

*A publication of The Land Institute | Number 52 | Spring 1995*

# *The Land Report*



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# BECOMING NATIVE

*to this place*

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## Introduction

*Brian Donahue*

The county changed my address. We used to live at Rural Route 1, Box 29A. Our functional address was (and remains) “a quarter mile east of the old red school-house.” Now, officially, we live at 1718 Aspen Road. They say it’s to facilitate emergency 911 response, which is good; but it feels like another sign of creeping — no, *bounding* — suburbia. We cringe every time we open our mailbox.

Why Aspen Road? There isn’t any aspen around here. There’s plenty of cottonwood, which is in the same genus. Cottonwood Road would at least have made sense. Apparently they needed something starting with “A,” since this is the first section road north of the county line. The next road up is now Buffalo Road. So why not Aster Road for us? The native prairie pasture that still dominates the landscape out here is full of asters.

But that’s no good, either. One of the worst things about the suburbs is the way they always name the roads after what they just destroyed. Houses go into an orchard and all that’s left is Applecrest Road and Blossom Lane. They should just be honest, and call them Development Drive, Build-Out Boulevard, or Lost Rural Character Lane. Fancy living on Just Ruined Place. Our road could become At Least it Used to be Rural Route 1.

We live about ten miles from Salina. A couple miles beyond us, in the Solomon River bottoms, is the small farming town of Bennington. I wouldn’t say that the village of Bennington is dying, but it certainly does not appear to be economically thriving. All the business has moved to the malls in Salina. A mile past us, within sight of the village, a new development of large, fancy houses on winding roads has gone into the prairie hills. I assume these new residents all work and shop back in

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Salina, as I do. Bennington is becoming a suburb of Salina. While small rural communities in the hinterlands drain away, at the receiving end of this demographic flow the suburbs rise and swamp other rural places. It is startling to see these two currents virtually overlapping in the same place at the same time.

The theme of this year's Prairie Festival, and of this *Land Report*, is "Becoming Native to This Place." We borrowed this title from Wes because it covers plenty of ground. At root, we are talking here about something quite specific: eating more locally grown food. One of my colleagues (who shall remain nameless for his own good) suggested we call it "becoming native to this plate." From this simple connection, we believe a host of good consequences will follow.

One of the chief concerns of what I can broadly call the sustainable agriculture movement has been the decline of rural communities. The work of Gene Logsdon, Wendell Berry, Marty Strange and others has concerned itself with conserving the best of our rural traditions, while turning away from the service of the extractive economy that has dominated rural society in this country from the beginning, and proven its undoing. When Wes Jackson writes about becoming native to this place, he is in part urging people to repopulate the small rural places that are dying. But, as he warns, we dare not resettle them with the same set of destructive assumptions that we first brought to them. Somewhere in our education system, or really, throughout that system and our entire society, we need to offer a "homecoming major." The question is, how can such a pervasive change in educational philosophy precede the sweeping change in society it is supposed to bring about?

Obviously, few of our institutions of higher learning are going to get far beyond offering maybe a "homecoming minor" anytime soon. Homecoming is not where the money is at. The work of homecoming in small rural places, which could exemplify ecologically sane ways of living, is vitally important. Those who have been born to it or drawn to it surely should keep at it. Meanwhile, another part of our rural landscape is indeed being

resettled, at a furious and frightening place, and with all of our destructive assumptions intact and flying their colors. The suburbs are expanding exponentially as those people who can afford to flee the cities. Anyone who drives the beltways surrounding Kansas City, or Chicago, or any other city — which I assume includes most *Land Report* readers — knows what I am talking about. Even a small city like Salina, Kansas (population 40,000), which is booming because it sits at the intersection of two interstates, is chewing up prime farmland. 15% of Saline County is Class I bottomland soil, 12% of the county is developed, and guess where most of this development has occurred?

What this suggests is that we are going to have to teach homecoming largely in the suburbs, because that is where the students are living now. Trips to the wilderness and television shows about the rainforests have their place, but they don't do much to get the message of how we might actually live with nature across. In fact, they can serve to reinforce the isolation from nature that characterizes industrial society. The articles in this issue of the *Land Report* are about bringing the matter of our connection to nature home to people in the most direct possible way, by what we eat.

These articles are about what is in some ways a new kind of farming. Although we include urban and rural examples of restoring these connections, by and large the arena here is the urban fringe. One thing suburban farms have going for them is ready access to a huge retail market, and several articles explore new ways of making this economic connection. But what is really novel about this kind of farming is its self-conscious dedication to education, and to building community. This is why I believe that in these kinds of efforts we have the footings of a broad-based institutional framework in which Wes's homecoming major could really be taught.

The suburbs are not pretty places. They epitomize the glutinous, ruinous consumption of nature that drives our economy. I do not think they are ecologically redeemable. Nevertheless, I am aware that most Americans of the next couple generations will probably grow up and live in these places, as I have. I know they can at least be improved. I believe they are places where the opportunity exists to get nature under people's skin in a way they will remember. It seems to me that the effort to become native to these places, both by its possibilities and by its limitations, will prepare the greatest number of our citizens for homecoming as the age of ecology gradually forces itself upon us.

The front cover presents Mr. James Hooks, Kansas City, Missouri. The back cover presents Mr. James Scharplaz, Minneapolis, Kansas.



## *The Ethics of Eating*

Alice Waters

I was an average kid — a middle-class American — who grew up in an average family. One of my earliest memories is of my mother in our backyard pointing out and naming the flowers to me, encouraging me to smell the forsythia, the lilies of the valley, and the lilacs. My father had planted a victory garden in our yard. During World War II the government encouraged families to grow food for their own tables as part of the war effort. One Fourth of July, for a costume contest, my mother dressed me as the Queen of the Garden. I couldn't have been more than three or four years old at the time, but I have a vivid memory of my outfit: a skirt made of big lacy stalks of asparagus that had gone to seed, a lettuce leaf top, bracelets and necklaces made out of peppers and radishes, and a wreath of strawberries for my head.

It was much later before I really started to pay attention to eating with all my senses. I spent my junior year in college in Paris. I hardly ever attended classes that year — my friend Sarah and I were too busy eating. We started out in the self-service cafeteria, where there were things I had never tasted before: yogurt, oysters, warm baguettes. I started hanging out with French friends who took a critical approach to food as a matter of course. For the first time, I was seeing how people live who think of good food as an indispensable part of their lives. Every day was punctuated by food-related decisions. Naturally, one spent an hour or so in the afternoon at the cafe with one's friends. But most revealing to me, we ate food only when it was in season, because that was when it was the least expensive and the best tasting. Eating together was a ritual that filled life with meaning, a sacred moment of the day, when flavors and smells intermingled with ideas and feelings.

I had never thought about food so seriously before. I had never thought of pleasure so seriously before. I wasn't

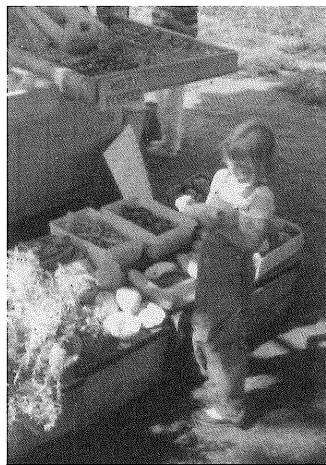
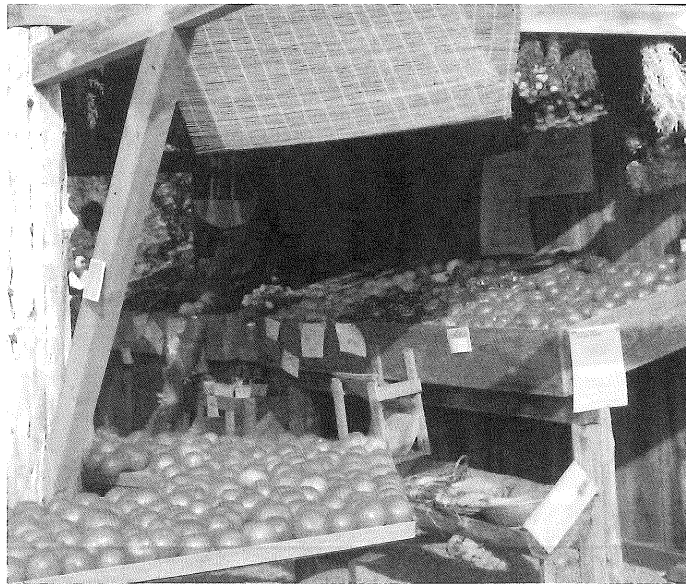
making an intellectual effort to understand all this; I was absorbing these lessons by osmosis. I had begun to feel that there is an intimate connection between food and the quality of people's lives.

I think many Frenchwomen and men have preserved a healthier, more natural way of eating. The last time I was in France with my family, we were fed by a friend of mine, a woman in her twenties who lives by herself, but who didn't hesitate at all to invite us to dinner at her tiny apartment. It was very simple and not the least bit extravagant: there was salad, some roast lamb, cheese, fruit; and the house was full of the good smells of garlic and rosemary.

What was so healthy and natural about this was the spirit with which she did it. She had cared enough to find good, local food — the best, not necessarily the most expensive — and to cook and serve it very simply, in such a way that it tasted like the essence of what it was. To paraphrase Wendell Berry, such a meal honors the materials from which it is made; it honors the art by which it is made; it honors the person who makes it, and those who share it.

After I graduated from college, I traveled all over Turkey and experienced the kind of hospitality you usually only read about — the no-questions-asked, totally accepting and generous sharing that only people who live close to the land seem to be able to offer to total strangers. Once we were camping out in the countryside, not far from some goatherds, and when we woke up in the morning we found that they had silently slipped a bowl of goat's milk under our tent flap while we slept. They simply shared the best they had. This is how we were treated everywhere we went. I didn't know then that the things I was learning about food and hospitality would profoundly alter the course my life would take.

From Turkey we went to Corfu where I lived for



a while on practically nothing, very simply, watching the sun and moon rising and setting over the sea. We ate fish just caught from the same sea, and picked fruit from the trees. There was a sense of immediacy and aliveness to the food. I was unmistakably part of the natural rhythm of the place. Everything seemed comprehensible. Looking back, I see now that I was learning that eating in this way can keep you in harmony with the earth.

Not too long after I moved back to Berkeley I started Chez Panisse Restaurant with a small band of friends and ten thousand borrowed dollars. I was twenty-seven years old. I was unbelievably naive, but obsessed with the desire to replicate the experience of eating I had loved over in Europe. I didn't appreciate how out of the ordinary it would be to think about food this way in an American restaurant.

Cooking food in season, for example, seemed like a foreign concept when we were starting out. In this country we were used to frozen food, and produce shipped from far away, available the year 'round. We had come so far from enjoying fruit right off the tree and only served right then, at its very best and ripest, that when we did serve fruit like that, a single perfect peach could be a revelation.

The more we got involved in trying to make our fantasies come true, the more we realized it wasn't simply a matter of going to the market and getting, say, tiny green beans at the peak of their season, because

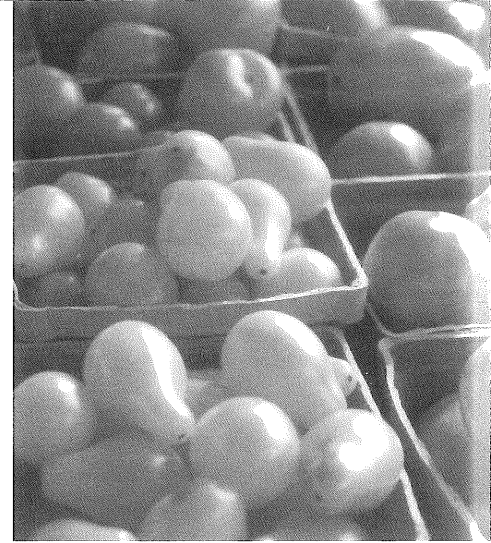
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***I believe that how you eat combines the political – your place in the world of other people – with the most intensely personal – the way you use your mind and your senses, together, for the gratification of your soul.***

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nobody was picking them that small or getting them to market that fast. More often than not, the fish we had to buy wasn't right out of the water that morning. That simple recipe for roasted chicken that had been so delicious in France never tasted right, because the chickens we could get had all the flavor bred out of them.

We had to start looking for all these products, and it has taken years to find them. The process began when a



neighbor offered us radishes and sorrel from her backyard garden, twenty-two years ago. Now we have a network of over seventy-five purveyors in California and Oregon who supply us with foodstuffs — including a farm in Sonoma that takes our compost and a little money in exchange for vegetables.

We discovered a pattern: when we looked for the freshest and best-tasting ingredients, we found that the people who produced them were frequently the most environmentally responsible. When we tried to find the products that were certified organic, we found that if they were fresh and ripe, they usually tasted the best.

I believed then, and I believe now, that actions have consequences, and that people acting responsibly can make a difference. I believe that how you eat, and how you choose your food is an act that combines the political — your place in the world of other people — with the most intensely personal — the way you use your mind and your senses, together, for the gratification of your soul.

Use eating to educate your senses. If you let your senses be deadened, and settle for food that's processed and wrapped and refrigerated, you're depriving yourself of the wealth of information that comes from sensual stimulation. Eating food is the best way to open up these pathways; it's something you do every day. So pay attention to what you are eating. If you choose food that is aromatic, with rich colors and varied flavors, your senses will be stimulated in ways that will enhance your consciousness, and that will improve your ability to communicate, not just about food, but about everything.

In many ways, the world we face is a sinister and dangerous place. We are beginning to see the frightening results of the damage we have already done to our environment. Last year, the Environmental Protection Agency issued a report estimating that out of every five rivers, lakes, and streams in the country, three are so seriously polluted that we cannot safely eat the fish in them. And yet we go on with no adequate plan to conserve our resources and, apparently, without suffi-



cient political will to slow down the pace of destruction.

However, you can make your own decisions about food without needing anyone's permission and without anyone else's help. If you choose to eat mass-produced, fast food you are supporting a network of supply and demand that is destroying local communities and traditional ways of life all over the world — a system that replaces self-sufficiency with dependence. And you are supporting a method of agriculture that is ecologically unsound — that depletes the soil and leaves harmful chemical residues in our food.

But if you decide to eat fresh food in season — and only in season — that is locally grown by farmers who take care of the earth, then you are contributing to the health and stability of local agriculture and local communities. When I buy food from farmers' markets, the food is alive, and it is irresistible. If we demand fresh, nourishing food, we help erase the stigma of elitism that is attached to good food in this country. Wholesome, honest food should be an entitlement of all Americans, not just the rich.

Part of the problem with our national attitudes toward food is that we are brought up to believe that food just isn't that important. Children aren't even taught to be curious about what they eat. Many of us have been taught that eating quickly is a good thing; and that no fuss, no mess, and no preparation time are good things. But we're missing the point when we try to save time by not shopping and cooking for ourselves. If we rush to eat quickly so we can get the so-called "worthwhile" leisure-time stuff, we are cheating ourselves. One of the truly worthwhile pleasures in life, it seems to me, is not in getting away from work, but in doing good work that means something.

Food can be transformative in everyone's life. One of the most powerful demonstrations of this truth is at

the San Francisco County Jail. About twelve years ago, a woman named Cathrine Sneed started a program called the Garden Project to teach organic gardening to inmates. The inmates in the program — Cathrine calls them her students — grow fruits and vegetables that are taken to homeless centers in San Francisco.

The effect of this experience on some of the gardeners has been so overwhelming that when they are freed they want to go back to jail in order to continue working in the garden. So Cathrine started another garden on the outside for her alumni to cultivate. Restaurants like mine buy its high-quality produce, which helps support this remarkable community project.

This Garden Project incorporates all that I think is important about food: the gardeners are not only growing and harvesting food, but they are cooking and serving it, and sitting down and eating together with a renewed sense of self-esteem, and with flowers from the garden on their table.

All of us, in or out of jail, need to learn this lesson. All of us must acknowledge that feeding one another is a fundamental part of healthy and moral living. Offering people things that help them to grow, physically and spiritually, is an act of the greatest love and respect for humanity. Supporting an economy that cares for the land is an act of the greatest love and respect for the planet that nourishes us.

This is the path we should follow throughout our lives. Remember, eating is an agricultural and political act, as well as a way to educate our senses. May we always enjoy it —intensely, I hope! It can change the way we treat each other, and it can change the world.

*Alice Waters is a Land Institute board member. This article is adapted from a talk she gave at Prairie Festival 1994.*

## *Sun and Grass, Flesh and Spirit: Meat Animals as Gift*

*Kathy Collmer*

“What kind of animal does beef come from?” a high school teacher asks his students. One of them doesn’t have a clue, even though hamburgers have been among her favorite foods for most of her sixteen years, and she gets good grades in all her classes.

If you were asked to guess where this incident took place, you’d probably figure it was a large city — New York, perhaps — where few, if any, of the students have ever been on a farm, much less laid eyes on a living cow. But no, this incident occurred in Goessel, Kansas, population 500 — a tiny little town encircled by farms, in the very heart of the heartland. Three-fourths of the students in this high school are rural kids who are bussed into town every day from the surrounding countryside. And yet, somehow, at least one student had made it all the way to the age of sixteen completely innocent of the knowledge of where beef comes from.

Here’s another story. A man phoned my husband, Jim, and me in response to our classified ad for drug-free beef. Before he bought any beef, he wanted to see what he’d be getting. So a few days later, the man drove twenty-five miles to our farm and Jim took him out to the pasture where the animals were grazing. He picked out the heifer he liked best, Jim put a tag in her ear for identification, and the next week we took her to a local locker plant for butchering. A couple weeks afterward, the gentleman received a year’s supply of frozen beef, cut to order. It turns out that he used to live nearby and

even knew Jim’s father before circumstances forced him to move to the city. He raised cattle himself, and he misses the taste of homegrown beef.

Our story, like the high school teacher’s, is set in rural Kansas. But it represents quite a different mentality about food. Beef is not something that comes out of a plastic package at a grocery store, but the flesh of an animal who, just days earlier, was happily munching native prairie grasses under an open sky.

The pleasure of having personal relationships with the people who eat what we produce is one of the reasons we have gotten into the business of selling beef directly to consumers. The alternative is to haul cattle to the sale barn in Salina, where cigar-chomping order buyers with Cadillacs parked outside sit and bid on our animals, then ship them out to the huge feedlots and packing houses in western Kansas where they’re treated like, well, cattle.

Sadly, this is still the fate of most of our animals. Since we raise no other crops — nearly all our land is hilly and covered with native grass — cattle represent our entire income. So far, the direct-marketing part of our operation is too small a fraction of the total to provide us a livelihood. But our dream is to one day disengage altogether from the feedlot system. That goal depends on enough people changing the way they think about their food from the attitude exemplified by the oblivious high school student, to that of the man who



wanted to see, smell, and walk on the land where his food comes from.

The first time I walked on this land, before Jim and I were married, what impressed me as a former city girl was that the cows seemed wild and untamed. When I tried to approach them, they got skittish and ran away — more like the wild bison that preceded them on the plains than the affectionate, pet-like bovines pictured in children's books, which is what I naively had expected. Jim explained that since these cows are not penned up but spend 365 days a year out on the prairie, they aren't comfortable when they see humans walking around in their vicinity.

The other surprise for me was the way Jim talked about the grass. Comparing the ranch to a farm, I had assumed that cattle were the "crop" and that the grass, being their food, was an "input". But Jim's way of thinking was quite different. As he explained, the grass is the crop and the cattle are merely the harvesters, analogous to combines on a grain farm, only better: unlike combines, these harvesters require little maintenance and no spare parts

or diesel fuel, have very few breakdowns, and in a miracle that mechanical engineers can't even approach, are self-reproducing!

Genetic engineers intent on manufacturing the foods of the future in soil-less laboratories can only envy the efficiency with which a humble, ordinary cow can convert a substance that has absolutely no nutritive value for humans — grass — into one of the most protein-, mineral-, and vitamin-rich foods there is. This is possible, of course, because of the complex community of bacteria that resides in a cow's digestive system.

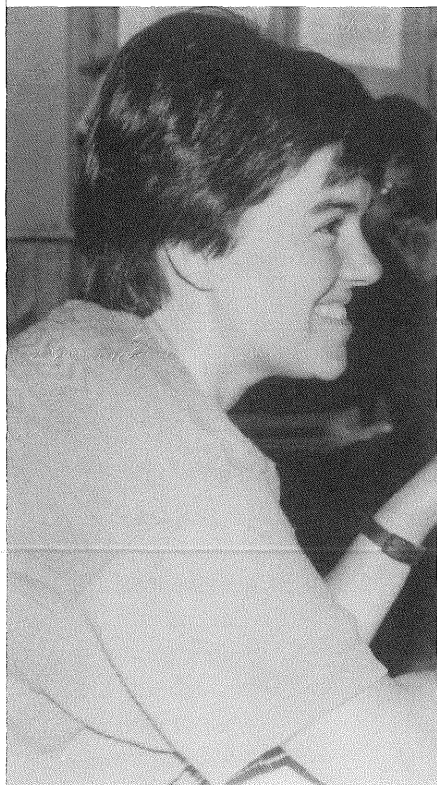
Cows get a bad rap these days, but they enable us to keep the prairie a prairie and still

derive human nutrition from it. For this reason, I consider the cow to be a truly wondrous animal — indeed, one worthy of our respect and gratitude. In her beautiful novel *Ceremony*, Leslie Marmon Silko, a Native American writer, describes the hunting and killing of a deer by two Laguna Pueblo Indian brothers. Before they can take the carcass home, they must perform a ritual to show the deer their love and respect. The ceremony reflects reverence for the life that has just been taken and appreciation for the deer's generosity in sacrificing itself so that its life might benefit human life.

Nothing could be further from this thoughtful, respectful way of killing than the assembly-line killing that goes on at a large packing plant — not to mention the difference between animals that have spent their entire lives in the open and those, like chickens, pigs and veal calves, that are confined in indoor factories or those, like beef cattle, that are confined in dreary feedlots. This brings me to another reason we are trying to market our beef directly to consumers. I don't want our animals, who have led a beautiful life out in the hills, to be treated like so much garbage. Our direct-marketed cattle never go to a feedlot, and the small local locker plant butchers them not on an assembly line but one at a time. The state meat inspector observes the whole process from beginning to end — unlike at the big corporate packing plants where inspectors have as little as thirty-six seconds to inspect each carcass.

I am glad of this not only for the sake of food safety, but for the sake of the animals. I once read that Islamic law commands that animals shall be butchered in such a way that no animal can see its own death approaching. At the factories where most American meat is processed, animals are lined up and butchered by the hundreds or thousands per hour, each animal often seeing full well what happens to the ones in front of it. While opinions differ about how cognizant of their fate the animals are at the end, the entire industrial-scale system of mass confinement and slaughter is clearly degrading to the animals, the environment, and the people involved with it.

What does all of this have to do with sustainability? Everything, I believe. The modern supermarket is full of bursting with mass-produced, identical items whose packaging usually gives no obvious clues to what they're really made of, much less where they came from. This encourages an attitude of thoughtlessness about our food that both perpetuates and is perpetuated by the thoughtlessness with which we treat our land, air, and water. As long as people don't care about their food — as long as they are content to eat factory-farmed, over-processed,



*Kathy Collmer*

corporate-marketed stuff — it's probably futile to try to get them to care about the land from which that food comes. But conversely, once people begin to care — really care — about their food, there will be no stopping the spread of sustainable agriculture.

The industrial food system depends on our willingness to remain ignorant about where our food comes from, even as it promotes the delusion that food sources are completely under human control. Consequently, we have lost not only our understanding of natural connections, but also the sense of mystery that has always hovered at the meeting of humans and nature.

If we want sustainability, we must regain a sense of the sacred where our food is concerned, like the Pueblo Indian at prayer over the body of the slain deer. Wendell Berry writes, "Eating with the fullest pleasure — pleasure, that is, that does not depend on ignorance — is perhaps the profoundest enactment of our connection with the world. In this pleasure we experience and

celebrate our dependence and our gratitude, for we are living from creatures we did not make and powers we cannot comprehend; we are living from mystery."

Paradoxically, it is only when we acknowledge the mystery — and our human limitations — that we gain any real understanding of natural connections. The mystery becomes real and palpable to us when we wade through the tallgrass with the living, breathing cow that will give us our beef, or when we stand in the wheat field, buffeted by the same wind that ripples the grain from which we will bake our bread. At times like these, we don't need anyone to tell us how completely the health of our own bodies depends on the health of the land and its creatures. For we realize that ultimately, they are one and the same: We are what we eat.

*Kathy Collmer is a former Land Institute Intern, and now a rancher near Minneapolis, Kansas.*

## ***Growing Food in the City***

*Cathy Bylinowski*

In view of the mirrored skyscrapers downtown, in the middle of an area termed "blighted," the Old Ballpark Garden in Kansas City, Missouri provides twelve acres of green, open space. Garden plots, leaf compost, demonstration gardens, a shelter for picnics, and several greenhouses used to raise low-cost vegetable transplants occupy the site. Whether in a large community garden like this, in neighborhood gardens or in back yards, urban gardening continues to be a popular activity. These gardens are often lauded for the beautification they provide and for the community empowerment that occurs when people work together to establish and maintain them. These are real benefits, but perhaps the primary virtues of urban gardens are more simple and direct: they keep alive a wealth of traditional gardening knowledge and culture, and they have real food production capacity. Resourceful Kansas City urban gardeners produce enough vegetables to feed themselves, share with family and neighbors, and even generate income.

Mr. and Mrs. James and Artic Hooks live in Kansas City's eastside Washington Wheatley neighborhood. Both Mr. and Mrs. Hooks were born and raised on farms in Arkansas. They had no choice but to garden as kids and grew up tending gardens and livestock and taking part in the harvest and canning. Today in their city lot they have a spectacular garden. It represents a lifestyle



choice of self-sufficiency, simple living and profound enjoyment of living and growing things.

The Hooks have lived for the past forty-one years on their Kansas City property, gardening in the front and backyard and in an adjacent lot. Their lot is approximately 100 feet by 100 feet, with a 70 by 100 foot area devoted to gardens, chickens, rabbits, flowers, a greenhouse and herb beds. In the spring and summer red cypress vines, hollyhocks and herbs grow alongside vegetables vigorous and lush enough to be attractive on their own. Last year they grew several varieties of cowpeas, including an unusual variety they call rice pea which quickly cooks down into a thick broth. Mrs.



Hook freezes, cans and pickles a great deal of the garden produce. She also enjoys drying strong minty-smelling sage, celery leaves, and hot peppers from the garden to use in her cooking.

Mr. Hooks keeps a flock of up to fifty Rhode Island Reds and Plymouth Rocks. He and Artic get more than enough eggs, allowing them to give some away and sell some. Artic says the caterers love the deep yellow yolks for cake baking. Throughout the gardening season, they sell eggs and whatever is producing well, collards, mustard greens and tomatoes, bringing in “enough to help,” which is occasionally \$30 to \$40 a day.

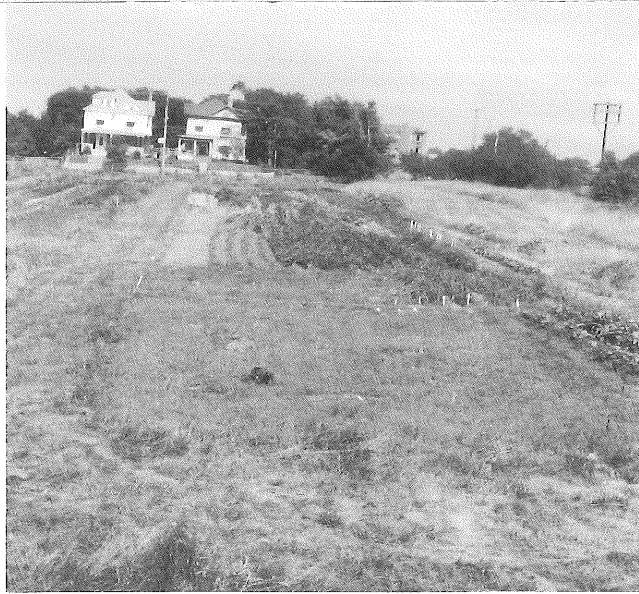
Mr. Hooks composts the chicken and rabbit manure and adds it to the garden beds. More than twenty years of adding compost and river sand has reclaimed an adjacent lot where a vacant house was bulldozed into the basement. Strips of metal against the fence hold in topsoil that is now about eight inches higher than the original ground level. This rich soil is responsible for huge collards, eighteen pound cabbages, and the regular occurrence of three pound tomatoes.

While some neighbors emulate Mr. and Mrs. Hooks, others have complained about their city farm. A neighbor who gladly accepted free eggs also filed complaints about the rooster. Mr. Hooks and a city inspector confronted the man, who then denied complaining. Mr. Hooks was allowed to keep the chicken, and the neighbor doesn't get any more free eggs. “Thank God,” Mr. Hooks says, “the rooster we have now is quieter.” Another threat to their farm came from an assistant city codes inspector who said that “there were too many flower pots in the yard.” Their style of gardening was so far from her expectations that she felt moved to report them to her supervisor. In some people's minds, the whole city should look like much of the suburbs; tidy, new and barren. Luckily her supervisor must have had a wider view of things, because he said that the Hooks had the “best-looking yard on the block.”

Mr. and Mrs. Hooks have a different standard of beauty and utility. Even in the city, they live closer to the earth, the cycle of living things, and closer to a culture of work and practical tasks than many people do. Warm evenings will find them working in their hand-made greenhouse, “enjoying a good place to sit,” or watching the birds they encourage to nest in the yard. They are quietly defying many assumptions about life in the city, especially for senior citizens. On 7,000 square feet of inner city ground, they have created an abundance of fresh, nutritious vegetables and eggs that supplements their diet and that of dozens of urban customers. They find plenty to do to “keep from being bored.”

As soon as word got around that there was garden space available at the Wayne Miner Community Center, Vietnamese children who speak English were sent to sign up for their parents. Sister Viola Brown, who works at the Center says it seemed to her that the garden was their “salvation.” The Vietnamese gardeners spent a lot of each day in the garden, getting up early in the morning to avoid the heat and coming back again in the evening. Gardening with their children, they save money on their food bills and maintain cultural traditions. Even though these six Vietnamese families did not arrive until the middle of the season, by August they had plenty of vegetables — some they were proud enough of to exhibit at the annual Kansas City Community Gardens' Harvest Festival.

The urge to garden is persistent. Given small amounts of space and light, it survives urbanization, displacement of thousands of miles, and our culture of convenience. Recent arrivals to the States such as these families have much to teach us about garden skills and resourceful living. Having not yet completely given up traditional, self-sufficient, simple lifestyles, they may be ahead of their time. Their diets include a great deal of



vegetables from their gardens and are lower in fat than the average American diet. Their gardens are intensively planted and highly productive. Instead of being miniature versions of mechanized agriculture, they are well-designed and visually pleasing. Walking into their gardens, one sees arbors constructed out of tree branches for bitter melon vines. The shaded space underneath provides a micro-climate conducive to summer crops of greens. Small earthen dikes enclose patches of soil kept moist for a type of sweet potato grown for its edible leaves.

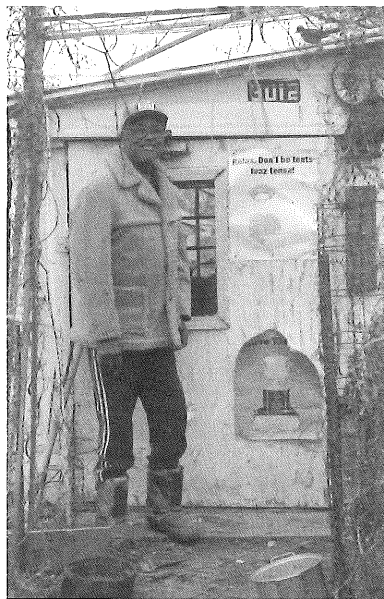
These gardeners transform neglected vacant lots into green, productive space. For them, gardening brings about a sense of continuity, and is an act of resurrection. The familiar tasks of growing and cooking vegetables tie them to their past, but also ground them in the present and help them feel more at home in their new location.

At the Old Ballpark Community Garden, located on the site of the old baseball stadium at 22nd and Brooklyn, predominately African-American gardeners grow food in their own tradition. Most come from the surrounding neighborhood, attracted to all the space with full southern exposure. Others are drawn to the garden because they are excited by the idea of growing their own food in the heart of the city. Ben Sharda, Executive Director of Kansas City Community Gardens (KCCG), says that about half of the gardeners have farm backgrounds or have had gardening skills passed on to them by parents or grandparents. Okra, crowder peas, purple hull peas, sweet potatoes, tomatoes, mustard, and turnips are major crops here as well as pole beans on many types of interesting trellises and supports.

The Old Ballpark Garden is on land that is rented by KCCG from the city each year for a nominal amount. Recently a local non-profit housing organization has approached the city about constructing thirty-one low to moderate income houses on the twelve acres. Their development plan does not include garden space. The city says that it always intended to do something else with the land since the old stadium was torn down in the early 70's. If houses are built, as the city says they eventually will be, never again will Kansas City residents have the chance to come together in a space of this size with such food production potential, in a part of the city that could benefit so many people.

Since people have been gardening at the Old Ballpark for more than a decade, it is likely that the proposed housing construction will encounter passionate defenses of this garden and of urban gardening in general. Hopefully the city, the developers and local residents can find ways to provide both housing and gardening space; if not this time then in future developments. If the goal is to make cities more livable, urban residential development should not preclude gardens. Gardening in the city provides important green oases. It helps maintain ethnic cultural identity, yet it is also an activity that can join diverse groups of people together.

The powerful message from these gardening efforts is that the city can bloom and produce food, and that those who live in less visible parts of town, with moderate means, sometimes not speaking English, have a great deal to teach us about resourceful, productive, and enjoyable gardening and living.



*Cathy Bylinowski is The Land Institute's gardener in Matfield Green.*

## *Cooperative Subscription Farming in Kansas*

*Dan Nagengast*

How can small farmers connect consistently with customers looking for a wide variety of fresh, locally-grown organic produce?

My wife Lynn Byczynski and I operated a market garden in the Topeka, Kansas area for five years. We pre-sold much of our produce through a "subscription service" which provided households with a weekly bag of whatever was fresh from the garden. Subscription services can bring retail prices for wholesale quantities, but require a willingness to spend a lot of time cultivating customers as well as crops. Not all farmers are inclined to spend so much time marketing, preferring to put the hours into the field. Once customers are obtained, a hailstorm can render the relationship moot anyway.

When we moved to Lawrence we wanted to continue gardening with a subscription service, but we also wanted to work with other growers, develop a new high-dollar market, increase the variety of fruits and vegetables we could offer, and insure that we could still supply our customers in case of a crop failure. We had not heard of a cooperative retail marketing group, but we wanted to see if one would work.

The result is the Rolling Prairie Farmers Alliance, a group of eight small-scale farmers near Lawrence. The partnership consists of two berry growers, a year-round herb grower, three members who raise chickens, one who raises lamb, and one who sells grass-fed boxed beef. Everyone produces vegetables to some degree, with five of us the primary producers. The basic strategy of the Alliance was to plan crops together so that we could provide a bag of produce each week to 200 customers.

All in all, the project was a success for everyone involved. We sold \$28,000 worth of produce that we would not have sold otherwise. We're pretty sure these were all new customers because no one experienced decreased sales at their other outlets. In some cases, we believe we actually did better at farmers markets and restaurants because of the publicity we received for the Alliance. We plan to expand and expect that this group will soon provide a significant amount of income for several of our members.

We did encounter some problems, though, that anyone thinking of developing a similar service should be aware of. Here's a summary of the major components of the program.

### *Organizing*

We received a three-year grant from the W.K. Kellogg Foundation to get the program rolling. A good part of that was allocated for the organizer's salary. The grant also provided for members to buy or build coolers and for soil tests and organic certification. Finally, we allocated some money for promotion: fliers, postage, logo development, farm signs, newsletters and so forth.

Coordinating production was the biggest headache. Food to fill 200 bags is a surprising mountain of produce. We developed spread sheets for each grower's production early on, but we were caught short twice by underestimated quantities that needed to be planted, or crop failures. Secondly, picking 200 pounds of beans (for example) is a job that should be divided up among several growers, not left to one or two poor souls. There were also differences of opinion on standards of quality, cleanliness, refrigeration and packing.



Those problems will be minimized next season because experience has given us a better handle on quantities. We hope to have the produce gathered earlier each week, possibly a day ahead of delivery, in order to better control quality and cleanliness. Because we don't always see eye-to-eye on quality, we're considering having a third party set standards and reject substandard produce. We expect quality to improve anyway because of grant money that is being used for growers to buy or build refrigeration. We will divide up growing chores better on labor-intensive produce such as beans.

### **Promotion**

As it turned out, we didn't have to do a lot of promotion, thanks to plenty of excited publicity about the program from the local newspaper. We contacted the food writer to explain the program in March and found ourselves on the food-section cover page. Within a few weeks, we had filled our quota of 200 subscribers and had a waiting list of 50. We were covered by newspapers seven times throughout the summer.

### **Delivery Site**

We negotiated with the local food co-op, the Lawrence Community Mercantile, to use the store as the pick-up point for bags every Monday. Initially, the Mercantile's managers were nervous that this would hurt the store's own produce sales, so we sweetened the pot with some rent from the Kellogg grant. We also worked closely with the store's nutritionist, Nancy O'Connor, to develop recipes that would use our produce and additional merchandise from the store. Her recipe sheets went in the bags along with our newsletter. We also did tastings of those recipes on the day of delivery, and stocked the additional items right at her booth.

Delivery days proved to be outstanding for the Mercantile. Two hundred additional shoppers coming through the door increased even their produce sales, especially on items that we do not grow. Many non-subscribers who just happened to be in the store at the same time were inspired to try the recipes using the store's own produce.

### **The Future**

A year ago we did not actually think of our little partnership as a business, but that is what it has become. It has opened up opportunities for us to improve our production for local markets. The farmers who have been raising organic and free-range chickens will be greatly expanding their production. We are also increas-

ing our subscription service to 250 members, and raising the weekly bag cost limit to \$10. With chicken sales this could allow us to triple our sales this summer. We successfully applied for a SARE grant to develop small-scale prototype coolers for use by market gardeners. One of those is nearing completion, and the others are designed and ready to be installed before the growing season.

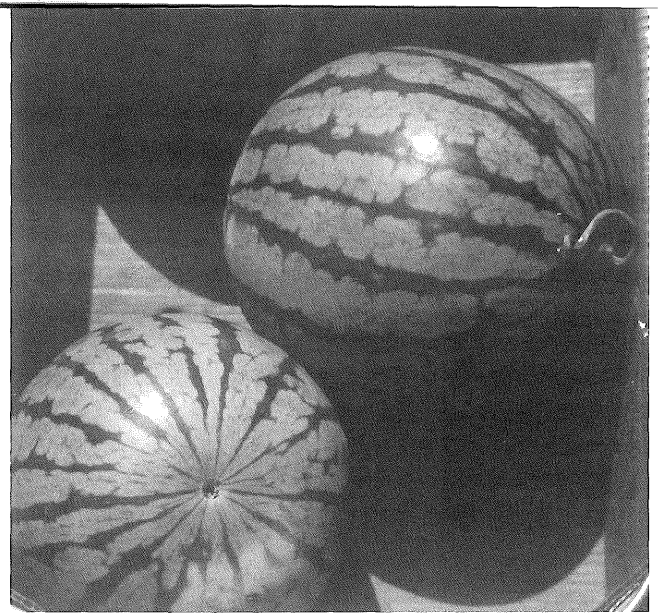
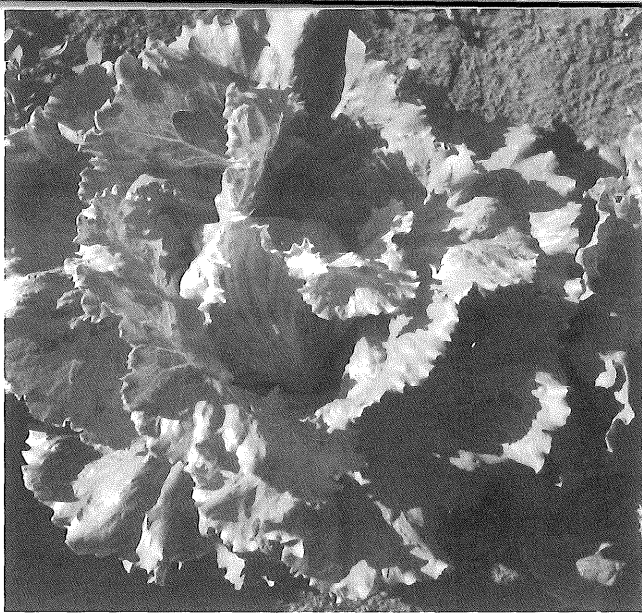
The Mercantile is interested in further partnerships, and we are holding spring plant sales in their parking lot. Farmers answer questions about organic production, and we have garden-size packages of organic amendments and cover crop seeds available to encourage backyard crop rotations. We are also discussing festivals at the Mercantile, including strawberry and tomato festivals.

Our cooperative efforts have led to some new potential outlets. We have met with other small-scale farmers in the Kansas River Valley to discuss opening a certified batch processing kitchen, where we might can and label our own produce. Much of this would be sold directly by the growers, but we may do some wholesaling to stores such as the Mercantile. We have met with the Lawrence Chef's Association which also includes chefs from Topeka and the Kansas City suburbs. We will try some cooperative wholesaling to restaurants this summer.

Can other groups make this kind of service fly without a grant? We think so. As a matter of fact we would have tried it even without the grant, although it did eliminate a lot of bumps in the road. Organizers must be prepared to put in some long, uncompensated hours, however. Other groups we have talked to reward their organizers by giving them first choice of what to grow, or increased allocations that can be sold through the service. When forming such a group, organizers should look for members with additional talents, such as accounting, graphics or marketing skills.

When the grant money is gone the Rolling Prairie Alliance will have to stand on its own, perhaps as a marketing cooperative. Some sort of percentage check-off system may be necessary to provide operating capital. As we become an institution, free press is harder to come by. These things come with modest success. But the essential element for growers who wish to try this remains simply the desire to do it. Our experience shows that the market is wide open for cooperative subscription farming.

*Dan Nagengast is Executive Director of the Kansas Rural Center, and a market gardener in Lawrence, Kansas.*



## *The Prairie Crossing Farm*

*Vicky Ranney*

Prairie Crossing is a “conservation community” of new homes in Illinois which incorporates a working farm. Located in Grayslake, a fast-growing town on the metropolitan fringe of Chicago, Prairie Crossing combines partial development with preservation of open land and agriculture. Already the farm at Prairie Crossing, through its community-supported vegetable garden, is providing residents and neighbors with healthy fresh food and a connection to each other and the land.

Prairie Crossing began as an effort to preserve the rolling landscape of farms, woodlands and wetlands which had existed in the vicinity since white farmers first settled there in the 1830's. When an extremely dense development was proposed for the 667 acre Prairie Crossing site in the 1970's, neighboring landowners along with local and county officials filed suit in protest. After fifteen years of litigation a settlement was finally reached, and in 1987 a group of neighbors, led by conservationists Gaylord and Dorothy Donnelley, bought the Prairie Crossing site for \$5 million. To recoup the purchase price they needed to develop the land.

From the beginning the purchasing group, Prairie Holdings Corporation, has been committed to the preservation of open space and the environment. Therefore 317 single-family homes will be built at Prairie Crossing over the next decade, but nearly 60% of the site will remain legally protected land — in the form of wetlands and prairies, lakes, greens, and a 150-acre working farm. To buffer the community against highways and a nearby landfill, the farmland encircles the clustered houses on three sides like a horseshoe.

The question soon arose: what kind of farming works best next to a residential development? A local

farmer whose family had lived and farmed in the neighborhood for generations was cultivating soybeans and corn on the site, using large equipment and synthetic chemicals. The size of his machinery requires large blocks of land which will inevitably diminish as home construction proceeds at Prairie Crossing, and the chemicals are a cause of concern for the health of the home buyers and the land itself. Therefore an alternative which involves the residents directly began on five acres of the farm in 1993. This was a community-supported vegetable garden (CSG) which grew to serve 117 families in 1994. Though small in acreage, the garden is already the center of a community which will include more local residents as Prairie Crossing grows.

This year resident farmers Tom and Denise Peterson will provide the shareholding families with generous baskets of fresh organic vegetables, fruit and flowers every week throughout the growing season. Members pay \$375 for a family-sized share; the season is expected to last about 20 weeks.

Community-supported agriculture, which has rapidly been gaining converts since its introduction from Europe over a decade ago, has advantages for both consumers and farmers. The member families enjoy a large variety of fresh vegetables grown by farmers they know. They can visit the farm, learn where food comes from, and discover the pleasure of cooking what is fresh in different seasons. In addition, festivals and special events bring them together with other families. For those who do not have the time, inclination or land to grow their own food, community-supported agriculture is a boon. At Prairie Crossing, which is a middle-income community, both parents in many families will work. They may not be able to raise their own food, but can support



local farmers who do.

The farmers benefit by receiving cash in the spring when they need it for planting, thus getting working capital up front and avoiding expensive bank loans. They come to know and can educate the people who eat their food. Farmers who enjoy this connection can have a central role in building a community that values the land and its produce.

Community-supported agriculture is well suited for suburban fringe areas like Grayslake, which is about fifty miles north of Chicago. Cities supply a large pool of potential members who live within a one- to two-hour drive. Eventually, most of the families who support the CSG will live in the new houses that will be built at Prairie Crossing. Now, while the houses are under construction, about half the member families come from the surrounding towns to pick up their shares at the farm. The rest live in Chicago or other suburbs and collect their shares from Tom and Denise at various delivery points, usually the home of a member. Delivery costs extra.

Despite the growing popularity of community-supported gardens, they do not suit everyone's needs. People who travel in the summer cannot collect their shares every week. Others may not be able to use a full share or find someone to split it with. Some need large quantities of food at short notice for parties or special events, and others simply prefer to select the produce they buy rather than receive a share of the weekly harvest, however varied it may be.

Therefore a farm market will open at Prairie Crossing in 1996. It will be housed in a restored 1880's dairy barn that had been slated for demolition. The timbers were numbered and taken down and will be re-as-

sembled at Prairie Crossing's Market Square later this year, along with a pre-Civil War farmhouse and a one-room schoolhouse. These community buildings will help remind homeowners of the heritage of the land and give them a sense of place. Prairie Crossing is not a historical museum or a nostalgia trip, however. The old buildings will be in active use. The large main floor of the dairy barn will accommodate community meetings, classes of the local community college, and art exhibits. (The opening exhibition will be photographs by Land Institute board member and art associate Terry Evans, who has been documenting Prairie Crossing and the surrounding area for over a year.) The main floor will also have a restaurant kitchen to accommodate catered parties and natural foods cooking classes inspired by Alice Waters. The lower floor will face south and contain the farm market. As the farm develops, more products will be available for sale at the market and its season will be extended. Until it is ready, the Petersons will sell their extra produce at other farmers' markets in the area.

Beginning this season, Prairie Crossing will rent garden plots near the CSG to individuals who wish to grow their own vegetables, fruits and flowers. Tom and Denise will plow the plots initially and provide advice on gardening methods. The garden plots, like the CSG, are expected to become a destination for walks at Prairie Crossing and a lively source of conversation and learning.

A number of other projects are under consideration at Prairie Crossing Farm, ranging from pick-your-own flowers to a cow-calf operation. Organic small grains could supply a bakery at the Market Square. This year an animal barn will be constructed, where people can



rent stalls for riding horses or for smaller animals such as goats and sheep. An animal barn manager who is already on staff will work with children in 4-H and other programs. Pastures have been planted. Eventually the goal is to have a whole-farm operation in which all the parts support each other, providing food, healthy exercise and healthy land.

A small shaggy plot near the CSG signals the long-term future of agriculture. Early on Wes Jackson visited the site of Prairie Crossing and provided important suggestions and inspiration. This patch is one of The Land Institute's experimental plots testing the viability of prairie grain candidates in many climates as part of developing perennial polyculture systems that may one day replace annual monocultures on erodable land (see *Land Report* 51 "Great Plains Project Update").

As Prairie Crossing develops, so will the farm. It needs to be planned systematically and to grow gradually, as we learn what operations are possible and profitable. If the idea of a farm incorporated into a community is to be a viable model, it needs to make money. If it is a drain on the developers or the homeowners' association, it will not last long. Nor will it be a success if it cannot give its farmers a living that reflects the value of their contribution to the community.

The Prairie Crossing Farm is being planned and implemented with these realities in mind. So far it is off

to a successful start. It has enjoyed extraordinary coverage in the press, including international coverage on CNN and front-page articles in several local papers. This level of interest in so young a project indicates, if nothing else, the great unmet need in our society for ways that people can connect with the land, and the interest in that simplest and most elementary link, the provision of our daily meals.

*Vicky Ranney is Vice President of Prairie Holdings Corporation, an editor of the papers of Frederick Law Olmsted, and a member of The Land Institute board.*



## *Tales of an Urban Farmer*

*Michael Ableman*

Slavka Kovarick stood crying in the midst of the crowds and bustle of the farmers' market. I had given her a sample of one of the large black mulberries we were selling. When I pulled her aside I found out that the taste of the fruit had transported her to her childhood in Czechoslovakia — to a mulberry tree in a village that she had not seen for twenty-two years.

How many times had I seen people moved by the fresh foods they would taste at the market or in our farmstand. "It reminds me of my childhood," I often hear, or "I haven't tasted fruit like this since the summers on my grandfather's farm." It is as if millions of messages are carried in the cells of our food, silent reminders of our roots and connections to each other and to the earth that provides.

But for many in the modern world our relationship with food has become a marginal one at best. We have become disconnected from one of the most intimate acts on earth — procuring and consuming that which nourishes our bodies, minds and spirits. Living in cities, with homes and work isolated from the natural world, it has become easy to forget the cycle of the seasons, that sweet corn does not ripen in December, or melons in February.

The simple offering of a vine-ripened tomato, or a carrot dug only hours before, can create a revolution among eaters. There is an incredible pleasure in watching people discover that corn does not need to be boiled and coated with butter and salt, that fruits do not need sugar, and that potatoes are not a tasteless utensil to

convey salt and ketchup to the mouth.

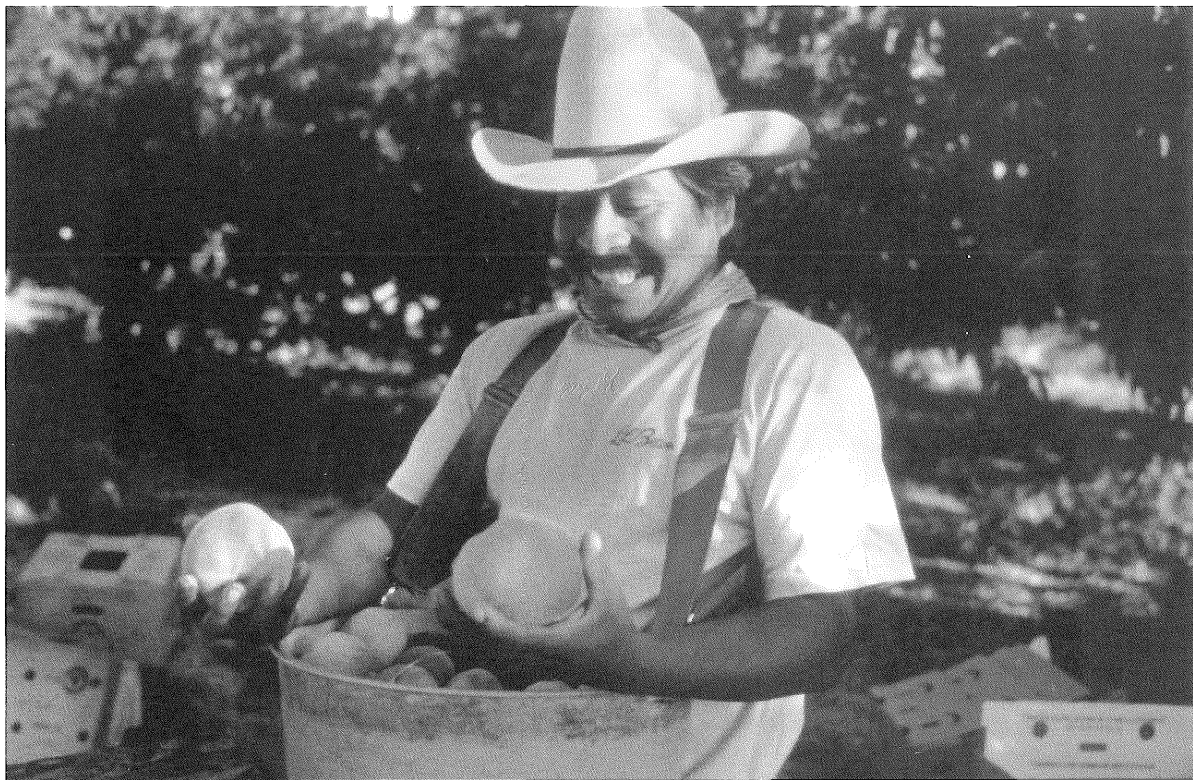
My responsibility as a husbandman has heightened seeing the faces of those who will eat my food. No middleman, no package to hide behind, no disembodied voice on the phone, no truck to load for distant parts. In this relationship nurturing replaces factory production.

Knowing those who will eat my food humanizes the process, returns life to the fields, and real care to every step. I can tell the person who is buying my corn that we just picked it hours before, that this year's melons or tomatoes will be late due to cool temperatures, that all of our food is grown with compost, and free of chemicals.

In this intimate coming together questions can be asked: "Where was this grown?" "When was it picked?" "What materials were used to grow it?" "How are the land and the people whose hands harvested it being treated?" Only questions, but the start of a profound change within a food system that has removed fundamental connections from our lives.

My farm is an unusual one. We are the last postage stamp remnant of an old ranch that once extended for miles around, on some of the deepest and richest topsoil on the West Coast. We are an island in a sea of tract homes, three minutes from two major shopping centers, six gas stations, twenty fast food restaurants.

A little over a year ago I was thrown out of bed by an earthquake. (My house, built in 1895, sways when the cat jumps on the roof.) It was 4:30 in the morning. I plucked my son out of his bed and headed out the back



door, arriving just in time to see all of the electricity in southern California go off in a wave. It was a rare and beautiful experience to gaze into the sky and experience the full array of brilliant stars in this urban environment where ambient light normally pollutes our night skies.

When the sun came up, it was one of those perfectly still, crystal-clear days that often follows an earthquake, and I thought I better go see if the world around our little farm still existed. What better way to feel the pulse of our suburban neighborhood than to visit the supermarket. So I walked the few blocks from the farm to our local Vons. Cars were colliding in mid-intersection (the traffic lights were out), the gas stations had lines of cars (the electric pumps were not functional), and when I walked into Vons on this brilliantly clear sunny day, it was completely dark. The ice cream was melting in the freezers, the meats were going off on the shelves, and hoards of people were frantically filling their shopping carts, using flashlights to navigate the aisles. When they reached the checkout counters there were handwritten signs that said "Sorry no change" — the ATM machines were down.

In this frenzy it struck me how incredibly precarious and fragile our current food system really is. We were 100 miles from the center of the quake, our only casualty had been loss of power, yet the whole system had begun to collapse. I thought of Vons as it is on a normal day: all the lights and three-color packaging and huge day-glo piles of fruits and vegetables, the bright illusion of abundance on demand 24 hours a day, 365 days a year, offering peppers and tomatoes in January. The so-called "Green Revolution" that brought this abundance seemed like a miracle, but it set in motion a whole chain of consequences that most of us aren't aware of because our food is grown out of sight. In the U.S., food now travels an average of 1400 miles from the field to the plate.

On our farm, the longest distance food travels is five minutes by cart from our farthest field to the produce stand. Often during sweet corn season, I'll wait until there is a crowd around the corn bin and then loudly proclaim that "this corn is kind of old." Everyone freezes and looks at me with alarm. "It's been almost an hour since it was picked."



*Fairview Gardens, Goleta, California*

On twelve acres we grow nearly one hundred different fruits and vegetables in a virtual year-round harvest: tomatoes, peaches and melons in summer; mandarins, greens and root crops in January; asparagus, berries and artichokes in spring. We feed close to 500 families through our produce stand, through a Community Supported Agriculture program with seventy member families, and through the four farmers' markets that we take part in each week. But we are also feeding the community in less tangible ways. Our tours, live-in programs for kids, summer concerts and lectures, and classes bring thousands of people to the farm each year, reconnecting them to the land. It is our small attempt to put "culture" back in "agriculture." We cherish our farm, for we see it as an anchor in a community that lost its moorings, in a time when nature and culture are at best viewed through the television or in a movie. There are those living next to us who have never set foot on our farm, who travel down to Vons or Lucky's for a head of lettuce when one has just been picked a few feet from their window. I believe that they are still touched by us, if only by the presence of this land.

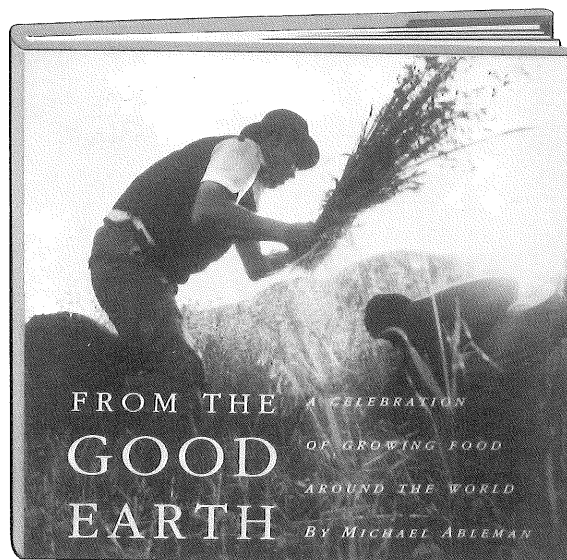
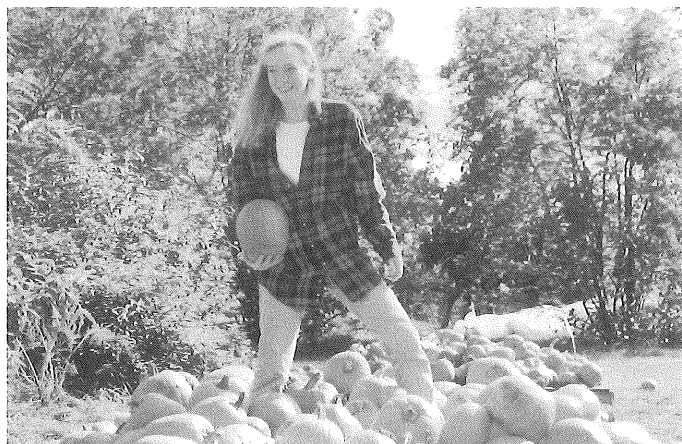
Ultimately my work is not only the caring for soil or the growing of crops. It is the growing of people and the maintenance of the farm as a cultural and, if you will, spiritual center. Surrounded as we are by eight churches, one might think that this area is some sort of power spot, our version of Stonehenge. There are times when I think that we are providing as much inspiration and education as all of the schools and churches around us. The native peoples who inhabited these lands long before us worshipped the earth; they were educated by it. They didn't require schools and churches — their whole world was one.

\* \* \*

Last year I was disking one of our fields that borders a major road. I had probably disked that field a hundred times over the years, but this time above the roar of the tractor I heard a "clink." I stopped, throttled down to an idle, took the tractor out of gear and got off. There behind the disk was a perfectly preserved stone pestle. The anthropologist at our local natural history museum told me that it was approximately 2,000 years old and would have been used by the local Chumash Indians to grind acorns to feed their families.

Here I am on the last remaining small farm, minutes from what was the largest Indian village on the West Coast (now a Taco Bell and tire shop), feeding my community just as some Chumash Indian was doing in the same spot 2,000 years ago. I wonder what will take place on this land 2,000 years from now?

*Michael Ableman is an organic farmer, photographer, and writer in Goleta, California.*



### *From the Good Earth*

*Food, land and culture are intertwined. In **From the Good Earth**, Michael Ableman documents his journeys to farming communities in South America, Africa, Asia, Europe, and the American Southwest; and to the industrial farms of California's Central Valley. The images evoke a living past, throwing modern agriculture in sharp critical relief. But **From the Good Earth** also celebrates the rebirth of small-scale organic farming and gardening around the world and challenges everyone to participate — in the marketplace, the kitchen, or in their own backyards.*

## The Flowering of the Suburbs

Brian Donahue

I did not set out to become a flower farmer. We began growing flowers on our farm because we liked them, and continued because, one year, we had no choice. Imagine being forced to grow flowers by hard luck. We had no idea they would become our largest cash crop, and would help save 35 acres of prime suburban farmland from development.

In 1985, I ran a non-profit organization called Land's Sake in Weston, Massachusetts, an affluent suburb of Boston. Friends and I had founded Land's Sake a few years before to care for Weston's community-owned land, and to employ and educate young people. Over the previous decades, Weston had pur-

chased close to 2,000 acres of conservation land to preserve the suburbanizing town's rural character. Most of this abandoned farmland had reverted to forest, but some was still open and tillable. The purpose of Land's Sake was to involve townspeople with their new common land in healthy ways. Much to my own amazement, it worked.

Today, Land's Sake harvests firewood and timber, maintains trails, conducts agroforestry experiments, cares for orchards, makes maple syrup and apple cider, and cultivates 25 acres of fruits, flowers and vegetables. Most of these projects take place on town-owned land, but the market garden that got us started did not. In 1981, we began farming part of the Case Estates, belonging to Harvard University's Arnold Arboretum. This was land that had been left to the Arboretum in the 1940s to serve as a suburban test station and nursery for the main grounds in Boston. By the 1980s, however, the Arboretum staff concluded that they had more land in Weston than they really needed or wanted to care for. So they approached newly-formed Land's Sake about a cooperative agreement to grow produce on the least-used parcel of the Case Estates.

I cooked up a proposal with a five year budget that projected solid profits, and we were off and running, with Harvard paying the bills. It seemed ideal at first. If there was ever an enchanted place to farm, this was it. The Case family had planted dozens of trees on the property a century earlier, Norway maples and Norway spruces and great European beeches, along with American oaks, maples, pines and hemlocks. Half a century after that, the Arboretum added several small oak and pine plantations, and clusters of specimen trees from around the world: densehead mountain ash, silver lime, sourwood and silverbells, flowering cherries and crabapples, Japanese larch and dawn redwood. Land's Sake, in turn, introduced small fields of strawberries, raspberries and vegetables among the trees, flowering around us as we planted in the spring. There were days when we worked until it was too dark to see because it was just too beautiful to go home.

The first few years of the farm were not a financial success, however. Borrowing a tractor to plow and disk, and hiring high school kids for everything else, we busted old sod until we had ten acres under cultivation. Slowly, we learned tricks like growing pumpkins for a year to thoroughly clean a field before putting in perennial crops like berries, which otherwise were quickly swallowed up by the resurgent grass. We got legume cover crops going to improve the soil, hairy vetch in the winter and red clover in the summer. Initial yields were low. We found some outlets for our stuff through the



farmers' markets and restaurants, but income continued to fall short of expenses. 1985 was the year of reckoning. The Arboretum decided to cut its losses with Land's Sake and to rent the farmland to a commercial farmer from another town instead.



the flowers for a dime or a quarter a stem, a fantastic bargain. They returned the next day and cut more, and more. The more they cut the flowers, the more the flowers grew. It seemed as though the soil itself knew this might be its

The Arboretum people liked what Land's Sake was doing, they just reached the conclusion that we were incapable of making a profit cultivating ten acres organically with kids and rototillers. They were under tremendous pressure to balance their books. They allowed us to retain one acre up front, as long as what we grew didn't compete with the farmer they brought in. And, for the first time, they allowed us both to open farmstands and sell directly on the property.

As a result, that year we grew oddball vegetables like yellow tomatoes, white eggplants, apple cucumbers and bottle gourds, tiny Jack-Be-Little pumpkins and huge Atlantic Giant squampkins. If it came out the wrong size or color, we grew it. We grew ordinary summer squash but sold only the blossoms. Mainly, we grew flowers. We took our acre and laid it out in small beds, making the shape of a large flower at the center. We planted these beds with dozens of varieties of annual flowers, which we had started in small greenhouses all over town. We grew flowers for drying and arranging: statice and celosia, strawflowers and salvia, globe amaranth and acroclinium, lamb's ears and artemesia. We grew cut flowers galore: asters and zinnias, bachelor's buttons and snaps, cosmos and cleome, towering red and white dahlias from the garden of Winslow Homer, and slightly sinister salpiglossis. All this was the genius of our master gardener, Rob Crockett, a visual artist who had suddenly discovered his true medium and scale.

That summer was intense. Harvard announced they intended to sell the property for development. They sent in a backhoe and dug twenty-five perc test holes, which was the maximum number of building lots the land could support under Weston's zoning laws. Townspeople were outraged and shocked. The farm adjoined one of the busiest intersections in Weston, and we suddenly found ourselves with a spectacular garden smack in the eye of a storm. People who had formerly waved to us from the road were now pulling in and buying flowers and vegetables like there was no tomorrow. The place swarmed with customers. We gave them scissors and sent them out to cut bouquets, selling

the last chance to bloom before being made to bear million dollar nouveaux chateaux. When the season ended, we were staggered to find that where the year before we had struggled to gross \$20,000 on ten acres, in 1985 we pulled in \$25,000 on just that one.

Meanwhile, the town mothers and fathers struck a deal with Harvard to purchase the property, and the drive was on to save the land. The price was \$3.5 million for 35 acres — a great bargain, we were assured. This may have been something less than what the land would have fetched on the open market, but it was still the biggest land deal in Weston's history. At first we didn't think the voters would go for it — a two-thirds majority was required to issue a bond. After the property tax revolt of the late 1970s, we assumed the halcyon days of conservation land buying in Weston were over. But we were wrong: it turned out nearly everyone was with us. That winter at town meeting the bond issue passed easily. In essence, townspeople voted to tax themselves \$100 a year per average household for 20 years to save our farm.

I can't say for certain that it was the farm that saved the Case land. It was a beloved piece of land long before Land's Sake had anything to do with it, a key part of Weston's "open space" that everyone had assumed was safe from development because it belonged to the Arboretum. Even the real estate interests joined the campaign to keep it open, it was so central to the character of the rest of the town they were selling and reselling. Still, I think our flower garden brought the place to life, and made the land visible to the community in a way it hadn't been before. It had become a place where town kids spent the summer growing things, and people came to pick vegetables and flowers. Our garden symbolized in a burst of color what that land meant to Weston.

The next year, Land's Sake recovered full possession of the farmland. We bore the private farmer no ill will — I am happy to say that his hometown operation continues to thrive, and we remain friends. But the Case land had become community land, we were the community farm, and we wanted our hard-won acres back. Today Land's Sake leases the land from the town. It is

the centerpiece of a twenty-five acre market garden that includes several other parcels of town open space. We have had good years and bad years, but by and large we make money at it. It is at the core of a year-round land management and environmental education program that covers most of the 2,000 acres of town conservation land in one way or another. But that front acre between the farmstand and the road is still a flower garden.

This story illustrates a possible future for farming on the urban fringe, I think. We call it "community farming," which is not the same as either "community gardening" or "community supported agriculture;" not that I have anything against those ideas. It is a revival of the idea of commons, land held for the common benefit of the local community. I would hardly propose community farming as a sweeping replacement for private farming, but I do think it has a special role to play, especially in suburban areas. Let me summarize its principles.

First of all, the land is community owned. In places where residential development is pushing land values sky high, most farmland in private ownership has no future but houses. Private owners will not protect land forever in an inflated market. What is not developed this year will be developed next year; what is not sold by one generation will inevitably be sold by the next. The only reliable ways to keep at least some of this land open are either for a land trust to acquire an easement (sometimes through partial development as at Prairie Crossing); or for the community to buy it. If just an easement is acquired the land can no longer be developed but can remain in private ownership and care, which is a fine solution in many cases — as when it keeps a Michael Ableman on the land. If the community acquires the land outright, it becomes responsible for the land's care, which opens up a new opportunity.

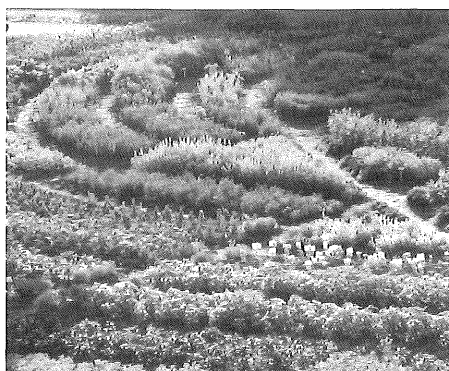
In community farming many people in the community become actively involved with the land. This is not land simply turned over to experts to "manage" on the community's behalf as a nature reserve or park. Expertise has its place, but in community farming it is forced to know that place. The experts have to answer to a board of citizens who are directly responsible to the community for the care of the land. Feedback about how the land is being used is rapid and dramatic. This is often annoying to the experts (I speak from experience), but healthy. They have to make their case to their neighbors. Even more important, the land is used to teach young people about the place they inhabit, by farming it organically. The value of this is incalculable. In the course of each decade, hundreds of children learn things about the origin of their food and their connection

to the land that would otherwise remain vague abstractions.

The final principle is that community farming has to make at least minimal economic sense. In fact it is educationally crippled if it doesn't, because kids detect that it isn't real. Once the development value of the land has been removed, these farms should pay their own way, even while upholding their educational purposes. There is a tremendous market for fresh, organic fruits, flowers and vegetables around our cities, especially when customers can get out with their families to enjoy the beauty of a well-tended farm. Suburban farms can make money without such gimmicks as petting zoos and miniature golf, simply by being what they are. Community-owned land is perfectly suited for the pick-your-own approach, so the customers (many of whom are also the landowners, not to mention the parents of the farmworkers) become involved with the land as well. At this point, the economic, educational, ecological and esthetic benefits of community farming all merge.

By most social and economic calculations, farming and suburbanization do not add up. Modern industrial agriculture has no place in the suburbs, it's true. But who wants to live around huge machines and toxic sprays anyway? Sure, I dream of a future of eco-villages surrounded by small organic farms and intact prairies and forests. But if we want to make the most of suburban farmland, right now, my advice is this: save it through partial development, farm it with kids, and grow lots of flowers.

*Brian Donahue is Land Institute Director of Education, and a Land's Sake board member.*





*Seated: Lisa Mosca, David Henretty. Standing: Dave Tepfer, Doug Walton, Karen Andersen, John Curtis, Tina Ray, Todd Wetzel, Brian Donahue, Heather Brummer.*

### 1995 Interns

**Karen Andersen** has a Bachelor's degree in environmental studies, with a concentration in ecosystems and a minor in German from Binghamton University in New York State. Karen has spent time studying the coral reef ecosystem at Hoftsra Marine Laboratory in Jamaica, and has studied tropical ecology in Costa Rica. She also spent a semester in Austria.

**Heather Brummer** is originally from Massachusetts and has earned a BS in biology from Bates College in Maine. She wrote her thesis on community supported agriculture and focused on how CSA's can alleviate environmental and social problems connected to industrial agriculture. She has been a sustainable agriculture intern at Drumlin Farm in Massachusetts and conducted a seed germination study in conjunction with Native Seeds/SEARCH. She also studied in Ecuador for a semester.

**John Curtis** graduated from Lawrence University with a BA in sociology/anthropology/Spanish. He has managed a model farm project with the Peace Corps in the Dominican Republic, served as a research assistant with the U.S. Fish and Wildlife Service in Alaska, and provided assistance as an outreach worker for a migrant health clinic.

**David Henretty**, from Detroit, Michigan, has one semester left to complete his degree in conservation biology at Brigham Young University. He has been a lab technician for a desert saltbrush research project, and a wildlife biologist assistant with the BLM in Colorado. He is interested in Utah wilderness designation and public lands management in general.

**Lisa Mosca** earned a BA in biology with a concentration in environmental studies from Swarthmore College. She has been a research assistant on two neotropical migratory research projects and has spent time in Germany. Lisa has also worked extensively writing appeals to the U.S. Forest Service on timber harvest issues on the East Coast and is interested in solid waste management issues, especially incineration.

**Christina Ray** completed a BS in agriculture science with a minor in international agriculture from Pennsylvania State University. She has experience conducting research on Lyme disease, and she spent a semester in Kenya and interned on a government farm there.

**Doug Walton** has a Bachelor's degree in business administration, emphasizing finance and economics, from Southwest Texas University. He has begun graduate work in natural resources at the University of Utah. Doug has worked on riparian habitat restorations as a biological technician with the U.S. Forest Service. He also spent several years as a volunteer activist with the Utah Sierra Club, working on mining law reform, grazing and other public land issues.

**Todd Wetzel** graduated with a Bachelor's degree in geology and environmental studies from Macalester College. He has interned with the International Alliance for Sustainable Agriculture, with responsibility for their resource library. Todd has also worked on a groundwater sensitivity analysis project for the Minnesota Department of Natural Resources, and an organic farm in West Virginia.

## Life at The Land

Karen Andersen

Amidst what seemed climatic schizophrenia (which they tell us is normal here in Kansas), the 1995 intern program got underway. Perhaps the wind-blasted, snowy days that alternated with sunny and warm stretches in February were a sign of just how diverse life at The Land would be for these newcomers. The majority of this year's interns have roots east of the Mississippi, but a few come to The Land from the West. Whatever their origins, this year's assemblage of interns have come together around two main themes; the search for a more sustainable agriculture and the desire to bike the flat, windy, puncture-vine-laden backroads of Salina.

In the short time since their arrival, the interns have already experienced much of what it means to be a part of The Land. Visiting Matfield Green for a weekend workday in the schoolhouse, traveling to local conferences, or having a visitor stop in to give a slide show and talk, are just a few of the events that complement the host of routine activities (if there be such a thing as "routine" here) that fill an intern's day. Below are some of the happenings the interns have experienced to date.

On a Saturday morning late in February, interns and several staff members drove to the Manhattan campus of Kansas State University to take part in the "Heartland Network Roundup". The Heartland Sustainable Agriculture Network focuses on "bringing people together

around good food, fertile soil, clean water, and revitalized rural communities". By integrating sustainable practices with innovative marketing strategies the group works toward a more economically, environmentally and socially sound agricultural system for Kansas farmers. The Roundup was a great way to expose interns to these local efforts in sustainable agriculture.

From Manhattan, the interns continued on to Matfield Green for a potluck dinner at The Lumberyard Cafe and a Sunday workday at the school. Matfield Green is the site of The Land Institute's most recent initiative, which involves setting up an ecological accounting project. Interns also took time out to learn some of the area's history and tour some of the buildings and property owned by The Land Institute and Wes Jackson.

Early in March interns had the opportunity to visit the ranch of former Land intern Kathy Collmer (whose article appears in this issue of The Land Report) and her husband Jim Scharplaz. Here, interns saw some of the ideas that were discussed at the Heartland Network Roundup being put into action. Part of the herd, which is marketed as "natural beef", feeds primarily on the native grasses of the prairie and is kept free of hormones and other chemicals that typify much of the mainstream beef industry.

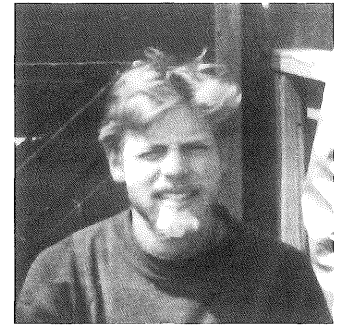
The first few months of 1995 have also seen a number of visitors come and go. Mick Womersley, a British native who is presently at the Forestry School at the University of Montana, showed slides and spoke about his research in sustainable development and some of the issues facing the Scottish Highlands. Paula Bramel-Cox, a plant breeder at Kansas State University and a Land Institute board member, came to discuss some of the basics of plant breeding and crop improvement, as well as some of the difficulties of trying to research ideas within the field of sustainable agriculture. And Amelia Hazelip, who subscribes to many of the ideas found in Masanobu Fukuoka's philosophy of gardening, came to us from France to share some of her work in a slide show and discussion. This year's interns are devoting a portion of the garden here at The Land to experimenting with some of the ideas which she presented.

Although this is but a glimpse of what new interns have so far experienced, it gives an idea of what life is like this year at The Land. In light of the dominant mode of intern transportation I have a small wish as we prepare for the months ahead: may the Kansas wind be always at our backs!

*Karen Andersen is a 1995 Land Institute Intern.*



*Heather Brummer*



*John Curtis*

*Todd Wetzel*



*Tina Ray*

## *Sponsor an Intern — An Update*

*Heather Brummer*

Last year, we began to offer our donors a new way to support The Land Institute: they could sponsor an intern. A small family foundation called the Leighty Foundation came up with the idea. They wanted to support The Land Institute, but to change the impersonal role that foundations traditionally play. They hoped to develop a closer connection with us. Their donation pays the stipend of one intern and that intern keeps the Leighty family informed of the year's events and happenings here. It is a way for the contributing foundation to learn more about what goes on at The Land Institute and to develop more personal relationships with the people here.

Rebecca Geisen was the intern sponsored by the Leighty Foundation in 1994. She enjoyed writing to the foundation, re-living the events of the year with people interested in, but not directly involved with the daily workings of The Land Institute.

There has been a great deal of enthusiasm for this idea. Already in 1995 it has expanded to include three new foundations. They are: the Ruth H. Brown Foundation, of Colorado (sponsoring Todd Wetzel); the L.J. Skaggs and Mary C. Skaggs Foundation, of California (sponsoring Tina Ray); and the Global Environmental Project Institute, of Idaho (sponsoring Heather Brummer). This year the Leighty Foundation is sponsoring intern John Curtis.

Because last year was the first time we tried this idea, there were no rules about how the intern and sponsoring foundation would keep in contact with each other. Rebecca wrote to the Leighty Foundation four times over the course of the summer and fall. This year the participating interns each worked out agreements

with their foundations, and will write on average every six to eight weeks.

Some foundations have a special interest in a particular aspect of The Land Institute's work. This year, for example, the Brown Foundation has a strong interest in the Sunshine Farm. Since Todd is working on the crop and animal integration project on the Sunshine Farm, he was the logical choice to keep in touch with the Brown Foundation.

The interns are willing participants. When Development Director Matt Logan first told the interns of the idea, four were immediately interested but only three foundations were available. Luckily, a fourth foundation signed on. It is exciting for the interns to know there are people who want to support The Land Institute and who also care to know more about how their investment is used. The interns are such an integral part of the operation that they are a great "inside source" about what goes on here. Sponsors can experience to some degree what it is like to be an intern without the long nights of reading and the hot summers of Kansas. The interns are happy to spend time with their sponsors, if only through an occasional letter or phone call, and to talk about what they have been doing with someone who is genuinely interested.

It seems the new Sponsor an Intern program is a success for everyone. We all look forward to an exciting year of working, learning and writing letters. If more intern sponsors come forward, we will be sure to find you an intern.

*Heather Brummer is a 1995 Land Institute Intern.*

## ***New Office Manager and Development Associate Stephanie Krug***

*Karen Andersen*

If you stop into the office at The Land Institute these days its likely you'll encounter a new smiling face, that of Stephanie Krug. In early January Stephanie accepted the position of Office Manager and Development Associate. On a warm and sunny spring afternoon I got her outside to find out a bit more about this newest member of the staff.

Stephanie grew up on a farm in Russell, Kansas, about one hour west of Salina, so she is certainly familiar with the context of the work being done here at The Land Institute. After spending eight years in Houston, Texas and experiencing life in the big city she decided to return to her roots and the more relaxed lifestyle of Kansas. Her interest in The Land Institute was first piqued while attending a Leadership Salina class where former Director of Development, Tom Mulhern, spoke about our research and objectives. After hearing several other positive references that heightened her interest, she happened upon the ad in the newspaper and applied for the position.

When I asked Stephanie what it was that really drew her here, she replied that she was at a point in her life where she wanted to make the move to a career that was more in line with her deeper beliefs. She was searching for a work philosophy that more closely corresponded to her own philosophy of life, and she found this missing link here at The Land Institute.

In describing her position, Stephanie explained that the ultimate goal is to split her time equally between managing the office and assisting with development, but

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***...she was at a point in her life where she wanted to make the move to a career that was more in line with her deeper beliefs. She was searching for a work philosophy that more closely corresponded to her own philosophy of life, and she found this missing link here at The Land Institute.***

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for the time being, the office management is occupying a larger share of her hours. "The volume of mail and phone calls that comes through the office is really amazing", she remarked, surprised at the incredible interest expressed by people throughout the country.

While national interest in The Land Institute is quite impressive, Stephanie hopes to work more on develop-



*Stephanie Krug*

ing our relationship with the local community. She feels this is "a market we could spend a little more time cultivating." As her own case illustrates, increasing the community's awareness of the ideas behind The Land Institute is the best way to increase its involvement.

Throughout our conversation Stephanie emphasized the real community spirit and dedication that she feels working at The Land Institute. People are here because they want to be, because they are genuinely dedicated to the principles upon which The Land Institute is founded, and that care really shows through in people's work. The opportunities she has to sit in on a class with the interns or to go on group prairie walks are some of her favorite aspects of the job, because they permit her to experience the whole of the cause that she is working to advance.

As for her time away from work, Stephanie enjoys attending pottery classes at the Salina Art Center and reading, as well as that favorite Land Institute pastime, "playing in the dirt." Her home garden includes a collection of twenty-four rosebushes, and she is understandably anxious for spring.

## Bringing Agricultural Research Closer to Home

Karen Andersen

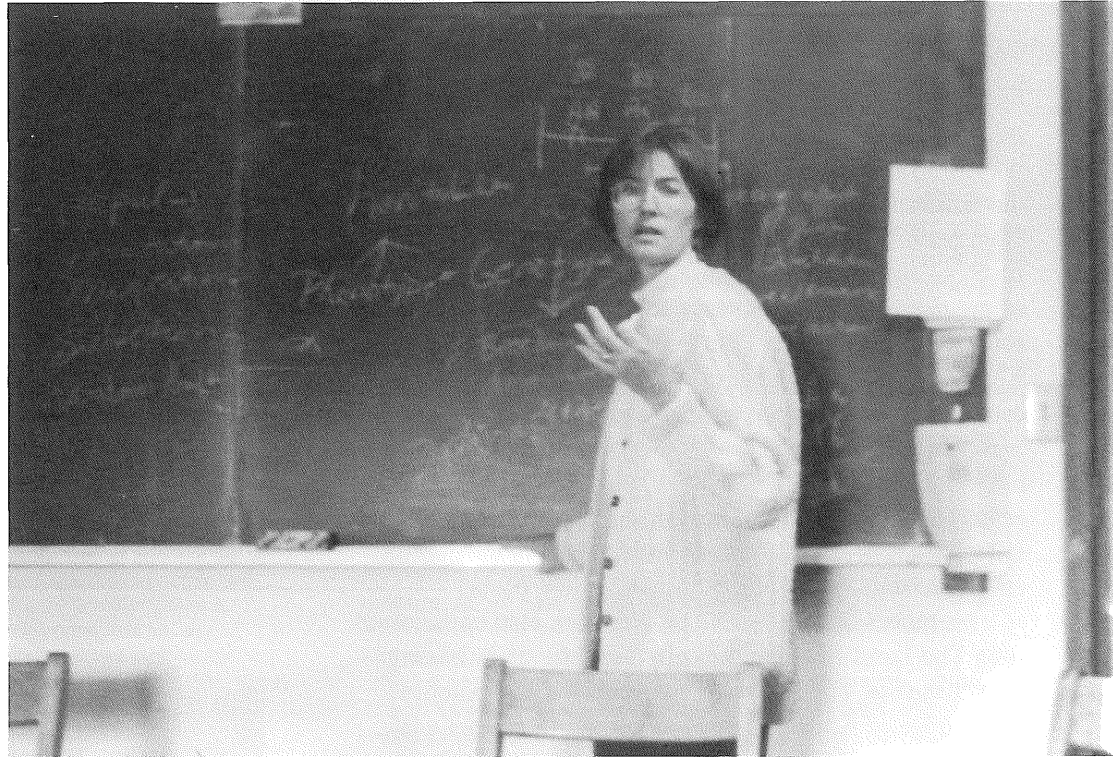
One aspect of bringing food supply closer to home is bringing agricultural research closer to home. Research aimed solely at improving yields has neglected to start with farmers and nature, two vital parts of a healthy agricultural system. Here in Kansas, the "Natural Systems Agriculture" of The Land Institute and the work being done by The Heartland Network both address these issues by putting the farmer and nature back into the research equation.

By overemphasizing high yield, agricultural research has helped to create a system based on high inputs of fossil fuels, pesticides and fertilizers. Within this system, losses in productivity due to the vulnerability of monocultures to insects and disease, and to the mining of soil, water and nutrient reserves, are countered by simply increasing the quantity of inputs used. The economic burden of these inputs has in turn played a major role in the decline of the small farm and the consequent depopulation of rural communities.

The Heartland Sustainable Agriculture Network is one organization that is addressing these environmental, social and economic ills. Coordinated by Jerry Jost of the Kansas Rural Center, the network is made up of small clusters of farmers who work to develop alternative agricultural systems. Through the network, "farmers rethink the values, goals, and measurements of a good farmer. It seeks to develop partnerships between farmers and institutions that advance quality of life, profitability, neighborliness, and resource conservation".

Some of the most promising partnerships developing within the Heartland Network are those between farmer clusters and agricultural researchers at Kansas State University. Mark Claassen is one such researcher, working with a cluster in central Kansas called "Covered Acres" on experiments using hairy vetch as a legume cover crop in crop rotations. The research measures soil moisture and quality, nitrogen-fixation and subsequent seed yields associated with the use of this cover crop. Similar joint efforts examining Austrian winter peas as a

*Kansas State University professor and Land Institute board member Paula Bramel-Cox talks to interns about plant breeding.*



cover crop are underway between researcher Bill Heer and the Heartland cluster "Resourceful Farmers" in south central Kansas. A third example is the "Wheat Quality" cluster, which is working with researcher Alan Schlegel of the Tribune Experiment Station to improve the protein content of organically grown wheat. Schlegel is also conducting a long-term comparative study of organic and conventional farming methods.

What makes these efforts special is the way they utilize on-farm research, re-establishing a vital two-way flow of information between farmers and researchers at a land grant university. These programs address the needs of particular farmers, and take place in the most realistic of experimental environments, the farms themselves. This careful attention to place is a key aspect of bringing agricultural research home. But the benefits of these programs reach even farther. When combined with innovative marketing strategies, these collaborations between researchers and farmers also help to strengthen farm families and revitalize rural communities.



The "Natural Systems Agriculture" of The Land Institute addresses another aspect of bringing agricultural research home; consulting the wisdom of nature. As Aldo Leopold wrote, "to keep every cog and wheel is the first precaution of intelligent tinkering". This has been one of the guiding philosophies behind The Land Institute's research; to examine the "cogs" and "wheels" of the native prairie to re-invent one of our oldest tinkering, agriculture. The joint proposal prepared by The Land Institute and Kansas State University to establish a model for a country-wide network of Natural Systems Agriculture research programs (see Land Report 51) is the logical next step in expanding this research homecoming. The core of this proposal lies in tailoring the work of research institutions to the ecological particulars of the places in which they occur.

Members of The Heartland Network also collaborate with The Land Institute through the Farmers Advisory Committee of The Sunshine Farm. Here, the practical knowledge of Kansas farmers is brought together with The Land Institute's research which consults the genius of nature. This advisory committee is another important way that cultural and natural wisdom can be combined to better guide research objectives.

Bringing agricultural research home is part of a larger effort to understand and preserve natural and human communities. Efforts such as those of The Heartland Network and The Land Institute are making strides toward meeting Wes Jackson's challenge of "becoming native to this place." The security of our agricultural systems and our home places can be better assured by distributing our research "eggs" according to the particular needs of place, rather than throwing them into one general high-yield basket.

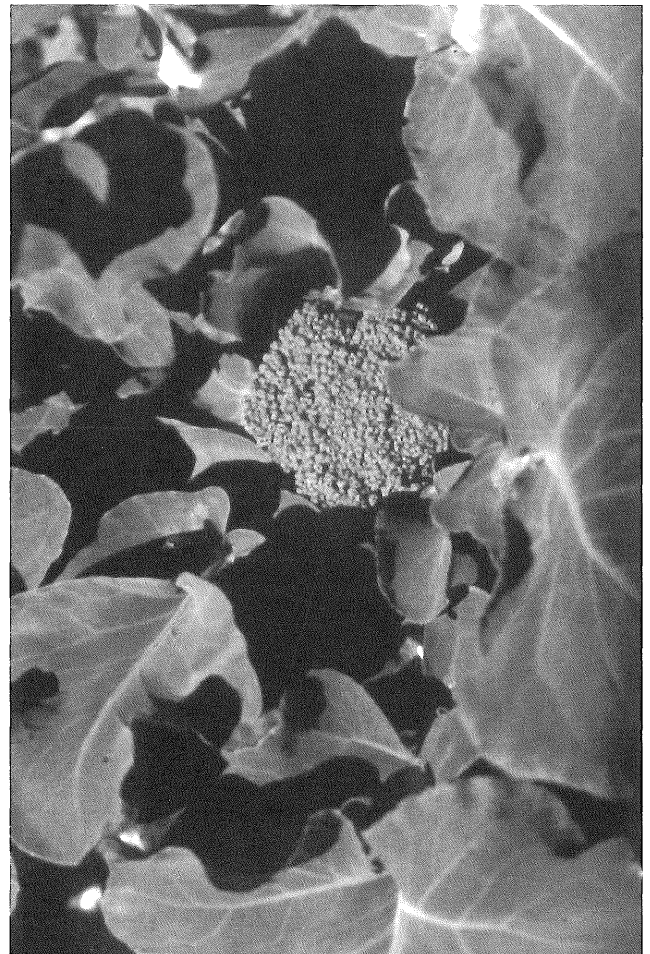
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## *Remembrance of Ken Taylor*

We were saddened to receive word of the death of Ken Taylor, founder of the Minnesota Food Association. Ken died January 6, 1995 of brain cancer. We quote from the MFA Board of Directors:

*In addition to founding the Minnesota Food Association, Ken served MFA as Executive Director for 12 years from October 1982 to April 1994. His legacy lives on in the people he has touched through his writing, his work as a community activist, his respect for people and nature. He wrote in his last Director's Report, "I have experienced the wisdom and courage of people who have consistently stepped forward in the face of ridicule and career threats — irreverent heretics who have asked the hard questions and challenged the conventions. I count myself fortunate to be able to say, 'these are my classmates and my teachers.'"*

*We offer you these words as a tribute to Ken Taylor's life. May we carry on with the gifts he has left within us.*



## Perennial Polyculture as an Assembled Plant Community

Debbie Crockett

### Abstract

This experiment investigates the roles of species diversity and environmental selection in the creation of stable communities of perennial grain crops. We established plots with four treatments representing different levels of diversity (4, 8, 12, and 16 species planted). All treatments include four perennial grain candidates: eastern gamagrass, Illinois bundleflower, mammoth wildrye, and Maximilian sunflower. We calculated percentage cover for all species present, and compared the four treatments and two fields with different cropping histories. Perennial grain crops were a minor contribution to the whole community, with planted species representing a mean of 14.9% cover. Non-planted species, which represented 149.9% cover, were represented primarily by such annual warm-season grasses as foxtail and crabgrass. Diversity, evenness, and percentage cover by cool-season grasses, composites, and legumes all increased with the diversity of the treatment. This experiment is compared with a broadcast seeded polyculture established in 1993, in which seed yield and percentage cover by perennial grains increased dramatically in the second year.

### Introduction

Through the perennial polyculture project, The Land Institute is attempting to develop an agriculture modeled after the prairie. Perennial plants decrease the problem of soil erosion that exists with annual crops. Polycultures reduce the need for inputs such as nitrogen fertilizer and pesticides. The Land Institute has studied five potential perennial grains that represent the major functional groups in the prairie: the warm-season grasses eastern gamagrass (*Tripsacum dactyloides*) and hybrid perennial sorghum (*Sorghum bicolor* x *S. halepense*), the cool-season grass mammoth wildrye (*Leymus racemosus*), the legume Illinois bundleflower (*Desmanthus illinoensis*), and the composite Maximilian sunflower (*Helianthus maximiliani*).

Ideally, a perennial polyculture would incorporate both the vegetative structure and the stability of a native prairie. Stability includes several components. Persistence is a measure of how long a community stays the same, an important quality for perennial crops which are not replanted yearly. Resistance is the ability to prevent new species, such as weeds, from entering the community. Resilience is a measure of how quickly a community returns to its original state following a disturbance (Pimm 1991).

Although The Land Institute's perennial polycultures show promise in seed yield and pest management, they are not as persistent, resistant, or resilient as we would like. For example, eastern gamagrass monocultures and bicultures need little weeding, but other plantings are susceptible to weed invasion. In another experiment, seed yield of mammoth wildrye has decreased precipitously over three years (Blume 1994). In the same experiment, unusual rodent damage caused losses of many Illinois bundleflower plants at one location, resulting in low seed yield in 1994.

Recent theories about how natural communities assemble suggest a new model for developing stable, diverse perennial

polycultures. Studies of grasslands show that highly diverse communities are more resistant to grazing and drought effects than less diverse communities (McNaughton 1985, Tilman and Downing 1994). Creating stable, diverse communities is not simple, however. Usually the assemblage of species must experience a history of invasions and extinctions, eventually "shaking down" to a persistent composition less diverse than the starting point. A stable community may show no evidence of its earlier stages of assembly, though these were probably critical in establishing that stability (Pimm 1991).

This experiment was designed to study how initial diversity can influence the establishment of stable polycultures of perennial grains (see Piper 1994). In subsequent years, we will track changes in communities with different starting diversities of seeded perennial plants, looking for rules and patterns about how stable communities assemble.

### Materials and Methods

Sixteen experimental plots were established in early 1994. The plots are represented by four treatments with different levels of diversity (4, 8, 12, and 16 species seeded; Table 1). Each treatment has four replicates. After two years, half of the plots will be reseeded with any of the original species that failed to establish. Species represent the major functional groups in the prairie: cool-season grasses, warm-season grasses, legumes and composites. All plots include four species studied in past perennial polyculture experiments: eastern gamagrass, mammoth wild rye, Illinois bundleflower, and Maximilian sunflower. In addition, treatments II, III, and IV include hybrid perennial sorghum. Other species were selected with an eye to their potential as perennial grains. Seed was obtained from Land Institute plots harvested in 1992 and 1993, the Kansas Plant Materials Center in Manhattan, or commercial sources. To keep within-species seeding density

**Table 1.**  
Species composition of four diversity treatments.

	C <sub>4</sub> grasses	C <sub>3</sub> grasses	Legumes	Composites
I	eastern gamagrass	mammoth wildrye	Illinois bundleflower	Maximilian sunflower
II	eastern gamagrass hybrid sorghum	mammoth wildrye blue wildrye ( <i>Elymus glaucus</i> )	Illinois bundleflower purple prairie clover ( <i>Dalea purpurea</i> )	Maximilian sunflower ashy sunflower ( <i>Helianthus mollis</i> )
III	eastern gamagrass hybrid sorghum switchgrass ( <i>Panicum virgatum</i> )	mammoth wildrye blue wildrye intermediate wheatgrass ( <i>Agropyron intermedium</i> )	Illinois bundleflower purple prairie clover bird's foot trefoil ( <i>Lotus corniculatus</i> )	Maximilian sunflower ashy sunflower grayhead coneflower ( <i>Ratibida pinnata</i> )
IV	eastern gamagrass hybrid sorghum switchgrass sand lovegrass ( <i>Eragrostis trichodes</i> )	mammoth wildrye blue wildrye intermediate wheatgrass western wheatgrass ( <i>Agropyron smithii</i> )	Illinois bundleflower purple prairie clover bird's foot trefoil leadplant ( <i>Amorpha canescens</i> )	Maximilian sunflower ashy sunflower grayhead coneflower Kansas gayfeather ( <i>Liatris pycnostachya</i> )

**Table 2.**  
**Percentage cover for 14 major species averaged across treatments (n=16). Major species include the ten most dominant species and the five perennial grains.**

Species	Mean % cover
Green foxtail ( <i>Setaria viridis</i> )	33.2
Bindweed ( <i>Convolvulus arvensis</i> )	25.3
Yellow foxtail ( <i>Setaria glauca</i> )	21.6
Toothed Spurge ( <i>Euphorbia dentata</i> )	18.3
Crabgrass ( <i>Digitaria sanguinalis</i> )	15.8
Hybrid sorghum	10.9 *
Buffalo bur ( <i>Solanum americanum</i> )	9.0
Alfalfa	5.8
Bird's foot trefoil	5.7 **
Annual sunflower ( <i>Helianthus annuus</i> )	5.0
Illinois bundleflower	1.2
Maximilian sunflower	0.8
Mammoth wildrye	0.6
Eastern gamagrass	0.2

\* mean percentage cover calculated for treatments II, III, and IV

\*\* mean percentage cover calculated for treatments III, and IV

constant across treatments, we used a seeding rate ( $\text{g m}^{-2}$ ) for each species that was 25% of the rate recommended to achieve a solid stand.

In March 1994, sixteen 16 x 16 m plots were staked out and placed at least 3.7 meters apart to minimize spread of seed between plots. The soil type is a Longford silt loam, 3 to 7% slope. Plots 1-8 (block one) were on a site that previously contained a five-year old stand of alfalfa (*Medicago sativa*). Plots 9-16 (block two) were on land that for the past two years had been planted in winter wheat (*Triticum aestivum*). The ground was plowed in fall 1993, then disked and harrowed in spring 1994 prior to planting. Seed of all species was hand broadcast uniformly in the plots in late March 1994. After broadcasting, we raked over the plots to incorporate the seeds into the soil.

Beginning in late July 1994 we used twelve 0.75 x 0.75 m sample frames per plot, with quadrats arranged systematically throughout each plot, to estimate cover class visually for each species encountered. To avoid edge effects, we did not sample within 1 m of plot borders. We estimated species composition and relative abundance using cover class estimates where 1=0-5%, 2=6-25%, 3=26-50%, 4=51-75%, 5=76-95%, and 6=96-100% cover (Daubenmire 1959). Cover classes were converted to median values (i.e. 1=2.5%, 2=15%, etc.), then averaged for each species per plot. From these values, we derived diversity (number of species per plot) and evenness (a measure of the equality of representation of different species). Evenness ranges from 0 to 1. We also categorized species by functional group, life history (annual vs. perennial), life form (herbaceous vs. woody), and origin (planted vs. non-planted). The mid-summer sampling period was scheduled to maximize our diversity estimate by overlapping early and late summer species. We tested for differences among treatments and between blocks using ANOVA followed by Duncan's multiple range test. We used  $\alpha=0.05$  as our criterion for a significant difference.

From late August through early November, we harvested seed from hybrid perennial sorghum and Maximilian sunflower

(excluding the 1 m border) as it ripened. The seeds were hand threshed, cleaned, and weighed.

## Results

Across the 16 plots, we identified a total of 68 species. Total planted species represented a mean of only 14.9% cover across all plots; total non-planted species represented a mean of 149.9% cover. Due to multiple layers of vegetation, total cover for each plot exceeded 100%. Of the ten dominant species, six were weedy annuals and one was a weedy perennial (Table 2). Alfalfa appeared in plots 1-8, an artifact of previous cropping history. Hybrid perennial sorghum and bird's foot trefoil were the only planted species to represent greater than 5% cover.

Diversity increased with the diversity of species seeded (Table 3). Evenness, cover by cool-season grasses, composites, and legumes tended to increase across the four treatments, although the differences were not significant. Representation by planted species was higher in the plots with 8, 12, or 16 planted species than those with 4 planted species. Total cover did not differ among treatments.

The two blocks also produced different assemblages (Table 5). Block one had higher diversity and percentage cover by composites, legumes, and planted species. Block two had a higher percentage cover by warm-season grasses. Although biomass was not sampled, block one appeared to have more total growth and more rapid plant growth in the spring and early summer.

Only two of the perennial grains, sorghum and Maximilian sunflower, produced seed this year. In both cases, seed yield was very low ( $<5 \text{ g m}^{-2}$ ).

**Table 3.**  
**Diversity, evenness, and percentage cover by different categories for plant species within four diversity treatments. Means followed by the same letter do not differ at  $p < 0.05$ .**

Treatment	Diversity	Evenness	Total % cover	% Cover-planted species
I	24.5 b	0.620	154	2.45 b
II	26.0 b	0.660	176	17.55 a
III	31.5 a	0.676	163	19.35 a
IV	32.8 a	0.694	174	27.15 a

**Table 4.** Diversity, evenness, and percentage cover by four functional groups within four diversity treatments. Means followed by the same letter do not differ at  $p < 0.05$ .

Treatment	% C <sub>3</sub> Grasses	% C <sub>4</sub> Grasses	% Legumes	% Composites
I	0.52	69.4 b	5.78	4.10 b
II	0.82	103.8 a	8.05	5.28 ab
III	2.65	66.8 b	13.78	13.95 ab
IV	2.72	83.2 ab	13.95	19.68 a

**Table 5.** Diversity, evenness, and percentage cover for different groups within two b-blocks that differ in recent cropping history. Means followed by different letters differ at  $p < 0.05$ .

Block	Diversity	Evenness	% Composites	% Legumes	% C <sub>4</sub> Grasses	% Planted species
1	30.9 a	0.671	16.1 a	17.0 a	65.2 b	21.6 a
2	26.5 b	0.654	5.4 b	3.7 b	96.4 a	11.7 b

## Discussion

The number of species that grew in the plots greatly exceeded the number of species that we sowed due to a large seed bank in the soil and ideal conditions for weedy annuals during the establishment year. We expect that next year the established perennial plants, with their underground stores of nutrients and energy, will have more resources to compete with the annuals.

Despite the heavy weed cover, some significant differences appeared among treatments. Diversity increased across the four treatments even though all of the seeded species were not found in every plot where they were planted. We expected an increase in percentage cover across the four treatments for each of the functional groups. Percentage cover increased for cool-season grasses, legumes, and composites, but not for warm-season grasses. We can attribute this to the high percentage of weedy warm-season grasses, and the low representation by perennial warm-season grasses. Total cover, an index of aboveground biomass, was similar for all four treatments.

Cropping histories of the two blocks likely led to differences in soil properties as well as seed bank composition (i.e. annual sunflowers in block one and an abundance of such warm-season grasses as foxtail and crabgrass in block two). Block one contained residual patches of alfalfa which led to greater cover by legumes. The higher cover by planted

species in block one was primarily due to the more vigorous growth of hybrid sorghum.

Seed yield of two perennial grains was much lower than yields obtained for these species in previous studies (Piper 1993, Piper and Kulakow 1994). We can attribute the low seed yields in the present study to below average precipitation, and to more intense weed competition than in experiments that are regularly cultivated. Furthermore, the seeds were broadcast at 25% of the seeding rate required to produce a solid stand; we expect a proportionately lower seed yield. We expect that seed yield and percentage cover by perennial grains will improve next year, based on results from another experiment at The Land Institute. This experiment, a broadcast seeded polyculture, was established in 1993 as a breeding project to compare several accessions of Illinois bundleflower and eastern gamagrass (Katcher 1993). Although the experiment had a different goal, it shares two design elements with the community assembly experiment: lack of weeding and hand broadcasting of seeds. Species composition changed dramatically from 1993 to 1994, with a shift from foxtail to muletail as the dominant species (Table 6). Turnover of species was high, with 10 extinctions and 16 colonizations. Percentage cover increased significantly for eastern gamagrass, Illinois bundleflower, and Maximilian sunflower.

**Table 6.**  
**Percentage cover for 14 species in a broadcast seeded polyculture, 1993 and 1994 (n=24 plots). Species include perennial grains and 10 most dominant species in 1993 and 1994.**

Species	% Cover 1993	% Cover 1994
Green foxtail	46.0	25.6
Eyebane ( <i>Euphorbia maculata</i> )	15.4	0.1
Illinois bundleflower	8.5	22.4
Windmill grass ( <i>Chloris verticillata</i> )	4.2	12.5
Bindweed	3.9	9.1
Witchgrass ( <i>Panicum capillare</i> )	3.0	0.3
Prairie cupgrass ( <i>Eriochloa contracta</i> )	2.7	0.0
Eastern gamagrass	2.0	10.5
Muletail ( <i>Coryza canadensis</i> )	0.0	24.9
Prickly Lettuce ( <i>Lactuca serriola</i> )	0.6	5.1
Alfalfa	0.5	4.9
Tumblegrass ( <i>Schedonnadrus paniculatus</i> )	0.0	4.6
Smooth brome ( <i>Bromus inermis</i> )	0.0	4.2
Maximilian sunflower	0.0	0.4

Cover by all perennials increased from 22 to 72%, whereas cover by annuals decreased from 69 to 61%. Both diversity and evenness increased. We can conclude that in a broadcast seeded environment, perennial plants do better in the second year than in the first year.

Both the 1994 community assembly experiment and the 1993 seeded polyculture experiment may serve as prototypes for future work in establishing perennial polycultures. Through these experiments we are exploring a method for establishing stable, diverse communities with minimal human intervention, allowing the environment to filter what works. To produce adequate seed yield, however, it may be desirable to manipulate the environment to favor perennial grains. Some possibilities include early spring burning to remove seed and dried plant matter, and mowing, which reduces competition from weeds.

Although this paper is limited to describing the initial communities, in future years we will begin to address issues of stability by tracking the trajectories in individual plots. We can assess persistence, measured by yearly turnover, and resistance and resilience by comparing responses to environmental stress. We will be able to determine if the different assemblages converge on one or more stable endpoints, and whether or not those endpoints favor the growth of perennial grains.

#### **Acknowledgments**

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# Perennial Grain Candidates on the Sunshine Farm

Kathleen A. Holm

## Abstract

This study compared seed yields between the inner and outer rows of a strip-cropping experiment on the Sunshine Farm. Two annuals, soybeans and milo, were planted in strips on either side of a strip of three accessions of a perennial legume, Illinois bundleflower (IBF). There was generally no difference in seed yield between IBF accessions or between milo or soybean plots adjacent to these accessions. There were differences between inner and outer rows for some IBF accessions, but not for the milo or soybean plots adjacent to these accessions. While IBF and soybeans showed no overyielding, IBF and milo did, which may have been due to planter alignment for the milo.

## Introduction

At The Land Institute we envision the perennial grain candidates we work with being grown as crops on farms in the future. The plant domestication, breeding and evaluation process, however, is slow and perennial grains humans can eat are not expected to be fully developed for at least another 50 years (Wagoner 1990). The Land Institute research staff has been working on domesticating these plants and evaluating how they respond in various mixtures over the past decade (Soule & Piper 1992). This paper explores how these perennial grain candidates might fit into its current Sunshine Farm project (Bender 1995).

While the perennial candidates do not produce sufficient grain for practical use, they can be used on the Sunshine Farm as forage for animals, or in the case of legumes, to fix nitrogen for soil building. They could be grown in separate fields or as part of the strip-cropping system on the Sunshine Farm. The 1994 Interface experiment examined the latter practice for annuals, milo (grain sorghum) and soybeans, and for a perennial, Illinois bundleflower. For each crop, seed yield was compared between inner rows, which resembled monoculture, and outer rows along the strip interfaces, which resembled mixtures. Overyielding, a yield advantage in a mixture relative to a monoculture, can occur when interspecific competition is less intense than intraspecific competition or where plant species are mutualistic. By field observations and by evaluating an index for overyielding for each crop over the next few years, we will begin to answer whether these candidates should be grown in separate fields or in strips with annual crops.

## Materials and Methods

The crops were sown on a level Cozad silt loam (coarse-silty, mixed, mesic Fluventic Haplustolls) on the Sunshine Farm. Three accessions of Illinois bundleflower (IBF) [*Desmanthus illinoensis*, Mimosaceae], a nitrogen-fixing legume, were used in this experiment to increase seed for The Land Institute breeding program. Accession 318 appears to be high-yielding and was collected from Ellsworth County, Kansas. Accessions 1143 and 1131 are both non-shattering varieties collected in Arkansas and Oklahoma, respectively. Last year, eastern gamagrass (EGG) [*Tripsacum dactyloides*, Poaceae], and mammoth wildrye (MWR) [*Leymus ramosus*, Poaceae] were also planted, but they will not be large enough for measurement until 1995. The EGG was originally collected from a roadside ditch on Crawford Street west of highway I-135, Salina, KS. The MWR was a Volga wildrye release from the Soil Conservation Service, U.S. Department of Agriculture.

In the narrow strip-cropping system oriented east-west on the Sunshine Farm, each strip consists of four rows planted 40 inches apart, making each strip 13 feet 4 inches wide. The Interface Experiment was planted out in three strips, each 900 feet long, which were plowed in fall 1993 and harrowed in spring 1994. Soybeans (variety: Flyer, indeterminate), were planted in the north strip, milo (variety: 510B, full season) in the

south strip, and the perennials in the middle. The 1993 crops in the respective strips were milo, oats, and soybeans. Prior to this, there were four years of winter wheat.

Soybeans were planted with a four-row planter on May 19, and milo May 20. The perennials were seeded by hand in plots separate from each other to facilitate seed harvest of large plots for The Land Institute breeding program. IBF was planted in plots 50 feet long. The EGG was planted in 25-foot long plots to separate IBF accessions to prevent pollen contamination between accessions. The MWR was planted in 100-foot long plots to provide adequate plot size for efficient pollination.

The IBF was planted on April 18, at a planting rate of 25 seeds per foot or a total of 8.9 grams of IBF per 50 feet, assuming 50% germination. The week prior to planting the IBF seeds were scarified. The IBF was also inoculated with rhizobial mycorrhizae when planted. This was achieved by digging up soil around IBF in old experiments several weeks earlier, drying it in the greenhouse, breaking it up into small particles, putting it in bags, and sprinkling it over the planted seeds before they were covered with soil.

The EGG seeds were treated with a fungicide and placed in moist burlap sacks for six weeks of stratification at 5°C before being planted on May 3. The planting rate for EGG, assuming 20% germination, was 12 seeds per foot or 100 grams per 25-foot row. The MWR was not planted until September 7 and 8, because it is a cool-season grass. The planting rate for MWR was 150 grams per 100 feet, assuming 20% germination.

The IBF and EGG plots were hand-weeded and hoed five times between May and the end of August. The major weeds were velvet leaf, viny milkweed, foxtail, and pigweed. The strips of soybeans and milo were cultivated twice and were "rogued" for velvet leaf and pigweed twice before they were harvested.

To collect seed yield data in these strips, three sample plots were set up in each IBF plot. The sample plots were five feet long and stretched across the strip's four rows. These sample plots were extended across the milo and soybeans when it came time to harvest the annuals. There were two IBF harvests and they stretched from the beginning of September through mid-October. The milo and soybeans were each done in one harvest, the nine blocks of milo were harvested on September 20, 1994, and six blocks of soybeans were harvested on October 4, 1994, and the final three blocks were harvested on October 11, 1994. There was no shattering at the milo harvest or at the October 4 soybean harvest, but some shattering did occur on all the second IBF harvests and the October 11 soybean harvest.

The experimental layout is a split-block design with three blocks and three samples in each plot (Steel and Torrie 1980). Because of missing values, PROC GLM was used for analysis of variance of main effects and their interaction, and residuals were examined for normality and homogeneity (SAS Institute

Inc. 1988; Sokal and Rohlf 1981). For testing simple effects between particular rows of accessions, standard errors were computed by hand, taking into account the number of blocks, samples and missing values (Cochran and Cox 1957).

To measure overyielding in the outer rows of the annuals and perennials along the strip interfaces, a land equivalent ratio (LER) was calculated. An LER is often used in agronomy to compare the yield or productivity of mixtures with monocultures. For two crops A and B, the calculations were as follows: First, outer row yields (the polycultures) were divided by two, since each crop makes up one half of the area of the polyculture design represented by this equation. The resulting values then go into Ap and Bp of the equation, each of which is divided by the respective inner row yield representing the monoculture. If LER is greater than 1, then the crops are overyielding.

$$LER = \frac{Ap}{Am} + \frac{Bp}{Bm}$$

where p=polyculture and m=monoculture

### Results

In the analysis of variance for soybeans, accession effect (F=0.69), row effect (F=0.74) and row x accession interaction (F=1.68) were not significant at the 0.05 level. For milo, the accession effect (F=2.53) and the row x accession interaction (F=1.19) were not significant, but the row effect (F=6.73) was. For IBF, accession effect (F=2.18) was not significant, but row effect (F=11.03) and row x accession interaction (F=3.08) were (Table 1).

In presentation of simple effects, the data from the outermost two rows of soybeans and milo are not presented because they were not adjacent to the IBF. Accession 1143 showed more significant differences between inner and outer rows across crops than the other two accessions (Table 2). IBF had more significant differences between rows across accessions than milo or soybeans (Table 2). Milo did not show any significant differences between rows (Table 2) even though the row effect was significant in the analysis of variance. This is because the latter was due to the outermost two rows for which data were not presented. Within rows, there were only a few significant differences between IBF

**Table 1.**  
F-values and F-test probability levels for each crop in the interface experiment.

Crop:	Soybeans	Milo	IBF
Source			
Accession	0.69 ns	2.53 ns	2.18 ns
Row	0.74 ns	6.73 *	11.03 **
Row x Accession	1.68 ns	1.19 ns	3.08 *

\*, P<0.05 \*\*, P<0.01 ns, not significant

**Table 2.**  
Seed yield (grams) [mean ± standard deviation] and land equivalent ratios (LER) for inner and outer rows of milo, soybeans and three accessions of IBF in adjacent strips. Means between rows were compared by tests explained in the text (n=9, except in cases of missing values).

IBF Accessions: Rows:	318			inner	1143			inner	1131		
	inner	outer	outer inner		inner	outer	outer inner		inner	outer	outer inner
<b>Crop</b>											
<b>IBF</b>	138.06 ±32.11	198.96 *** ±30.42	.72	105.99 ±29.29	152.34 *** ±25.60	.72	91.93 ±27.01	106.33 ns ±55.30	.58		
<b>MILO</b>	1014.44 ±182.33	1051.76 ns ±123.17	.52	992.75 ±163.12	1040.67 ns ±102.92	.53	1107.26 ±178.38	1080.02 ns ±172.11	.48		
<b>LER</b>	1.24			1.25			1.06				
<b>IBF</b>	147.55 ±32.66	136.68 ns ±31.07	.46	116.77 ±30.51	75.44 *** ±11.77	.32	111.87 ±54.06	100.05 ns ±53.20	.45		
<b>SOYBEANS</b>	341.51 ±85.83	382.12 ns ±58.73	.56	243.14 ±66.61	342.52 *** ±97.72	.70	314.77 ±50.71	352.99 ns ±72.87	.56		
<b>LER</b>	1.02			1.02			1.01				

\*, P<0.05 \*\*, P<0.01 \*\*\*, P<0.005 ns, not significant

**Table 3.**  
**Degrees of significance between mean seed yields for accessions within each row for IBF and for the interaction of milo and soybean plots with the IBF accessions within each row. See Table 1 for means and tests (n=9, except in cases of missing values).**

Rows: IBF Accessions:	318/1143	inner 318/1131	1143/1131	318/1143	outer 318/1131	1143/1131
<b>Crop</b>						
<b>IBF</b>	ns	ns	ns	ns	**	ns
<b>MILO</b>	ns	ns	ns	ns	ns	ns
<b>IBF</b>	ns	ns	ns	*	ns	ns
<b>SOYBEANS</b>	ns	ns	**	ns	ns	ns

\*, P<0.05    \*\*, P<0.01    ns, not significant

accessions and between milo or soybean plots interacting with IBF accessions (Table 3).

The LER results show that overyielding was higher in the interaction between milo and IBF than for soybeans and IBF (Table 2). There was not much difference between accessions in overyielding (Table 2). In the interaction between milo and IBF, IBF made a larger contribution to overyielding than milo, significant at the .05 level (F=7.18 for two means). However, in the interaction between soybeans and IBF, soybeans made a significantly larger contribution than IBF (F=11.06 for two means). In this interaction, the yield of IBF was lower in the outer rows than in the inner ones, significant at the 0.05 level for accession 1143, but only trend-wise for the other two accessions.

### Discussion

Although accession 318 has been higher-yielding over many years in Land Institute plant selection plots, this did not hold for the first-year plants in the larger-scale plots for this experiment. Also, accession 1143 had more significant differences between rows than the other two accessions. This may have been due to the prostrate habit of this accession that might have led to more interaction between adjacent rows.

The overyielding exhibited by the milo and IBF may have been due to slightly wider spacing between the adjacent outer rows of IBF and milo as a result of planter alignment for the milo. Thus the greater contribution of IBF to overyielding with milo may be due to its ability to spread and more completely use this slightly wider row. The LER contribution of approximately 0.5 for milo suggests that any nitrogen fixed by IBF was not available to the milo. Perhaps the one-year old

IBF plants will fix more nitrogen next year so the milo can benefit.

The lack of overyielding for soybeans and IBF suggests that there was no overall benefit from growing the two legumes together in adjacent rows. However, the soybeans made the greater contribution to overyielding, perhaps due to its larger growth rate and size.

The ultimate goal of this experiment is to determine what is the best use of perennial grain candidates. We cannot draw those conclusions after only one season of data with IBF in its first year, and without data on EGG and MWR. In 1995, we will measure yields of seed and biomass. The hope is that over the years, as this experiment continues, definite patterns will emerge between these perennial/annual interactions.

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# Soil Quality on The Sunshine Farm

Joel Gerwin

## Abstract

The Sunshine Farm Project seeks to track energetic expenditures on soil maintenance and the resulting changes in soil quality. Baseline data from 1993 the north half of the farm to have higher levels of nutrients than the south half, possibly due to cropping history. Results from early Spring 1994 showed higher  $\text{NO}_3^-$  and available P levels in the top 30 cm of former soybean strips than in former milo strips. Total N in the 30-60 cm layer was higher in former milo strips than in former oats and soybean strips. While K levels in the top 30 cm were higher in former oats and soybean strips than in former milo strips, former milo strips had higher levels of K in the 30-60 cm layer than former oats strips. These results show that different crops in our strip-cropping rotations impact soil nutrient levels differently, justifying crop diversity as a strategy to slow the depletion of particular soil nutrients. We did not find any differences in physical or biological soil properties between former oats, soybeans and milo strips because it takes more than a few years for these properties to be affected. Energetic expenditures on soil maintenance in 1994 were a small part of the farm's energy budget.

## Introduction

The Sunshine Farm Project attempts to quantify the amount of attention we must pay to our soil. As in other sectors of the farm, such as poultry or grain production, our research tracks the energetic and nutrient inputs into the soil. Rather than accounting for the nutrient and energetic outputs as we do with other sectors, our soil study tracks the resulting changes in soil quality. We measure chemical, physical and biological properties to get a full picture of soil quality. Stork and Eggleston (1992) define soil quality as "the fitness of soils for the sustainable production of healthy, agriculturally desirable plants." The Sunshine Farm project seeks to maintain soil quality with minimal off-farm inputs. The extent to which it succeeds indicates the cost of a truly sustainable agriculture.

## Materials and Methods

**The site** - The Sunshine Farm's cropland consists of 50 acres of level bottomland 3 miles south of Salina, KS. The soil is a silty loam of the order Entisols, suborder Fluvent and great group Haplustolls. The average annual rainfall is 74 cm (29 inches). The farm has been continuously cropped, mostly for wheat, for at least the last eight years. From 1990-92, the northern 20 acres of the farm were planted to wheat and the southern 30 acres to alfalfa. In 1993, we began strip cropping on the north half; strip cropping on the south half began in 1994. Two five year rotations are grown in repeating blocks of five strips which are considered replicates within a given rotation. Since 1993 was the first year of rotations, 1993 data from the two rotations were combined for crops that occurred in both of them, such as milo, soybeans and oats.

**Soil sampling** - Soil samples for chemical testing were taken from each of the five strips in 6 blocks in the north half and 6 blocks in the south, for a total of 60 sites sampled. We fixed permanent sampling sites which will be used in future years. From 12-16 April, 1993, samples were taken from two depths: 0-15 cm and 15-30 cm. From 22-25 March, 1994, three depths were sampled: 0-30, 30-60, and 60-100 cm. Each 1993 sample was composited from five subsamples all taken within 20 feet. Three subsamples were composited for each 1994 sample. Samples were analyzed for pH, Bray phosphorus (P), extractable ammonium ( $\text{NH}_4^+$ ), nitrate ( $\text{NO}_3^-$ ), exchangeable potassium (K), total nitrogen (Tot N), total phosphorus (Tot P), organic matter (OM) and cation exchange capacity (CEC). Details of procedures are in North Dakota Experiment Station (1988).

In 1994, we sampled for physical and biological properties on half of the above sites, three blocks in the north and three in the south, or a total of 30 sites. From 12-17 May, we measured bulk density, water holding capacity and infiltration rate using the method described by Cramer (1994a & b). We sampled for

earthworm abundance with a variation on the mechanical digging technique described by Bowan (1993). We hand sorted soil samples that were 18 cm deep and 15 cm in diameter, sorting three samples for each strip. We took worm counts from 13-17 May and again from 16 September-3 October.

**Analysis** - In order to decide whether to combine the north and south halves of the farm in future analyses despite their difference in cropping histories, we conducted analyses of variance (ANOVAs) on 1993 chemical data and nonparametric median tests on 1994 physical and biological data to detect significant differences between the two areas. To understand the effect of our rotations on soil quality, we conducted ANOVAs to test for the effect of 1993 crops on 1994 soil properties. In these ANOVAs, we tested only those strips in the north half of the farm containing oats, milo or soybeans, since there were sufficient number of strips to perform the test only for these crops and there were no strips in the south half in 1993.

To detect pairwise differences between means, REGWF procedures were used (SAS Institute 1985). Residuals were tested for equality of variances and normality in order to meet the assumptions for doing ANOVAs, and data were transformed if necessary. The 0.05 level of significance was used throughout.

**Energy accounting** - We calculated energy and labor hours for 1993-94 operations to improve soil quality, which were: compost management, alfalfa (for soil quality and for hay) and sweetclover. Only 29% of expenditures on alfalfa establishment were charged to soil quality, while 71% were charged to hay production, according to the typical allocation of first-year alfalfa biomass to roots and crown vs. forage (Heichel et al. 1984). Since deep root action, N-fixation which occurs in nodules on the roots, and breakdown of dead root tissue are responsible for much of alfalfa's effect on soil improvement (Kansas Rural Center 1991), we settled on the root-forage breakdown as a best approximation. Since sweetclover was grown with oats as a nurse crop, energy expenditure on seedbed preparation was charged to oats, and only the energy expended in the production, transport, and planting of the clover seed was charged to soil improvement. Energy expenditure on sweetclover plowdown was considered seedbed preparation and charged to the next crop, which is standard convention.

## Results and Discussion

**Soil properties: north-south comparison** - Tests showed many significant differences in soil properties between the north and south halves of the farm (Table 1). The north half had lower pH and higher levels of P, OM,  $\text{NO}_3^-$  and Tot N at

both depths. It had a higher level of Tot P in the top 15 cm of soil and higher CEC and levels of K and  $\text{NH}_4^+$  between 15 and 30 cm. Generally, chemical properties of the soil were better in the north than in the south. This was not true of biological properties. Median tests confirmed what was clear even without statistics: both fall and spring measurements showed more worms on the south half (spring: 56 worms/m<sup>3</sup> + 104, fall: 119 worms/m<sup>3</sup> + 172) than on the north half where every sample contained no worms (0 worms/m<sup>3</sup> + 0).

The obvious lack of replicates for the north and south halves of the farm means that we can only speculate that cropping history is responsible for the differences in initial soil quality (Hurlbert 1984). From 1990-93, alfalfa was grown on the south half and from 1990-92, wheat on the north half. The land was not chemically fertilized during this period. Because alfalfa is harvested several times a season, nutrient removal by the plant is high (Lamond 1993); this may explain the south's lower levels of P, Tot P, and K. The reduced tillage associated with alfalfa may have resulted in the higher worm densities found in the south half (references in Bowan 1993). Lower levels of  $\text{NH}_4^+$ , Tot N,  $\text{NO}_3^-$ , OM and CEC, and higher pH, were probably not caused by the alfalfa; their source is unclear.

#### Soil properties: 1993 crop effects

Tests for effects of 1993 crops on 1994 soil properties showed several significant effects (Table 2). P levels in the top 30 cm of the soil were higher in former soybean strips than in former milo strips. While K levels in the top 30 cm were higher in former soybeans and oats strips than in former milo strips, K levels in the 30-60 cm layer were higher in former milo strips than in former oats strips. While the cause of these differences in nutrient levels is unclear, they do indicate a significant crop effect.

$\text{NO}_3^-$  levels in both the 30-60 and 60-100 cm layers were higher in former soybean strips than in former oats or milo strips. Soybeans obtain 39-66% of their seasonal N needs from their symbiotic association with N-fixing bacteria, so our result confirms the benefit of including legumes in rotations (ref. in Heichel et al. 1981). Most soil N is converted to  $\text{NO}_3^-$  over time, which may explain why similar differences did not appear in  $\text{NH}_4^+$  levels (Mitchell 1970, p. 53). 67-93% of soybean roots are in the top 15 cm of the soil (Kaspar 1985), so the differences in the lower soil layers may be due to nitrate leaching caused by the heavy rains in 1993.

Tot N in the 30-60 cm layer was higher in former milo strips than in former oats strips. Tot N includes organic nitrogen tied up in crop residues. While oats may produce high levels of aboveground residue (Hickman et al. 1992), a higher level of Tot N at the 30-60 cm depth may still result from milo's deeper and higher biomass root system (reference in Mitchell 1970, p.191).

We did not find any differences in physical or biological properties between former oats, soybeans and milo strips. We expect it to take several years for these properties to be affected.

#### Energy accounting

Energy data for 1994 is summarized in Table 3. Unless otherwise noted, fuel and materials energy content were derived from Boustead and Hancock (1979). The embodied energy for alfalfa and sweetclover seeds were computed from Heichel (1980), and for inoculum from Sieverding (1991; p. 289). There were 6.16 acres of alfalfa and 3.71 acres of

**Table 1.**  
Means and standard deviations for soil properties that were significantly different between N and S halves of farm.

Soil Property	North	South	
pH: 0-15 cm	6.30 ± 0.29	6.71 ± 0.37	***
pH: 16-30 cm	6.15 ± 0.27	6.37 ± 0.49	*
P: 0-15 cm (PPM)	27.7 ± 19.12	11.17 ± 4.29	***
P: 16-30 cm (PPM)	17.52 ± 10.18	8.92 ± 5.08	***
K:16-30 cm (PPM)	436.0 ± 102.5	355.8 ± 55.6	***
OM: 0-15 cm (%)	2.54 ± 0.56	2.07 ± 0.35	***
OM: 16-30 cm (%)	2.24 ± 0.37	1.85 ± 0.39	***
NH <sub>4</sub> <sup>+</sup> :16-30 cm (PPM)	6.95 ± 4.49	5.43 ± 0.78	**
NO <sub>3</sub> <sup>-</sup> :0-15 cm (PPM)	3.44 ± 1.59	1.83 ± 1.21	***
NO <sub>3</sub> <sup>-</sup> :16-30 cm (PPM)	3.83 ± 1.66	1.43 ± 1.02	***
Tot N:0-15 cm (PPM)	1255.1 ± 243.2	1139.4 ± 132.6	*
Tot N:16-30 cm (PPM)	1177.1 ± 188.9	1037.6 ± 183.3	**
Tot P:0-15 cm (PPM)	388.7 ± 46.9	365.2 ± 20.3	**
CEC:16-30 cm (MEQ/kg)	16.69 ± 1.71	15.63 ± 1.54	**

\*p<0.05 \*\*p<0.01 \*\*\*p<0.001

**Table 2.**  
Means and standard deviations for 1994 soil properties that were significantly different due to 1993 crop effects. Means followed by the different letters are significantly different at p<0.05.

Soil Property (PPM)	Milo	Oats	Soybeans
P:0-30 cm	12.5 ± 7.0b	15.7 ± 10.2ab	16.9 ± 11.2a
K:0-30 cm	421.7 ± 51.5b	480.8 ± 77.2a	491.7 ± 100.9a
K:30-60 cm	364.2 ± 91.4a	287.5 ± 54.7b	307.5 ± 65.9ab
NO <sub>3</sub> <sup>-</sup> :30-60 cm	3.6 ± 0.62b	4.0 ± 2.2b	7.90 ± 2.95a
NO <sub>3</sub> <sup>-</sup> :60-100 cm	1.27 ± 0.76b	1.47 ± 0.73b	3.25 ± 2.15a
Tot N:30-60 cm	932.8 ± 208.5a	742.0 ± 97.5b	812.5 ± 159.0ab

sweetclover. We had planned to have 12.3 acres of alfalfa which, along with the sweetclover would have put 32% of the farm in forage legumes. However, 6.1 acres of alfalfa were lost to winterkill. Sweetclover growth was poor, perhaps due to the high density of the oats nurse crop, so sweetclover's impact on soil quality was probably negligible.

In 1993, we composted 5400 lbs of old hay and 59,550 lbs of horse manure from on the farm, and in 1994, 74,560 lbs of old hay. The relatively high labor demand for composting stems from our method of mechanically creating a series of compost piles and moving the portable chicken house and pen about every two weeks to surround particular piles. The chickens then foraged in the piles, turning them in the process. Though this system demanded additional labor, it made the compost into a direct food source for the chickens, while allowing them to enrich it with their droppings.

We expended a total of 1.8 hrs of labor/A and 0.6 million BTUs/A of the 50 A farm for soil maintenance in 1994, equivalent to 4.1 gal diesel/A. These figures would have been slightly higher, at 2.0 labor hrs/A and 7.1 gal diesel/A, if we had produced our planned 12.3 A of alfalfa. Conventional till crop production expends about 9 gal diesel/A for direct fuel expenditure and 3 hrs labor/A for such crops as oats (Weaver 1980), milo (Bukantis 1980), wheat (Briggle 1980) and soybeans (Scott and Krummel 1980). Our direct fuel expenditure of 1.1 gal/A and 1.8 hrs/A shows that soil maintenance is relatively cheap energetically compared to conventional crop production, although soil maintenance labor demand on our low-input, labor intensive farm is close to that of conventional crop production.

**Table 3.**  
**Energy and Labor Expenditures to Maintain Soil Quality in 1994**

Operation and acreage	Energy expenditures (Gal diesel equivalents)		Labor hrs	Expenditures included in accounting
	Direct (fuel)	Indirect		
Alfalfa production: 6.16 A	9.4	141.9	8.74	29% of energy in seed, inoculate, fuel and machinery for transport, seedbed prep and planting
Sweetclover production: 3.71 A	1.8	10.0	2.5	total energy in seed, inoculate, fuel and machinery for transport and planting
Compost management 1994	45.2	0.5	78.3	total energy in fuel and machinery used to transport and grind old hay and turn and move piles
Projected 1994 expenditure in gal diesel/A for 50 A farm	1.3	5.8	2.0	based on twice as much alfalfa production, according to farm plan (see text)

### Conclusion

The differences in soil nutrient levels associated with different crops confirm that crop diversity can affect soil quality. Each crop utilizes nutrients differently; soybeans fix atmospheric nitrogen, while milo's extensive root system may have kept nitrogen in the soil. Diversity keeps our soil healthy. Energetic accounting will allow us to place a cost on the maintenance or improvement in soil quality which we hope to achieve. Although roughly a fifth of the farm was in forage legumes after winterkill, energetic expenditures for soil improvement alone were a small part of the farm's energy budget in 1994.

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## Connecting With Friends of the Land

Matthew Logan

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*Matthew Logan is Land Institute Director of Development.*



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