stock is constant (the earth does not grow at a rate equal to the rate of interest), as is the flux of solar energy. Finitude alone would not necessitate a SSE if we could continue growth by recycling our stock faster and faster. But entropy dictates that recycling cannot be complete; energy, in particular, can only be used once. Substitution of one resource for another merely changes the form of low entropy being used. In this sense, entropy is the ultimate resource.

We have two sources of low entropy: solar, which is practically limitless in stock but strictly limited in flow rate, and terrestrial, which is finite in stock but may be used at as great a rate as we choose. In the past century, we have moved to dependence on a rapid use rate of terrestrial low entropy; now, we are beginning to shift back to solar.

Evidence that we are approaching the limits of growth has been given by Lester Brown. The peak productivity of our major renewable systems --farmland, grassland, forestry, fisheries--is not sustainable. Based on consumption of fossil fuels fuels and overuse, peak production leads to a reduction in carrying capacity.

Because these limits are observable in the world today, the development plans of many Third World countries, which aim for U.S. levels of mass consumption, will be unattainable. As well as speaking of underdevelopment, we need to speak of overdevelopment, which can be defined as a per capita use rate of resources which would not be sustainable if all people consumed at that level.

A SSE is desirable for both economic and ethical reasons. From an economic standpoint, growth is justifiable only as long as its marginal benefits exceed its marginal costs. In the current growth economy, the costs of growth are not measured, but added into the GNP! Ethically, if sustainability is desirable, so is a SSE. The value of sustainability can originate in a mystical reverence for the earth or in the Judaeo-Christian notion of stewardship. "Sustainable" is not forever, but is limited to the lifetime of the sun; nevertheless, there is a difference between twenty years and 200 million. Most people would agree that the earth should not be consumed in one generation.

In making the transition to a SSE, Daly believes that we should aim for aggregate, macro-level control with minimal sacrifice of freedom and individual variability. We must start from where we are now, and retain the institution of private property and the price system.

Three institutional changes would have to be made. First, population must be controlled. If birth rates do not drop naturally, the right to reproduce may no longer be treated as free and limitless. Daly discussed Kenneth Boulding's idea of exchangeable birth rights as a way of setting limits but still allowing individual variability.

The second change must be to limit throughput. Input to the economy can be limited by controlling resource depletion, and the market can allocate resources within the economy. Depletion quotas on basic resources set by the government and auctioned to private firms, or a national ad valorem severance tax, would set the boundaries between the economy and the environment. The market should not be trusted to set these limits because it measures only exchangeable value associated with short-term pleasure and pain, while ecological interferences are long-term in effect and are not exchangeable.

The market also makes no qualitative distinction between poverty and luxury, so the third change must be to limit inequality. Some inequality is needed for incentive, but equity and efficiency must be balanced. Daly proposed setting maximum and minimum limits to income, with the minimum income financed by revenue from the severance tax or the depletion quota auction. Although the higher resource prices necessary to limit throughput and force greater efficiency would hurt the poor, the extra income resulting from the higher prices can be redistributed to compensate.

The specifics of these proposals need not be the final answer to a SSE, but it is important to have specifics to encourage debate and better proposals. Economists must learn to take seriously the biophysical limits of the growth economy.

Solar Showers Built

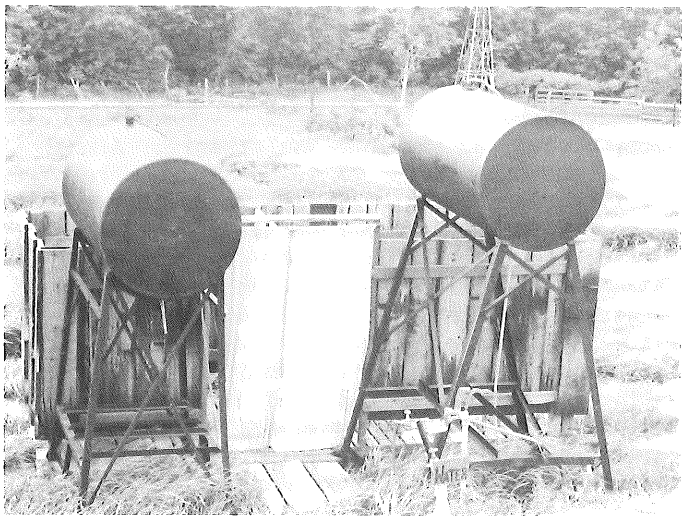
Paul Adelman

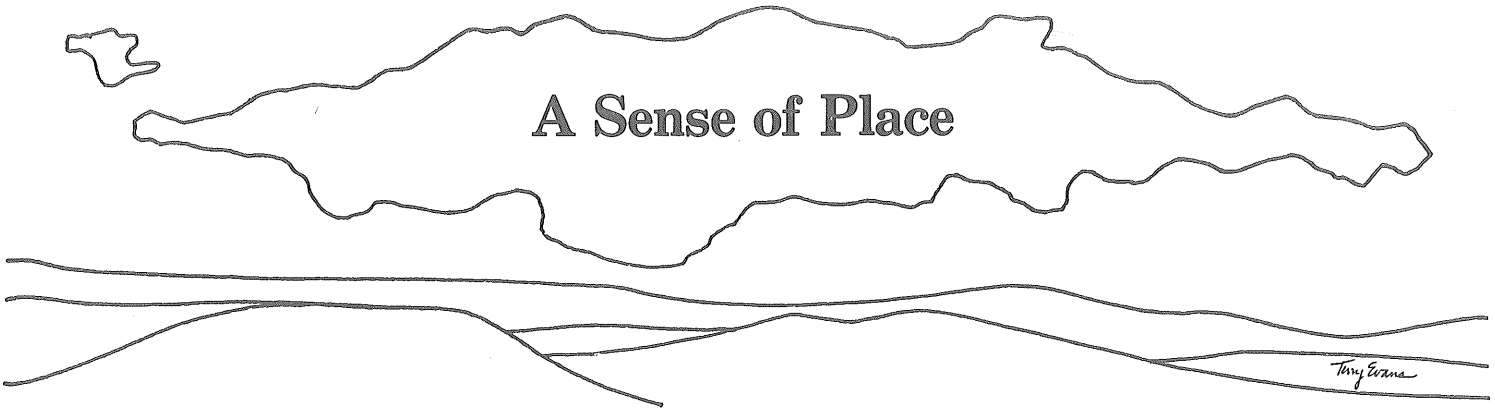
Two visitors from Kentucky, former Land student Den Berry and his friend Frank Jenkins, were the first to use The Land's two new solar showers. We built the showers for this year's Prairie Festival, although few people used them due to cool and rainy weather. But they were simple and inexpensive to construct, and until next year's Prairie Festival, we will shower there after working outside all day.

We built the showers out of two unused 250 gallon gravity feed gas tanks. We oriented them with their long sides facing south and painted them black, to maximize their solar efficiency. After the valves and nozzles were added, Den and Frank, who came to help us get ready for the Prairie Festival, finished them by building walls and a floor. There is no roof, so shower takers must brave the elements, which can be nice during the summer.

We can't tell exactly how well the showers work, because the summer is still heating up. I calculated that three days of 90^{o} weather should heat the water in the showers to a comfortable showering temperature, which is not a stunning solar performance, but adequate in light of the simple design and low cost of the showers.

The showers are not glamorous, or high tech, like so many solar devices these days, but we think they are appropriate to the task they fulfill; refreshing ag interns and visitors to The Land during the hot Kansas summers.





Walking Across the Tallgrass Prairie

Kelly Kindscher

On May 5, 1983, Vicky Foth and I stepped out of my sister's car on the Kansas-Missouri border in the industrial Weatherwood District of Kansas City and shouldered the packs that we would be carrying for the next 79 days. We then proceeded to the busiest intersection in town, where the Kansas River meets the Missouri--the confluence of the Kaw and the Big Muddy--to begin our Trans-Prairie Walk. From this point, we would walk west, following unpaved county roads wherever possible and going cross-country where there was sufficient rangeland, until we reached the foothills of the Rockies, south of Denver.

One purpose of this walk was to deepen my perspective and knowledge of the land and vegetation of the Kansas-Colorado prairie. What follows is a report of the transect of vegetation which I made of the tallgrass prairie region from the Kansas City area to Kanopolis Reservoir, Ellsworth County in central Kansas.

This first one-third of the entire walk showed me the transition from trees to grass as I walked from Oak-Hickory forest to the Mid-grass Prairie region. According to A. W. Kuchler in his "Potential Vegetation of Kansas" map, the Kansas City, Kansas, area and Wyandotte County, if allowed to return to their natural vegetation, would primarily be Oak-Hickory forest. In fact, early records listed Wyandotte County as the most wooded county in Kansas with a wooded cover of fifty percent. The other fifty percent of the land was prairie. Almost all of the other counties in the state were over ninety percent prairie, and those in the western part of Kansas were ninety-nine percent prairie.

We had to walk almost all the way across Kansas City, Kansas, before we came to a remnant of natural vegetation. As we climbed up the hill in City Park, there were some ancient red and black oak trees rooted firmly in the loess soil. The loess was deposited here after the tremendous dust storms, which blew up fine particles of soil from the river valleys when the glaciers retreated during the Pleistocene epoch.

Under these trees were two woodland wildflowers--Solomon's seal and spring beauty--which indicated that at one time before the trees were thinned and bluegrass and fescue were planted here, it was rich woods. The spring beauty more than lives up to its name. It is one of the first plants to bloom in the spring and its five-petaled pinkish-white flower is highlighted by a brilliant red veination pattern. Here in this park, spring beauties were clustered in colonies that formed almost perfect circles around the base of oak trees. But the spring beauty is an unusual plant in that it can be found in both native prairie and woods. At the same time that it was blooming here under oak trees, it was probably also in flower almost 230 miles west in the mid-grass pastures of Ellsworth County.

During the walk, I harvested wild edible plants to supplement our backpack-carried food. I did this because they were fresh and available, their taste and nutritional value added variety to our diet, and because I am fascinated by these indigenous and introduced food sources. It should be emphasized, however, that before any wild plant is dug for food, one must be certain of the plant's identity and use and also that it is part of a healthy local and regional population that can be harvested from, without endangering its population base.

Both spring beauty and Solomon's seal have edible roots. The spring beauty has a small, starchy corm, but like many wildflowers, its beauty is greater than the nourishment it provides and it should not normally be uprooted.

After a ten-mile trek, which soon came to be our daily routine, our first day ended. We had reached the Grinter House, a former inn and now a Kansas State Historical museum. Jeff Brown, the caretaker and former Land Institute student, put us up in the great tradition of the Grinter House. Here, many a pioneer traveling west used to spend the night, after crossing the Kansas River on the ferry that was located just below the house.

Heading on west the next morning, we came to Camp Nash, a wooded Boy Scout camp just northeast of Bonner Springs. Three white-tailed deer and a rose-breasted grosbeak acknowledged our presence on the way to our first prairie

remnant. Beside some clumps of greening native grass were carrotleaf lomatium, blue-eyed grass, and an orange-flowered pucoon. These prairie wildflowers are not invasive plants and their presence indicated that this dry south-facing slope had originally been prairie. Now it was rapidly being overgrown by dogwood and several species of oak and other trees because there were neither large herbivores, wild fires, nor fires set by the natives to keep this land in prairie.

The third morning of the walk, we reached an area where there was a larger proportion of cropland and tame green pasture than wooded land. This observable transition is marked on Kuchler's map as a boundary between Oak-Hickory forest and a mosaic of tallgrass prairie and Oak-Hickory forest. A soil change was also evident; loess soils on the uplands were replaced with clay ones, which in some places was accompanied by considerable amounts of rock.

Soon thereafter we started seeing a new vegetation type that I will define as Kansas Thorn Forest. It is composed primarily of Osage orange and honey locust trees, which both have irritating thorns that are a definite impediment to those who decide that they want to hike Kansas. Thorn forests have not been described for our region by the scientific community, so it should be mentioned that they contain other non-desirable species, including cedar trees, bristly green briar, buck brush, beggar's ticks, multi-flora rose and poison ivy.

The Kansas Thorn Forest is an example of land abused by cattle. In most cases, the original vegetation was prairie and as cattle overgrazed the land, the tallgrass prairie was eaten shorter and shorter, until after years of continued heavy grazing, annual grasses and weeds replaced the native tallgrass prairie species. Recently, many of these areas have been replanted to tame grasses (such as brome or fescue) which the landowner interseeded into the pasture and then fertilized to get larger yields. Tree seedlings have an opportunity to get established in the dense sod of the non-native grass because of overgrazing. Most tree seedlings are eaten off by cattle; however, honey locust and Osage orange are too thorny, and red cedar is too bitter. Unless these lands are burned, cleared, or sprayed with herbicides, a thorn forest develops. Kansas Thorn Forest is found in Eastern Kansas, primarily on hilly ground that has been too steep for crops. We had to walk through some Thorn Forest, but avoided it when we could.

THE AUTHOR: Kelly Kindscher is a former Land Institute student, currently managing a community garden in Columbia, Mo. In the fall, he will be in Lawrence, Ks., working on a book about edible prairie plants.

The Flint Hills south of Rossville was the first area we saw where the landscape was completely dominated by its natural vegetation. Earlier we had walked through a few prairie remnants and some areas of native woods, but most of the land had been plowed or had been seeded to non-native pasture grasses. The Flint Hills of Kansas contain the largest remaining portion of the original tallgrass prairie. In order to see as much of this area as possible, we crossed it diagonally, heading southwest from Rossville to Council Grove.

Most of the land in the Flint Hills is well managed by the ranchers who own it. However, there are some areas that have been abused. These places have few species of wildflowers and sizeable populations of grasses that are less palatable than the common Flint Hill tallgrasses--big bluestem, Indian grass and switch grass.

I learned from a rancher that some cattlemen have applied herbicide to pastures to "knock back the oakbrush (a Flint Hills rancher word for aromatic sumac, which has oak shaped leaves) and other woody species," but it appears that most ranchers control the woody growth by fire. This is more economical, effective, and actually stimulates new growth, if the burn is conducted at the proper time. I did not see much evidence of herbicide being the sole factor in reducing diversity of prairie pastures. I suspect that herbicides were used most heavily on the pastures that had already been degraded by overgrazing.

Flint Hills ranchers are managing their rangeland for the maximum production of grass rather than for a diversity of prairie species. At the current time, the most profitable program is to burn their pastures in the spring to keep out undesirable species, to run the right number of cattle so as to not diminish the root reserves of the tall grasses by overgrazing, and to trust nature to provide rain and plant nutrients. All of this could change if the ratio of cattle prices to fertilizer and herbicide costs were to increase.

A rancher near Lake Wabaunsee concurred with my observation that certain species of prairie plants had been grazed out, even on well-managed prairies. Notable was the absence of Eastern gama grass and the restriction of many wildflowers (such as prairie rose, prairie turnip, and Cobea penstamon) to rocky outcrops, while on prairie hay meadows in adjoining areas (which are mowed once annually and receive no grazing) these same plants were widespread. Because of these observations, I am firmly committed to the belief that we should establish a Tallgrass Prairie Preserve. However, I do not like the outright condemnation of land. Instead, I would prefer to see a Prairie Preserve established through the purchase of land as it becomes available and through conservation easements, which can uphold the ecological management of this grassland resource while allowing for its use as pasture for livestock.

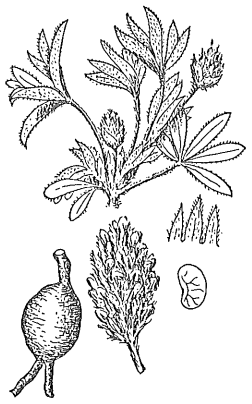
One thing became obvious to me in the Flint Hills. When looking at plants, or when looking at a large and continually changing diversity of anything, "what you don't recognize, you just don't see." There were many times when I noticed a plant in flower and realized that actually I had been seeing it for quite a few days. I hadn't paid attention because I was not familiar with it. Now I have a greater appreciation for vegetational studies which inventory everything within one meter square quadrants, because this forces one to take notice of plants that one does not recognize.

While walking across what used to be the Lockhart Ranch (one of the largest and best-managed ranches in Kansas in the 1950's) south of Lake Wabaunsee, I gained a new perspective of the beauty of the Flint Hills. On this day, May 18, it was cold, damp, and cloudy after the previous night's heavy rain, and there was a strong east wind. I had always noted the similarity between the prairie and alpine regions because of their openness, both of them being, as Willa Cather described the prairie, "the floor of the sky," because they have low-growing vegetation which permits distant horizon lines and expansiveness to be observed.

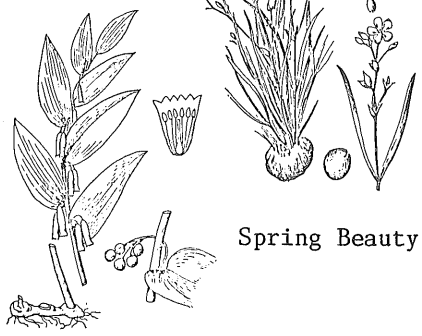
On this day, the similarity to the alpine was striking. Being a late, wet spring, there were only small green shoots of grass showing and only a few yellow wild indigo and blue-eyed grass plants that had begun blooming. The incessant wind buffeted my chilled body, and all the spaciousness caused me to have acute feelings of loneliness. I had a "Flint Hills delirium," a perceptual change which I had experienced once before in the Flint Hills during the intense heat of summer.

This time the delirium was induced by the cold and the awesome beauty of the land. I was making my way up from the Mill Creek valley floor to the pass. The round green-colored hills closed in around me and took on the appearance of a cirque. As I started the final ascent, with clouds moving fast towards me from the south, I saw a red elm tree bent from the summer winds. Its flag-shaped top reminded me of the stunted trees of an alpine vegetational type called the krumholtz. I almost expected it to snow. In actuality it was not quite that cold, and after I reached the top, tired and out of breath, I looked back and saw that, in fact, I was here in Kansas surrounded by the Flint Hills. The wide expanse of land reminded me of a book of photographs that Terry Evans helped to assemble called No Mountains in the Way.

After reaching Council Grove, we followed the Santa Fe Trail for the next few days. West of Wilsey, we found some Santa Fe Trail ruts in a pasture. Three ruts had cut into the prairie five or six feet deep where the trail crossed a ravine. Apparently when the trail got too deep, the travelers just made another crossing next to it. I was surprised to find the same prairie vegetation in the bottom of the ruts as in the adjacent pasture. I even found the uncommon prairie turnip, which I have considered to usually be an indicator of high-quality, undisturbed prairie. This seems to indicate that the prairie can respond to local disturbances when a nearby seed source remains undisturbed. In other words, the prairie can heal itself when the wound is not too large.



Prairie Turnip



Spring Beauty

Smooth Solomon's Seal

We reached the Smoky Hills, or more accurately, our first outcropping of Dakota Sandstone, south of Abilene, in Marion County. They were the first large hills we had seen in a few days. Because of their geology, they are more rounded in shape than the Flint Hills. This eastern edge of the Smoky Hills illustrates how vegetational change occurs abruptly in certain localities rather than gradually over a large area. Changes in the soils or topography seem to be more important factors than the east to west rainfall gradation which influences the vegetation across the entire prairie bioregion.

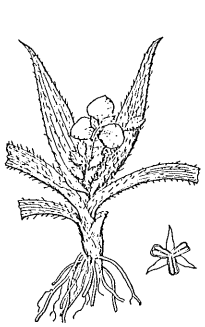
As we climbed into the Smoky Hills and came to the first Dakota Sandstone outcropping, I noticed that it was a good prairie remnant. The previous night I had walked across a very diverse hay meadow on a hilltop and had seen lead plant, blue-eyed grass, yellow and blue wild indigo, senecio, Indian turnip, ground plum milkvetch, death camas, and wild rose. But here, just a few miles further west on another hilltop, was a pasture with Dakota Sandstone parent material soils. Though it was grazed and less diverse, it contained seven new species of prairie plants that I would add to my journal. They included old plainsman, Corydalis, Frazier's wild onion, short-stemmed spiderwort, yucca, Tephrosia and clammy ground cherry.

Most of these plants like sandy soils, such as those formed from Dakota Sandstone. Of these, Frazier's onion, one of my favorite wild food sources, is restricted to sandy soils of central Kansas. It has a marble-sized root with a mild onion taste, but is starchy with a texture like a water chestnut or a Jerusalem artichoke. If one could gather enough Frazier's

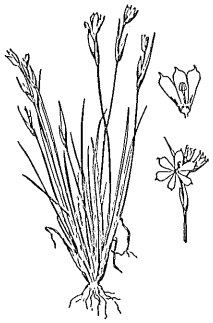
onions, or if plant breeders could develop them to have larger bulbs, I believe they could almost become a staple in one's diet. Because their edible roots are small, dispersed and never in a bountiful quantity, I ate only a few, but these tasty pieces made me think of the sustenance they may have provided the Kansa, Pawnee and other indigenous people of the region.

Although Indians of the Great Plains were known to be hunters, they also gathered a considerable variety and quantity of wild foods. Certain places were favorite wild food gathering areas and this probably affected the location of camp sites. I also believe that there was probably a pattern of wild food gathering that occurred on a regional scale. As I came to realize on the walk, there are areas where it is easy to dig and areas where it is more difficult to dig edible roots. The easiest places to harvest roots, like the prairie turnip and wild onions, are on sandy soils. For this reason, I found that Frazier's onion, growing on the loose sandy soils in the Dakota Sandstone area, was much easier to dig than the prairie onion which, while it has a shallower root, is found further west in soils with a higher clay content.

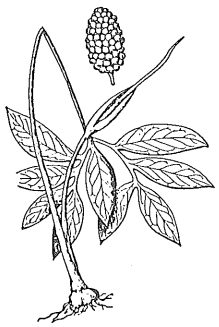
The most difficult place to dig edible roots was in adobe clay soils in eastern Colorado, west of Limon. One night, after walking a tiring ten miles during 95-plus degree heat, I was too tired to keep digging down through the rock-hard soil to harvest a prairie turnip root. I suspect that the Indians were very aware that it was easier to dig roots on sandy soils and probably made an effort to stay in their general vicinity as much as possible.



Short-stemmed Spiderwort



Blue-eyed Grass



Green Dragon

There are some places to visit that are inherently special. One of these is Horsethief Canyon and the adjacent Dakota Sandstone canyons and hills at Kanopolis Reservoir in central Kansas. Indians came here to hunt, dig and gather wild foods and carve petroglyphs. At various times, they lived here.

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

The western end of Kanopolis Reservoir is only half as far west as is usually shown on maps, because of its low water level. However, the map-defined western end of the reservoir marks two important boundaries or transition zones. First, it marks the western edge of the transition between tall grass and mixed grass prairie; and second, it marks the western limit of where significant forest island can be found within prairie. Both of these boundaries are defined and illustrated by Kuchler on his map and both were confirmed by my observations.

The Horsethief Canyon area is one of the furthest west places in Kansas where big bluestem and other tall grasses grow on the top of hills, and where a considerable number of hardwood trees can be found in the ravines. Walking west along the north side of the reservoir, I noticed that there were burr oak, red elm, Kentucky coffee, ash and hackberry trees.

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

According to Janet Bare in Wildflowers and Weeds in Kansas, green dragon is found in the eastern third of Kansas in moist, rich woods and mostly in wetter ground than jack-in-the-pulpit. Here it was located in central Kansas, not just one plant, but dozens, creating a large colony. The furthest west location I had previously known for this plant was Marty Bender's find of a single plant in the woods at The Land Institute immediately above the Smoky Hill River. However, the Atlas of the Flora of the Great Plains does show Ellsworth County as its westernmost location.

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

Waldo Wedel, in his Introduction to Kansas Archeology, notes that there was an Indian village site located across the creek from these oaks and green dragon patch. Because this plant is well west of the major part of its range, is growing in a large colony, and was the only woodland wildflower present, I believe that

Continued on pg. 25.

Nature's Wisdom or the Scientists' Cleverness?

Two Biological Emphases in Agricultural Research

by Wes Jackson

Since World War II, there has been a tremendous change in the structure of agriculture worldwide, mostly because of yield increase. In the 60's and 70's, the so-called "Green Revolution" took place in Mexico, India and in Asia, and yields of wheat and rice soared. The establishment of the international research centers, the growing sophistication of some of the major seed houses, and the interaction of those companies with the geneticists and agronomists in the land grant universities brought on this revolution. More researchers, employing the statistical models of Sir Ronald Fisher and others, devised more efficient means of selection, increased the number of inbred lines, marker genes, etc. The implementation of this knowledge was accompanied by relatively low oil prices and by an enormous increase in the use of commercial fertilizer, pesticides and irrigation.

In the mid to late 70's, the revolution seemed to be over as an increase in the use of fertilizer was not proportionally met by an increase in yield. The fertilizer curve line was going up and the yield line was flattening. Moreover, farm yields were coming closer to the yields in experimental trials. In other words, research results were no longer far ahead of field results.

It was inevitable that these converging lines would be noticed. Agricultural researchers would coast for a while on their past dramatic achievements, but the good observers among them would point out that the technology which breeders had employed to bring about the record yields was about milked dry and that we should start now to implement the new science and technology which had been established in biology. This field, called molecular biology, would give us a new knowledge base to exploit for the purpose of feeding an increasingly hungry world, and it would shore up our ability to produce for a future export market. The fact is that yields are still increasing at the rate of about 1% per year using conventional breeding, but that isn't impressive enough.

This move to upgrade agricultural research through the application of molecular biology is now gathering momentum. Land grant universities are pleading for money and receiving it-legislatures and private foundations are appropriating millions of dollars to construct biotechnology labs and begin programs in genetic research.

The "New" Biology

The whole field of molecular biology began in 1944, the year that Avery, MacLeod and McCarty published the results of their experiments, which suggested that DNA and not protein was the chemical responsible for heredity. In 1953, James Watson and Francis Crick reported that the structure of the DNA crystal was a double helix. They won the Nobel Prize they were after, and DNA and double helix became household words.

These discoveries caused a revolution in the structure of biology departments and the direction of biological research. Molecular biology became the prestigious field, and graduate students flocked to enroll in it. Descriptive botanists were not replaced at retirement; the "new" biologists who were hired had more background in chemistry than they did in traditional biology. The budgets for scientific hardware went sky high. Electron microscopes, which can now cost a half million dollars, became absolutely essential, as did fast and accurate weighing equipment, growth chambers controlled by computers, etc. "Cutting edge" science became very expensive.

Then, almost without notice, the era of discovery moved smoothly into the era of manipulation, until we had new household words and phrases such as "gene splicing," "gene stitching," and "DNA surgery." We were told that this new biology would cure cancer and other diseases, that we could produce super plants and animals.

During the past twenty years, the molecular biologists who were taking their post-docs during the sixties have professionally cloned themselves. The modern day descendants of the new breed in the sixties, like their predecessors, may never have had a field biology course, never milked a cow, maybe never have driven a tractor. But they are looking for work. There are only so many pharmaceutical

. . . what they are trying to do is write large the last 50 years of agriculture.

houses, only so much interferon to be made, only so many who can work at tricking bacteria to make insulin. There they are, credentialed, knowledgeable of the equipment, toned up on the literature, and ready to transform agriculture.

What they have in mind is currently limited, but the future is boundless. They plan to turn grasses, for example, into plants that will fix nitrogen as readily as some of the major legume crops. They hope to introduce genes for resistance to various insects and pathogens. They hope to boost yields. It all sounds so good, and it is difficult to argue with their agenda. But it is clear that what they are doing is trying to write large the last 50 years of agriculture. They are offering the "specific problem-specific solution" approach as the infallible recipe. This approach assumes that everything outside the specific problem for which they intend to splice in a solution can be held still, that nothing else will wobble, or if it does, that they can splice in a correction for that, too.

All of this is high tech research, and we can be sure that any outfit which gives us a crop with a spliced-in gene is going to demand a patent and some kind of a royalty payment. It is doubtful that their primary concern will be the high energy cost of American agriculture. One also doubts that they will care greatly about the national and global soil loss problem.

The Other "New" Biology

Another kind of change has been going on in biology, a change that has been scarcely noticed, but one that is extremely important to the future of agriculture. This is not a revolution; it is a synthesis. Biologists in the fields of taxonomy, ecology, genetics and evolution have been putting together a new field that might be called, for want of a better name, population biology. The primary contributors to this field have been plant ecologists and population geneticists, people with interests in evolutionary biology. They study species strategies like r and K selection--whether a species emphasizes seed production or protection of a plant once it is established. They study source-sink relationships in the production and allocation of energy in plants: does a plant send the harvested sunlight to the seed or to the root to over-winter? They study senescense in plants, the mechanisms of interaction among plant species, the diversity and natural dynamics of populations. They are interested in weeds as colonizing species, insect interactions and the role of pathogens.

The work of these plant population biologists or ecologists is admittedly still at the "knowledge-for-its-own-sake" level. Few have ever considered how the knowledge could be applied beyond its usefulness in publications, promotions and tenure at the universities. But what they have accumulated and what they have to offer is what those of us interested in a sustainable agriculture need to pay attention to,

. . . should a crop plant be regarded more as the property of the human or as a relative of wild things?

for the sustainable agriculturist begins with the notion that agriculture cannot be understood on its own terms--that it comes out of nature. The test for this is the question: should a crop plant be regarded more as the property of the human or as a relative of wild things? If it is viewed primarily as the property of the human, then it is almost wide open for the kind of manipulation molecular biologists are good at. If, on the other hand, it is viewed as primarily a product of nature, as a relative of wild things, then we acknowledge that most of its evolution occurred in an ecological context, in a nature that was of a design not of our making. I want to underscore the fact that the scientists who study this are at the other end of the spectrum from the molecular biologists. They may admit that humans learn faster than nature but they also acknowledge that nature is hard to beat because she has been accumulating information longer. Most of the mistakes of nature have been corrected over time.

Rather than embrace gene splicing, "cutting edge" agricultural research can benefit more from this inherently broader tradition. A new agriculture must come from people who are students of nature at the ecosystem level. For after all, a natural ecosystem, like a prairie, sponsors its own fertility, recycles its nutrients, avoids the epidemic from both insects and pathogens, and does not lose soil beyond replacement levels. People who make it their lifetime occupation to study the kinds of ecosystems that feature all these elements of sustainability must be pried loose from the perches where they discover and accumulate "pure" knowledge. We need to get some of them to take the knowledge about ecosystems that has been accumulating for the last 30 years or so, and work with us in the development of a sustainable agriculture. Molecular biologists can also have a role, but they must follow, not lead.

What those of us interested in sustainable agriculture need always to keep before us are the questions: How are we going to run agriculture and culture on sunlight? What are we going to do when the oil is gone? What are we going to do to stop soil erosion? Ecosystem agriculture has answers to all of these questions. Molecular biology has few or none.

It might be argued that since the fields of population biology and ecology are so complex and so little is known of living things and the physical-chemical world which surrounds them, concentrating at the ecosystem level, rather than at the population or organism level, will be impractical. Work at the ecosystem level could get argued down even if our goal is to save soils, prevent chemical contamination of

the countryside and get farms to sponsor their own fertility and energy. The argument could be made instead that molecular biology is mature now, and that the payoff from the likes of gene splicing is more promising for solving the immediate problems of agriculture. Conventional wisdom may hold, in other words, that we should go with our long suit.

I do not think molecular biology is our long suit. The synthetic field of population biology and ecology is just as mature. It hasn't received the same amount of media coverage. It hasn't been featured in Time and Newsweek. But consider the barriers molecular biology must overcome to be able to deliver on the promises--promises which have to do with production only--promises which never include the notion of sustainability.

Barriers to Genetic Miracles

With few exceptions (and they are exceptions because of certain anomalies) the gene splicing work to date has featured the relatively simple prokaryotic organisms, the bacteria and their associated viruses. Such organisms are several orders of magnitude simpler than the kinds of cells nature has used to make redwoods and lions, lilies and people, and with the help of humans, corn plants and Holsteins. For gene splicing to be useful at this level, there must be a method of incorporating the gene into the entire genetic complement of the recipient species. This will be no small trick, but let us assume that it can be done.

First off, the team of molecular biologists must know what gene or genes they want to transfer from one creature to another. Next, they must find a source. Then they have to be able to extract the small amount of DNA representing that gene or genes out of the rest of the DNA in a complex cell. So far, maybe so good. What if the transferred gene fails to work in the new environment? They will have to find out why. Most of the requirements necessary for that gene to function in its new and alien world will be unforeseen and unforeseeable. Furthermore, it is unlikely that the newly-modified genome (all of the old gene material of the host cell, plus the newly-introduced material) can be easily propagated.

So much for the easy part. I call it easy because it involves the most straight-forward kind of manipulations imaginable so far. Now for the hard part, the more formidable problems. Because all genes interact to some degree, the traits which are strongly influenced by several genes working together will stand as a barrier to the gene splicer. They are still beyond the current "state of the art" for gene splicing. Professor Dick Richardson, geneticist at The University of Texas at Austin, pointed out to me that some traits such as "growth rate" are affected by many hormones, including episodal ones that are present for short periods of time in low concentrations. Many of these are only now being discovered. When their existence is known, isolation may begin, but if the genes are from widely divergent organisms, their regulation may differ in the new host and fail to work as planned.

A gene is often separated into several pieces and located in widely separated places on the chromosome or perhaps even on another chromosome. While this is a tricky problem to overcome, it is no more tricky than isolating the various genetic components which regulate a particular gene in question. Once a complete gene and all of its regulators are isolated, there is the problem of the entire assembly becoming precisely incorporated into the genetic material of the recipient organism. If it isn't incorporated early enough in development and misses being transferred into the germ line so it can be transferred to the offspring, for all practical purposes, it is a dead end.

Let us assume that all of the barriers to the present have been overcome. We are now faced with a problem somewhat similar to what geneticists confronted nearly forty years ago, during the heyday of radiation genetics. This was a time in which numerous geneticists believed we could improve crops and speed up evolution by irradiating the germ plasm and then selecting the desirable products. What that generation of geneticists and plant breeders learned is that they had on their hands the same problem as the previous generation of geneticists who had believed that some biological wonders could be pulled out of the progeny of some very wide crosses. The problem they had was how to get rid of all the variation they suddenly found on their hands, and how to re-optimize the desirable traits against such a scrambled genetic background. The background of spliced in genes may not be so scrambled, but the problem of re-optimization is still there. In other words, even if all the steps are taken successfully up to the point where the spliced gene and its regulators from a distant plant family are successfully transferred, an untold amount of breeding work remains before the genetic background is shaken down enough to accommodate the newly-introduced trait and its regulators.

The Ecosystem Level Alternative

The ecosystem level of biological organization is complex, much more complex than the DNA level of any species, but it is not necessarily more complicated for the human to work and deal with. For that matter, the level of the molecule is more complex than the atomic level, but molecular biology as a field is no more complicated than physics as a field. At the ecosystem

Ecosystem researchers will simply be dealing with huge chunks of what works.

level, if researchers and farmers take advantage of the natural integrities which have evolved over the millions of years, they may be dealing with great complexity. But it may be much less complicated for the human than gene splicing at a much less complex level of biological organization. Ecosystem researchers will simply be dealing with huge chunks or blocks of what works.

The point is, if we continue to lose soil, if our soils and groundwater supplies continue to be polluted because of our single vision focus on production, the day will come when few will care whether molecular biology ever existed as a discipline. There is enough "on-the-shelf" knowledge now, all in the area of population biology, evolutionary biology and ecology, to begin to meet the needs of the land and the needs of this species of ours which was shaped by the land.

Why have we been so slow in getting started? Well, such an ecological agriculture was really not possible until the last ten or fifteen years, until the great synthesis began to emerge, until sufficient knowledge about the workings of natural ecosystems had been discovered.

We still have a great opportunity to do something about the problem of agriculture, but we have little time in which to take advantage of that opportunity. Right now, the average age of the agricultural researchers is around 57, about the age of the average Kansas farmer and pretty close to the average age for the farmer in America. This means that in the next five to fifteen years, a lot of agricultural researchers are going to retire. 60,000 professional slots will open in agriculture next year and there are only 52,000 people trained to fill them, a deficit of 8,000. There will undoubtedly be deficits in subsequent years, as well. What this means is obvious--if we can get people trained in ecological agriculture, we can change the structure of American agriculture very fast, for in another ten to fifteen years, many of these people would move into positions of responsibility. If we fail to produce enough students of ecological agriculture, then students of molecular biology will fill the positions.

The final consideration has to be the land and the people on it, the farmers and their families. Experts who simply have technological tricks they want to play with on the American landscape, with farmers standing by in a more or less passive role, should not be tolerated. I propose that scientists who have been studying natural ecosystems begin to talk directly to farmers and agronomists about the application of their research to ecological sustainable agricultural systems. We will need all three of these groups working together if we are to learn how to produce food from the land in a sustainable manner.

Land Report Research Supplement?

It's on the Word Processor!

Linda Okeson

If you sent $1.00 for postage to have The Research Supplement sent to you, you will receive it. We could not complete it in March as promised, but do plan to get it printed this summer.

The first Research Supplement, edited by Wes Jackson, contains reports on experiments conducted during 1983.

Walking Across the Tallgrass Prairie
Continued from pg. 21.

there is a strong possibility that it was originally established here by some Indian women who were well aware of the plant's edibility and ecological requirements and decided to plant it here in the sandy soil and leaf mold for future harvesting.

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

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

More Wind Energy Experiences

John Craft

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

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

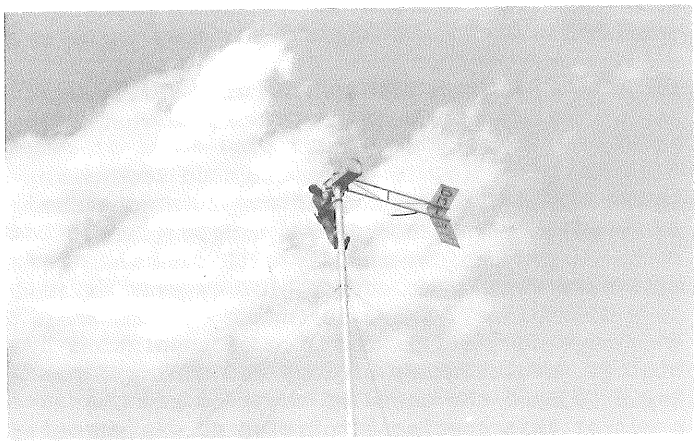
At the time this happened, I was living and working in Iowa. Paul Krumm and Wes Jackson phoned for advice and I suggested several rewiring strategies to shut down the machine; however, none of them were successful. It was an exciting event for the interns, who had only begun their program about ten days earlier.

Although disappointed at the loss of the unit, we generally felt the experiment had been profitable. It produced good power while in operation, the induction generator controls proved reliable, and the extended tower proved rugged. As in any failure, we learned a lot. Now there is at least one more rotor-governing mechanism to add to the "good ideas that don't work" list!

Windcraft 3500 Installed

The 90 foot tower stayed empty until May 21, 1984, when I bolted an induction generator with rotors 15.5 feet in diameter to its top. This machine had been used as a research and development tool by Windcraft Energy Systems, Inc., a company I started in Goessel, Kansas. In August of 1982, the Winpower Corporation of Newton, Iowa, purchased the company and the manufacturing rights to the machine. Winpower continues to manufacture and market an improved version of the unit.

Windcraft 3500 features a 130 volt A.C. induction generator, fixed pitch rotor, and a "side-swinging" tail that aids in rotor control



and serves as a method of shutting the machine down. The machine is expected to produce 500 KwHrs each month on the average and is interconnected with the Kansas Power and Light Company's utility lines that serve The Land Institute.

32 volt Jacobs Continues to Require Maintenance

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

In the past two months, two failures occurred: (1) the yaw slip ring that supplies power to the field became loose and had to be completely removed. The Jacobs is currently being operated with full field input, and therefore no battery charging regulation is possible, except for manually furling or unfurling the tail. This is not viewed as a serious problem, as the Land seems capable of consuming whatever power the Jacobs can harvest. (2) The two bolts securing the top tail bracket to the generator frame sheared, allowing the tail to droop. This is the second time these bolts have failed. The 3/8 inch grade five bolts were replaced this time with 3/8 inch grade 8 bolts in an effort to avoid the recurrence of this problem.

At the same time we were replacing the bolts, we noticed a cracked weld on the tail frame. The entire tail was removed, repaired, and reinstalled.

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

Considerations for a Sustainable Society

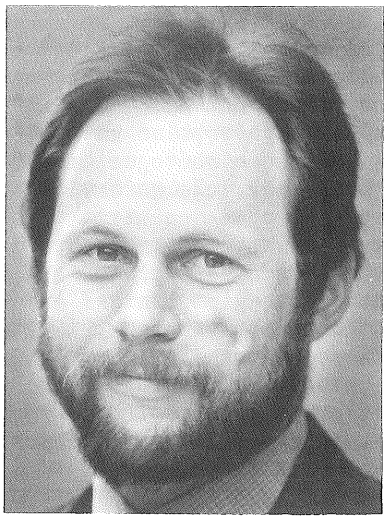
Ann Zimmerman

"We live in the shadow of World War III. And if you'll forgive me, I'd like to talk about it." Conn Nugent, a remarkably articulate spokesperson for the International Physicians for the Prevention of Nuclear War (IPPNW), lectured at Salina's Kansas Wesleyan University, May 9, 1984. His visit was jointly sponsored by several organizations, including The Land Institute.

In his position as Executive Director of the IPPNW, Conn Nugent represents 85,000 doctors from over forty nations, including groups of about 28,000 from both the U.S. and the U.S.S.R. The IPPNW, described by Conn as "relentlessly non-political", seeks, by circulating the same factual information throughout the world, to prevent nuclear war as a consequence of the physicians' ethical, professional commitment to protect life.

Conn Nugent, himself, is a graduate of Harvard and Harvard Law School and lives in Cambridge, Massachusetts. Formerly, he was in the Peace Corps in Costa Rica, and served as co-director of New Alchemy Institute on Cape Cod.

Land students felt fortunate to become better acquainted with Conn when he later sat in on a morning classroom session at The Land Institute.



A student of history, Conn reviewed for his listeners how World War I and World War II began in order to cautiously speculate on the future. The following is a summary of his lecture:

Wars of the 20th Century

HOW WORLD WAR I BEGAN

In 1913, the year before World War I began, an extremely influential book was published in London describing why a war between the great powers of the time was impossible--first, because weapons of destruction had become so lethal that no civilized power could ever entertain questions of entering a war; and second, because the economic interdependencies of nations had developed to such an extent that to engage in a war would be to engage in national suicide. How was it possible then, that just one year later, soldiers all across Europe were proudly marching to war? To explain, Conn broke down WWI into five different wars, all of which began in August 1914.

1. An Economic War

This theory of a war of the balance of powers was, especially during the early 1960's, held to be the major, perhaps the only, reason for WWI. But this explanation has since satisfied fewer and fewer historians. Wars other than the economic one began simultaneously, and, asserts Conn, "these other wars, I think, are more frightening; because they suggest tendencies in the human character which, in the context of WWIII could spell the danger of human extinction."

2. A Patriotic War

It had been long established in the European tradition that self-defense was a precious right. But not until the 19th century, when the "nation" developed as the object of loyalty of all citizens, did national self-defense become such a high ethical quality. As WWI began, every country and nearly every soldier sincerely believed that they were fighting wars of national self-defense. "There is not one nation in August 1914 that honestly thought of itself as the aggressor....It is very difficult to point to the villain in August 1914."

3. An Idealistic War

1900 to 1914 was an era of economic growth, of rising expectations, of great idealism, in which especially young men thought it their destiny to make an idealistic stamp on the world. They went to war out of idealism and a commitment to their own personal growth. "This war, this crusade, would allow these idealistic actions to blossom and flower in the comradeship of a joint endeavor."

4. A War on War

The next war mentioned was characterized by the familiar expression, "the war to end all wars."

5. An Imaginary War

Conn described, finally, an imaginary war which had been brewing in the minds of the general public and of the military staffs of Europe. The public had been "toying" with the idea of war--through popular novels, newspaper essays, and even some photographic montages of the time. Meanwhile, the general staffs of nearly all the European countries "had, since essentially 1870, nothing to do but devise plans for war." And these plans were marvelous things. Each strategic plan had as a necessary first step, total mobilization, to a degree never before seen on the planet. ...Once a button was pushed, an imaginary war, which had for fourteen years existed in backrooms, all of a sudden assumed terribly real proportions.

THE BEGINNINGS OF WWII

Turning to September 1939, the beginning of the second World War, Conn set out to discover which of these same five wars had an influence in igniting World War II. But first, he made the comment: "It is curious, I think, that when most of us who were born immediately after that war (WWII) look back on it, it strikes us as the idealistic war, as perhaps the paradigmatic war of the 20th century that should have been fought. What we might remember is that that is a perspective of December 1941. That's a Pearl Harbor perspective, when this nation was attacked, when the radical sins of the Nazi regime were beginning to be revealed, and when in fact it looked as if evil was hurled forth on the face of the planet. It was a very different situation in September 1939.

WAS WWII FIVE DIFFERENT WARS?

An economic war? Yes, this was a war of balance of power. "It was that if nothing else, because it was a playout of the unsettled question of WWI, which was: What is the role and what is the nature of the German nation? ...In the vacuum of that unanswered question, Hitler attempted to move."

A patriotic war? The Germans, feeling aggressed by the Treaty of Versailles, did indeed consider that they "had a mission of national self-defense which in the tortured logic of the Nazis required an offensive effort. But England and France were noticeably lack-luster in their enthusiasm."

An idealistic war? No, not in September 1939.

A war on war? Not until much later in the 1940's.

A war impelled by previous imaginary wars? "Not in the sense of public opinion. The public, between 1913 and 1939, did not want to hear of war ... And yet the general staffs always had their imaginary war."

Understanding the Definitions

The meaning of "defense" has changed. National defense was once the protecting of the homeland and its people against attack and invasion. This definition was expanded to mean "defense of national interests." "National interests" are increasingly ambiguous, increasingly short-term, and increasingly changeable. There is less and less accountability on the part of decision-makers for precisely what is being "defended." It is, therefore, hard to assess on a pure cost-effectiveness basis, whether that which has been "saved" through "defense" exceeds the cost of the "defense."

It is further clear to me that our operational idea of "national interest" is to do whatever is necessary to insure our access to more and more of the earth's renewable and non-renewable resources (not only more and more, but more and more in excess of our share), in order to support an economy based on endlessly-increasing consumption. We haven't, in the spirit of the "free market," entered into "arms-length transactions" between economic equals. We have, instead, used our economic and military power to enter into one-sided, oppressive arrangements which give us the things we want (depriving others) and which "stabilize" parts of the world which are of interest to us (oppressing others).

From remarks by Weeden Nichols, Chief Warrant Officer, U.S. Army, retired, in the session on National Security during the Sunday morning program, "The Cost of Our Economic System," Prairie Festival 1984.

IMPLICATIONS FOR WWIII

In WWII's image of the destruction of Hiroshima by an atomic bomb, it was clear that something new had happened. "No longer could there be an imaginary war which titillated public interest; no longer could political leaders call for the use of nuclear weapons as an act of patriotism; no longer could a full nuclear war be labeled as a war on war. A deep and utter change in human events had occurred.

World War III will be different from WWI and WWII in some fairly obvious ways. With fewer than 500 people on earth now necessary to carry on a world war, compared to the many millions required for world wars I and II, "World War III will be a world war, not because of the number of combatants, but because of the number of victims."

Perhaps none of the five wars which began the earlier world wars will be necessary to ignite WWIII. "It strikes most observers as more likely that if we have a WWIII it will be because of a combination of accident and miscalculations with genuine friction and genuine animosity."

In speaking about the characteristics of nuclear weapons, Conn pointed out that the trend is toward small, highly mobile systems. "What makes these systems especially troublesome is that you can hide them....They can be undetected from satellites; they can go undetected by on-site inspection teams....And without easy verification, nuclear arms control agreements are going to be more and more difficult to come by."

At this point in his lecture, Conn reviewed various possible starting points for WWIII. The scenarios ranged from a direct U.S.-U.S.S.R. confrontation to an Islamic coup in Saudi Arabia; a nuclear exchange between India and Pakistan, to terrorists with bombs in New York and Leningrad. We generally focus on a possible American-Soviet conflict because of their nuclear arsenals. Both countries have contingency plans which call for the use of nuclear weapons, although it is the official policy of both governments never to employ those weapons. "If we have learned anything from the beginning of WWI and WWI, it is that plans are dangerous," Conn warned. "And yet these same plans are necessary to maintain that balance of terror we call deterrence."

CONCLUSIONS

An audience to such a presentation as Conn Nugent made often comes away with no new conclusions, even with less hope than before. But Conn did have a couple of innovative suggestions, perhaps reflecting his experience with dialogues involving Soviets and Americans as well as other nationalities within the IPPNW. He concluded:

> "I don't mean to propose any easy way out of this dilemma. But there are a number of steps which at least strike me as being necessary. Number One is that these plans should be made public. If there are plans for the use of nuclear weapons, and indeed there are, let's hear about them. Where are they? Number Two: Americans must ask themselves and Soviets must ask themselves, what exactly would be required to go to war with the enemy? What's the "causus bellum"? If our oil is cut off, is that a good reason to go to war? If a democratic government takes power in Poland, is that a good reason for them to go to war? Let us have open discussions on what cause conceivably might impel us to war.
>
> At bottom, it seems to me, there is no way out of this dilemma without Americans realizing that their health and the future of this planet depend upon the Soviet Union; and for Soviets to understand to the bottom of their being, that their health and the future of this planet depend upon the United States of America. We have reached a new stage in human affairs in which, like it or not, two systems which are antithetical, two systems which have genuine points of discord, and two systems which will for the foreseeable future have points of discord and contention, these two systems need each other for their own survival."

Third World Desperation: A Threat to World Security

Martin Gursky

As an agricultural intern at The Land Institute, my studies and research are primarily related to biological and agricultural questions. Interns are, however, encouraged to think about and discuss global issues. An issue we cannot avoid confronting is the possibility of nuclear war. For whatever the outcome of our agricultural research, its usefulness depends on a stable and peaceful world. It is becoming increasingly clear that the stability of the world is threatened by economic desperation and growing militarism in the third world.

Economic Realities

Since the shock of the oil crisis of 1973, a great deal of international attention has been devoted to determining whether global supplies of nonrenewable resources, especially energy-related materials, can meet the growing needs of an expanding world population. Lester Brown, in State of the World 1984, reports that since the crisis, global outputs of goods and services have dropped from 3.5% annually in 1973 to 1.6% in the last three years; and many countries, including most of the industrial world, have experienced actual contraction in their economies. In addition to the current global recession, human populations continue to grow, especially in the poorer countries, where even meeting basic necessities like food and shelter is impossible.

According to Judith Jacobsen, a former senior researcher at the World Watch Institute, (Transnational Perspectives Vol. 9, No. 2, 1983) there are already 55 developing countries which have declared that population growth threatens any hope of making economic gains. The World Bank reports that there are some 800 million

people today trapped in conditions of "absolute poverty," their lives dominated by hunger, ill health and the absence of hope. The Global 2000 Report cautions that the downward spiral of poverty and the growing disparity between rich and poor is leading to increasing frustration and resentment. This can cause political instability and threaten the security of all nations.

Not only have the poorest of the developing nations suffered economic stagnation, but so have those fortunate enough to have large oil reserves. The June 10, 1984, New York Times reports that countries like Mexico, Brazil, Venezuela and others not so poor (but not blessed with oil) like Poland, Argentina, Korea and Rumania, owe western banks about 800 billion dollars. These countries are finding it increasingly difficult to pay their creditors. The average Latin America country's payment, just to meet interest charges, is thirty to forty percent of export earnings. Presidents from some of these countries, in a recent meeting, concluded that their nations cannot indefinitely accept these risks. Michael Moffit in an article in the Progressive (February 1983) sees higher interest rates as having placed oil prices as the chief obstacle to development for the people of the third world. He even says we should be prepared for a possible collapse of the international monetary system.

In his book Eating Oil, Maurice Green encourages his readers to look beyond the boundaries of the U.S. and ask:

> Do I care about the human race as a whole? Am I my brother's keeper or is what happens to other people of no concern to me? Does the happy chance, over which I had no control and for which I can take no personal credit, that I was born in the United States rather than in the third world, automatically entitle me to a larger share of the world's resources? Is it right that the United States which contains 1/18 of the world's population should be using up 1/3 of the present world's production of irreplaceable fossil fuel energy? Do I want to watch on my TV the spectacle of millions of people in less privileged countries starving to death before my very eyes?

In a chapter in Critical Choices for Americans (Volume VI, 1976), Harrison Brown makes a comparison between the average inhabitant of the U.S. and a typical peasant from the third world. The peasant might have associated with him a part of a wooden or stone dwelling unit and a few simple tools. He and his possessions will be powered for a year by about 150 kilograms of cereals. By contrast, an average inhabitant of the U.S. is associated with about 10 tons of steel, 160 kilograms of copper, 140 kilograms of lead, 100 kilograms of zinc, 18 kilograms of tin, and 110 kilograms of aluminum. His energy equivalent requires burning more than 10 tons of coal. His per capita cereal consumption now exceeds 800 kilograms, most of which is fed to animals.

In looking at the widening gap between rich and poor nations, Kenneth Boulding, in the book Toward Century 21, says that as deplorable and tragic as this gap is, it is not likely to upset the stability of the international system unless there are unforeseen developments in weaponry. Apart from this, the countries face the prospect of being not only poor, but impotent. He goes on to say that if the poor countries can neither threaten nor bargain, then their only hope would seem to be the development of an increasing sense of world community that will strengthen the organs of world government and persuade the rich countries to devote larger proportions of their products to assist the development of the poor countries.

The Development of the Poor Nations

Mahbub ul Haq of the Overseas Development Council says in The Third World and the International Economic Order that when rich countries hear the poor countries' criticism, the first reaction is to dismiss it as empty rhetoric. Their standard reply is that the internal market mechanism works and that the poor nations are always out to wring concessions from the rich nations in the name of past exploitations. They believe that the poor nations are demanding a massive redistribution of income and wealth which is simply not in the cards. Their general attitude seems to be that the poor nations must earn their economic development, much the same way as the rich nations did over the last two centuries, through patient hard work and gradual capital formation, and that there are no shortcuts to this process and no rhetorical substitutes. But when we start from a position of gross inequalities, the so-called market mechanism mocks poverty, or simply ignores it, since the poor hardly have any purchasing power to influence any market decisions. This is even more true at the international level, since there is no world government and none of the usual mechanisms existing within countries that create pressures for redistribution of income and wealth.

The poor nations have come to realize they cannot gain an equitable deal from the present international economic structure, so they have demanded a new economic order, knowing full well

In the mad scramble to sell nuclear power to the third world, the nuclear suppliers have tried to deny their products' genesis of war.

that there are very few examples in history of the rich surrendering their power, willingly or peacefully.

Mahbub ul Haq contends that even though third world nations are not important enough financially, economically or politically to figure in the calculations of the developed countries, in the long run there is likely to be a dramatic shift in the balance of power. He says that on the basis of demographic trends, the rich nations are a shrinking minority, and this is likely to create a "reverse dependency" where the lifestyle of the rich will come to depend on the continual goodwill of the poor.

The Spread of Nuclear Weapons

Mahbub ul Haq also sees another development during the next few decades which is going to reduce greatly the maneuverability of the privileged minority, namely, the spread of nuclear weapons. It looks inevitable now that the nuclear monopoly will not remain in the hands of a few nations. Richard Barnet says in an article in Mother Jones, May 1980, that there will be fifty or more additional nations with nuclear weapons by the end of the century. Patrick B. Heffernan, Amory B. Lovins and L. Hunter Lovins in their book The First Nuclear World War (1983), present in great detail a scenario illustrating how an atomic catastrophe may be triggered by a series of small nuclear wars and acts of terrorism in the third world. By 2990, they foresee that Israel, Iraq, Libya, India, Pakistan, Taiwan, South Korea, Brazil, China, Egypt, Argentina and South Africa will all be able to produce and use nuclear weapons. We know that half of these countries can do so today.

As an answer to the economic dilemma of the nuclear industry in the U.S., President Reagan has encouraged the export of the atom to the third world. Vast subsidies have gone to the poor nations to pay them to haul U.S. reactors away from their near-bankrupt builders. Canada and France have also actively financed the installation of their reactors in less developed countries. In the mad scramble to sell nuclear power to the third world, the nuclear suppliers have tried to deny their products' genesis of war. They are relying on the International Atomic Energy Agency to regulate nuclear materials but that agency's power is all but non-existent.

Not only is the developed world dumping its ailing nuclear industry on the third world, but it is also shipping non-nuclear military hardware at an unprecedented rate. Michael Klare (The Bulletin of Atomic Scientists, May 1984) reports that according to the State Department, total Soviet military sales to the third world countries for 1972-1981 amounted to 64.9 billion dollars; while U.S. sales of weapons alone totalled 48.1 billion. The U.S. Arms Control and Disarmament Agency reported that the Soviets transferred at least some arms to 42 third world nations between 1975-1979 compared to 51 for the U.S. In general, Soviet sales to third world countries incorporated less sophisticated gear than comparable U.S. transfers.

What we need is a new definition of security.

James Cracraft, in the same issue of the Bulletin of Atomic Scientists, states that between 1960 and 1982, the developing countries have received either by purchase or in aid, 400 billion dollars worth of military hardware, while over the same period received only $25 billion in development monies. U.S. military expenditures in 1980 totalled $144 billion, developmental aid, $7 billion. The military value of arms supplies to the third world by the Soviet Union in 1983 is estimated to have been at least six times that of Soviet economic aid. James Cracraft agrees with Michael Klare that the arms transfers pose a growing and still graver threat to international security. Cracraft points out how many of the countries with the largest foreign debts have also a disproportionate value of arms imports. Still even more disconcerting is that of the 116 countries labeled "developing" in 1983, 56 were military regimes with very poor records of human rights.

At the U.N. Special Session on Disarmament, which took place in New York in 1978, members declared that the escalating arms race is seen by most countries more as a threat than as protection, and as increasing and intensifying insecurity. Although a reduction in arms expenditures is an obvious source of increased development funds, only little attention was given to the relation of disarmament to development; even less attention was given to reducing the third world's expenditures on arms. It appears that neither the developed world nor the third world is ready for disarmament: the political will just does not exist.

A New Definition of Security

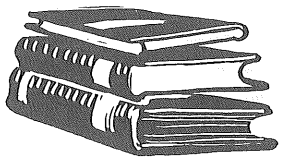
In a contest with the Soviet Union over ideology and access to the world's remaining resources, we in the western world have armed ourselves to the eye balls in destructive power. I think it is fair to say that all nations and all people are less secure today than they were ten years ago, last year, even yesterday. We have been accelerating our destruction and now have included many more active participants.

What we need is a new definition of security. So far the United States has spent almost $3 trillion on national security since 1945, and we are less secure today than we were then. We have more destructive power than any nation on earth has ever had. But we seem

unable to translate this awesome force into political power. According to Heffernan and the Lovins, our new concept of national security, as well as global security, must be enlarged beyond military and energy concerns. It must mean food security, grounded in an agricultural system that replenishes soil and water and protects the ecosystem that supports it; health security embedded in an environment free of toxins and carcinogens; economic security, and the social security of a population with the hope and desire to work for a continually improving world, not one fraught with a "psychological climate of suspicion and mistrust that makes international cooperation impossible.

We have to develop the strength to act in the world so that our children and grandchildren may live. We will have to rebuild our faith in the possibilities of a decent society--not just for ourselves but for our four billion neighbors. More missiles or aircraft carriers will provide neither that desperately needed political will nor practical options. The very real danger is that we scare ourselves into impotence, and perhaps oblivion.

We need to move quickly and radically towards a world where nations can live in harmony and in a creative spirit. We must ultimately control our numbers and our greed. We must recognize that life exists only within certain biological limits which we have the capacity to easily exceed.



Books

With These Hands: Women Working on the Land

edited by Joan M. Jensen
The Feminist Press, McGraw Hill, New York, 1981
295 pages, paperback

Reviewed by *Debra Israel*

In reading the book With These Hands: Wome Working on the Land by Joan M. Jensen, I was eager to learn about women farmers. As a woman interested in agriculture, it is important to me to have models of women who have been active in this field. The usual reaction to women who want to farm is, "You'd better marry into it!", as agriculture is one of the most male dominated fields. With These Hands doesn't provide one with numbers of women working on the land, but it shows their presence through examples. In trying to learn more about women farming than was included in With These Hands, I talked with Tracy Ehlers, who has been researching women farmers in Iowa. She said that the 1978 Agricultural Census revealed that five percent of all farmers in the U.S. are women and that in Iowa, 3,000 women are farming. However, she believes these numbers are low. Although women are in the minority among farmers, we need to hear about the ones who are there so that the negative reaction becomes less prevalent.

An issue that came up at The Land fairly often this past year was the supposedly inclusive use of the pronoun "he." When talking of farmers in our culture, or of the predominant figures in the alternative agriculture movement, one is primarily referring to men. So when writers or speakers say they are using the word "he" to mean both male and female, it usually is fairly obvious that they aren't; they are saying "he" because that is what they mean. This is made painfully obvious when the writer or speaker sticks in an occasional "he" or "she" when the intention is actually to include women. There is no easy solution to this problem of language, but the nonrecognition of women's involvement in agriculture is encouraged by always naming the farmer a "he." The dynamics between a culture and a language are important and one will not change without the other. It has been said that we need to get more people working on the land to be better stewards of it; perhaps the values that women have been raised with will be more helpful in creating a sustainable agriculture than the aggressive values that men are taught. At any rate, it's important to realize the value of women in agriculture throughout history.

With These Hands is an ambitious volume. In a little less than three hundred pages, Jensen touches on Native American, Black, Mormon, Shaker, Euro-American and Hispanic women. She moves through time from before whites took over the U.S. through colonial times, the southern plantation system, westward expansion, and post-Civil War period to the present. She provides examples of rural women from different areas of the country and different classes of people. At times the book was disappointing, as I was expecting to read more about women who were actually farming, rather than general stories about the lives of women who are living on the land. The selections that did talk about women farming were more specific about the woman's overall life than the way she farmed. Yet the examples were there in the three Misses Hodges who farmed together in the South, the Native American women, and a southern black woman farming twenty acres, among others.

The book also shows the integral part that women play in life on a farm, even when the labor is split on traditional male/female lines. Because this representation of a rural woman's life is more commonly written about, for example in pioneer stories, I was more interested in the examples of women doing the non-traditional (by Euro-American standards) work.

The format makes the book very readable. Each chapter has an introduction which gives the historical context of the upcoming passages. The selections within the chapters are varied. Some are excerpts from novels; some are letters, diaries, poems, oral histories or speeches. Some of the diaries which just enumerate daily events are tedious to read, but the selections are brief. Because so many topics are touched upon, no in-depth studies are presented, but the references provide good sources for further information. The photographs throughout the book, as well as the photojournal at the end, are striking accompaniments to the printed materials. Most of them are from the 30's and 40's, taken by photographers under the direction of Roy Stryker.

Joan Jensen provides a good perspective on the different experiences of women with varying ethnic, racial and class backgrounds. She sensitively covers the white invasion of Native American land and the practice of black slavery. She also discusses the difficulties for non-whites to own farmland and the problems in switching from a rural to an urban lifestyle. An interesting point was that in many West African and Native American agricultural traditions, the women are very involved with farming in the field--unlike the tradition we've inherited from the Europeans. White men, in saying that women cannot do hard physical labor and therefore cannot farm, contradict themselves by having used black women as field slaves in the past and females as migrant workers now. As eloquently stated by Sojourner Truth who had been a field slave, "Look at me! Look at my arm! I have plowed, and planted and gathered into barns, and no man could head me, and aren't I a woman?" (Page 57, With These Hands.) What white men have said is that white women are weak, but separating women by race makes a gender argument very flimsy. In the selection, "The Uncertain Harvest," in the part on mothers of the South, it was interesting to note the women's preference for field work over their household chores.

Besides agricultural work, Jensen also includes selections on rural women's involvement in various political movements. For example, the Grange and the Farmers' Alliances were the first male-dominated organizations to allow women to become members, hold office and act as representatives to regional and national conventions. Women have also participated in the struggles of migrant workers; an example is Dolores Huerta, who is very active with the United Farm Workers.

With These Hands also contains sections about women leaders in different social movements, like abolition and suffrage, who also were linked to the farm and rural life. For example, when polygamy was practiced among the Mormons, the farm wives were very involved in the suffrage movement. This was facilitated because women in the Mormon community were not isolated from each other. Although Susan B. Anthony is most well known for her suffrage work, Jensen included a speech of hers on agriculture in New York State, in which she exhorted women to plant gardens and orchards so farms would be diversified. Bringing rural women's political involvement up to the present, the author includes a selection about Women for the Survival of Agriculture. The New York branch recently picketed so no farmers would sell their milk at a low price, and they succeeded in getting the price raised.

Juli Neander, 1983 Ag Intern

An interesting article on this topic, "The Ladies' Department of the Ohio Cultivator, 1845-1855: A Feminist Forum," by Frances W. Kaye, appeared in Agricultural History, volume 50, 1976. In the pre-Civil War years, many agricultural journals discussed women's rights issues, but the Ohio Cultivator was one of the few that heartily supported it. Its Ladies' Department covered many issues affecting rural women. Another article I ran across in Agricultural History was called, "Women in the U. S. Department of Agriculture." The author, Gladys L. Baker, discusses the positions which women filled in the Agriculture Department, including research jobs, from the late 1800's to the present.

Some selections showed farm wives disturbed by their lack of control over what happened on the farm. One called "I Just Up and Bashed Him," was about a woman whose husband sold her cow and kept the money. Another, called "Pioneering in the Northwest," was about a woman who warned her husband not to borrow money, but because he did anyway, they lost their land.

Community living is described in selections about the Shakers, Twin Oaks and a women's collective. In the section entitled "The Next Step: Women-identified Collectives," the author Jeanne Tetrault discusses the dynamics of men

and women working and living together when women are trying to learn non-traditional (for women) skills. She brings out the struggle to recognize when women are leaving jobs for men to do, just because they are men, and not because they necessarily are more skilled. This is an issue that must constantly be addressed in our society when trying to work in a non-sexist way in a mixed group of men and women. The way we are brought up is sexist, and if we don't challenge ourselves, we will stick with those jobs with which we feel comfortable. Often the woman who wants to learn non-traditionally female work must constantly push to be able to do it; otherwise, the job is done by a man, who may or may not be better qualified than she, but is nonetheless more self confident. This is one reason why some women are choosing to work in female groups only, where they do not have to fight as hard to learn new skills. This is one way to change things. The other would be an increased sensitivity on the part of men, in a mixed group, to be aware when they are dominating certain jobs and step back and ask why.

This book raises many points which could lead to whole books themselves. After reading it, one should be fully prepared to defend women's capability as farmers, both in terms of physical labor and management capacity. Women's further involvement in agriculture can be based not only on the idea that things can change, but also on the fact that women have worked on the land before. Despite its shortcomings in terms of concrete examples of women farming, I highly recommend the book.

It's not all Sunshine and Fresh Air

edited by Marty Strange, Center for Rural Affairs, 1984

Reviewed by *Mike Berghoef*

"Agriculture has become not only the most dangerous occupation in America, but one which is increasingly unhealthy as well."

This statement, counter-intuitive to many, is the subject of the Center for Rural Affairs (CRA) April 1984 investigative reports on Chronic Health Effects of Modern Farming, entitled It's Not All Sunshine and Fresh Air. This collection of eight reports begins to fill the vacuum which exists in the literature addressing long-term health assessment on the farm. Acute health hazards of farming (i.e. pesticide or fertilizer poisoning) presently receive public and government attention due to their overt, immediate effects. However, the subtle chronic problems do not, because addressing them may lead to questions about technology and policy in modern agriculture.

In the "Conclusions and Recommendation" section, the author Marty Strange concludes that health risks are increased when size, intensity and specialization of the operation increases. Significantly, modern industrial agribusiness openly strives to increase these three factors.

> "The changes that have taken place in American agriculture in the span of two generations are staggering. Principally, these changes have constituted an industrial revolution on the farm, the application of standard technology to the replacement of diversity with uniformity. These alterations have changed the environment within which farm families live. They cannot help but have implications for the health of those people."

In "Respiratory Problems Caused by Hog Confinement Facilities" (M. Strange, L. Krupicka), the authors review how U.S. hog production has become rapidly industrialized in the last fifteen years. This has led to the problems, correlated with increases in scale, intensity and specialization, found in hog confinement facilities. Dangerous concentrations of gas in these operations are due to anaerobic decomposition in the manure pit (hydrogen sulfide, methane and carbon dioxide) and fossil fuel burned in heaters (carbon monoxide). The effects of ambient particles of grain or fecal dust are compounded by the toxic bacteria they can carry and the gases (hydrogen sulfide and ammonia) that they absorb. These ubiquitous elements are then readily inhaled deeply into the lungs of both the workers and the hogs. In evaluating the effects of these elements, it is important to remember that their toxicity is amplified when they exist in combination.

To counter the diseases produced in hog, poultry and beef confinement facilities, the operators routinely give antibiotics at low, maintenance (sub-therapeutic) levels mixed in with feeds. In "Health Effects of Feeding Drugs to Animals," Chuck Hassebrook reports that this widespread overuse produces bacteria that are resistant to the drugs. Researchers are now looking at how the livestock bacteria might crossbreed with human bacteria. As a result of this crossbreeding, strains of salmonella, influenza and gonorrhea, resistant to antibiotics, could be transferred to humans. Strong circumstantial evidence exists for this process and those workers with the most immediate exposure experience the highest risk.

The Food and Drug Administration (FDA) proposed to ban tetracycline and penicillin in feed premixes in 1977. The Chairman of the Agricultural Subcommittee of the Congressional House Appropriations Committee blocked the rule until further research could be completed. Pressure from drug companies to drop the proposal and accept applications for new antibiotics is increasing, as is the pressure from environmental groups to follow through on the ban. The FDA says it will continue to research the issue and has scheduled a reevaluation for this summer.

The report called "Official (Un)Concern About Farm Health" addresses the problems with governmental regulatory agencies. Problems in Workman's Compensation, the Occupational Safety and Health Administration (OSHA) and the FDA usually center on agricultural exemptions and a thin, patchy, non-coordinated coverage of health issues. Low health and safety standards (i.e. for nuisance dust, noise, ventilation and protective clothing) and insufficient health research data are worsened by the exemptions which reduce reporting and record keeping. The agencies' emphasis on covering only the larger farms tends to become a subsidy for largeness, therefore, a hidden cost for others. For example, OSHA funds are not to be used on farms with fewer than ten employees.

"The Hidden Health Effects of Pesticides" article (M. Strange, L. Krupicka, D. Looker) points out that many of the Chronic Health test results for pesticides, required by the Environmental Protection Agency (EPA), are inaccessible to the public. This is because chemical manufacturers claim that trade secrets would be exposed to their competitors. The potential for deceit is immense here, and, in fact, in 1977, International Bio-test Laboratories (IBT) was found guilty of falsifying data. Out of 801 studies, 594 were invalid (supporting 140 chemical registrations). However, the registrations on none of the chemicals were suspended, and none of the replacement tests are available for public scrutiny.

"Special Local Need" (SLN) and "Emergency Requests" are avenues whereby the EPA can allow state and federal agencies exemption from the normal registration requirements for pesticides. In these special cases, health testing is not required before release and use.

> Between 1978 and 1982, the number of "emergency" requests increased from 199 per year to 724 (264% increase)."

In the final section, the CRA makes several recommendations. Governmental agencies should collect more complete and accurate data and make the results available to the public in non-technical language. Chemicals and machinery should have labels disclosing the chronic health risks of exposure. OSHA requirements and Workman's Compensation should be extended uniformly over agriculture. Toxicity research by independent labs should be paid for, but not supervised by the chemical company seeking registration. These steps would begin the process of working toward full knowledge of health risks, promoting accurate and honest assessments of agricultural health trends, and urging more responsible participation in farm-related decisions.

The CRA is known for its policy research in helping low income farmers and rural people achieve economic justice. Copies of this report are available for $5.00 and $1.00 postage and handling. Send check or money order to Center for Rural Affairs, Box 405, Walthill, Nebraska 68067.

Editorial: Vote for the Earth

Dana Jackson

Environmental Action has traditionally targeted twelve members of Congress having the worst environmental records (the "Dirty Dozen") for defeat during election years. This year they have targeted Ronald Reagan and the twelve appointees and advisors most responsible for inspiring and implementing his assault on the environment.

President Reagan's administration has tried to give away public lands, avoided toxic waste clean-up, ignored acid rain and championed subsidies for the ailing nuclear power industry. But Reagan's foreign policy and military build-up are even more environmentally destructive, not just to the U.S., but to the whole planet.

Most scientists believe that human population growth must be controlled to protect biological systems, prevent the rapid depletion of mineral resources, and make economic development in poor nations possible. In a paper prepared for the World Population Conference August 6-13 in Mexico City, the White House proposes that the U.S. cut off assistance for family planning programs in nations permitting abortion. The paper argues that population planning has only limited value in development. At the same time, the Administration has pressured the World Bank to shift support away from projects to benefit the very poor and, instead, finance large-scale capital ventures which enhance the value of private enterprise. Ignoring the economic desperation among third world millions fosters destruction of biological resources and threatens world security.

The most immediate threat to the global environment is nuclear war. Under Casper Weinberger, Secretary of Defense, we have added 165 billion to the Pentagon's budget, an amount close to the current national deficit. By increasing the arms race, even to outer space, we have increased world tensions and the likelihood of war.

Reagan acts as if we could fight and win a nuclear war. Scientists startled the public during the World after Nuclear War Conference in October by describing a nuclear winter which could occur with the detonation of only one percent of the combined American and Soviet strategic arsenals. The injection of smoke, soot and dust into the atmosphere would block the sun, cause temperatures to plunge, and stop photosynthesis.

Paul Ehrlich writes in Coevolution Quarterly #42 that the nuclear winter information should make decision makers realize that "thermonuclear devices are not weapons of war, but implements of mass suicide." Yet we cannot expect a President, who neither understands photosynthesis nor entropy, to realize this. As Ehrlich says, "If Reagan's revival-meeting view of foreign affairs does not lead to our demise in 50 to 150 minutes, then continuation of his environmental policies will produce the same result in 50 to 150 years."

VOTE - as if the life of the earth depends upon it. It does.

Bridge In

Three years ago, the bridge by The Land was literally pulled down by a backhoe catching the iron beams across the top as a truck/trailer rig hauling the equipment crossed the bridge. The old wooden plank bridge has been replaced by a modern concrete structure.

You can now approach The Land from the west on Waterwell Road (not marked) which goes east from the Western Auto Warehouse on old Highway 81, east from Ohio Street where the blacktop ends.

Warning: Strictly adhere to the 20 mph speed limit along the curves of the road. The road is narrow, has loose gravel, deep ditches, and the curves are poorly banked.

Changing Your Address?

The Post Office does not forward 3rd class bulk mail. Please inform us if you change addresses. If EXP21 appears on your label, your subscription expires with this issue. PLEASE RENEW NOW.

The Land Institute
ROUTE 3 • SALINA, KANSAS 67401

Non-Profit Organization
U.S. Postage Paid
Permit No. 81
Salina, Kansas 67401

Friends of The Land

NAME_____

ADDRESS_____

_____

PHONE_____ DATE_____

(CHECK CATEGORY OF CONTRIBUTION)

_____$15 _____$25 _____$50

_____$100 _____$500 _____Other

_____$5 U.S. subscription to THE LAND REPORT

_____$10 Foreign subscription - THE LAND REPORT

The Friends of The Land have been extremely important. Many helped collect materials to build the first classroom/office/shop; many donated their time and labor to begin reconstruction after the building burned in October 1976. Friends donated books and money to help develop another library and began contributing to the general support of The Land through yearly gifts. The Land needs these friends, and new friends, too.

The Land Institute is a private, educational-research organization. In recent years, several privage foundations have awarded grants for special programs. These would not have been made if The Land had not shown a record of broad-based support from individuals who make annual contributions. Continued financial support from Friends of The Land is vital.

Contributors receive THE LAND REPORT and other occasional publications, plus notices of events sponsored by The Land Institute. The Land Institute is a non-profit organization, and all gifts are tax deductible.