

Cultivating local biomass for renewable energy

By STEFANIE TROUT, Leopold Center Graduate Communications Assistant

As the local food movement continues to gain momentum, the University of Iowa is positioned to start a new trend: local fuel.

The UI Biomass Fuel Project emerged in response to the University's 2010 pledge to achieve at least 40 percent renewable energy consumption by 2020. The plan seeks to green the campus's energy portfolio with locally-grown biomass that could improve Iowa's environment, benefit local communities, and support the rural economy.

At the time, only 11 percent of the fuel burned in UI's power plant came from biomass, in the form of oat hulls, while 50

percent of the energy was generated from burning coal. The University consumes 90,000 tons of coal each year, all of which is imported from outside of Iowa. The 2020 target will cut coal use by half and make up the difference through locally-sourced biomass that could retain millions of dollars that would have been spent on out-of-state coal.

In 2012, a Leopold Center grant supported the formation of the Biomass Partnership Project (BPP). This pilot project brought potential collaborators— from researchers to industrial representatives to farmers— to the table to assess strategies for cultivating

BIOMASS (cont. on page 4)

Food at work: More than vending machines

By SAVANNA LYONS, Leopold Center Graduate Marketing Assistant

The vending machine and cafeteria aren't the only places to get food while on the job these days. Employees at some eastern Iowa businesses are getting fresh produce, milk, yogurt, meat and other items from a Worksite Food Box program.

A new toolkit from the Leopold Center, Iowa State University Extension and Outreach (ISUEO) and the Iowa Food Hub explains how this new model can be transferred to other communities. Information in the toolkit was gathered from a pilot project tested in northeast Iowa by the Iowa Food Hub. The toolkit, "Developing a Worksite Food Box Program," offers guidance for food hubs interested in delivering local food, aggregated from multiple farmers, to

employees at their workplaces. The Worksite Food Box strategy has shown promise as a way of reaching customers who otherwise would not consume local food, and also provides a stepping stone for the growth of new food hubs. It is the first in a series of toolkits on marketing strategies and best practices for food hubs.

Why food hubs?

More Iowa farmers are choosing to sell their products locally. In 2007, almost 3,000 farmers in Iowa sold \$16.5 million of local products directly to consumers. Shortening the supply chain from farm to consumer allows farmers to keep a larger portion of each dollar that consumers spend. Managing larger volume accounts such as hospitals, grocery stores or

FOOD HUB (cont. on page 10)

INSIDE THIS ISSUE



7



9

Director: Losing more than just a species	3
Kirschenmann: Strategies for a hotter, scarcer world	5
How to protect and improve our valuable soil?	6
Bio-Dome imagines future of food in space	8
Program reaches landowners with conservation advice	9
Annual local food conference looks at next-steps for Iowa	11



The newsletter is on the web at:
www.leopold.iastate.edu

To subscribe, send an e-mail to
leocenter@iastate.edu

LEOPOLD CENTER

LEOPOLD LETTER MISSION

The mission of the *Leopold Letter* is to inform diverse audiences about Leopold Center programs and activities; to encourage increased interest in and use of sustainable farming practices and market opportunities for sustainable products; and to stimulate public discussion about sustainable agriculture in Iowa and the nation.

Leopold Letter ISSN 1065-2116

LEOPOLD CENTER STAFF

Director

Mark Rasmussen

Distinguished Fellow

Fred Kirschenmann

Ecological Systems Research Program

Jeri L. Neal

Secretary

Blue Maas

Marketing and Food Systems Research Program

Craig Chase

Graduate Students

Savanna Lyons
Stefanie Trout

Layout by

Stefanie Trout

Outreach and Policy Coordinator

Mary Adams

Communication Specialist

Laura Miller

Administrative Specialist

Heather Scott

Cross-cutting Research Program

Malcolm Robertson

Assistant Scientist

Corry Bregendahl

Program Assistants

Arlene Enderton
Lynn Heuss
Priyanka Jayashankar
Alice Topaloff

LEOPOLD CENTER ADVISORY BOARD

Keith Summerville, chair, Drake University, Des Moines

Aaron Heley Lehman, vice-chair, Iowa Farmers Union, Polk City

Dennis Dahms, University of Northern Iowa, Cedar Falls

Bill Ehm, Iowa Department of Natural Resources, Des Moines

Kamyar Enshayan, University of Northern Iowa, Cedar Falls

Dale Farnham, State Soil Conservation Committee, Ames

Doug Gronau, Iowa Farm Bureau Federation, Vail

Maynard Hogberg, Iowa State University, Ames

Erin Irish, University of Iowa, Iowa City

Susan Jutz, Practical Farmers of Iowa, Solon

Paul Lasley, Iowa State University, Ames

Marc Linderman, University of Iowa, Iowa City

Michael Naig, Iowa Department of Agriculture and Land Stewardship, Des Moines

Steven Mickelson, Iowa State University, Ames

John Olthoff, Dordt College, Sioux Center

Jennifer Steffen, State Soil Conservation Committee, Birmingham

The Leopold Center for Sustainable Agriculture seeks to identify and reduce adverse socioeconomic and environmental impacts of farming practices, develop profitable farming systems that conserve natural resources, and create educational programs with the ISU Extension Service. It was founded by the 1987 Iowa Groundwater Protection Act. The *Leopold Letter* is available free from the Leopold Center at 209 Curtiss Hall, Iowa State University, Ames, Iowa 50011-1050; (515) 294-3711.



Iowa State University does not discriminate on the basis of race, color, age, ethnicity, religion, national origin, pregnancy, sexual orientation, gender identity, sex, marital status, disability, or status as a U.S. veteran. Inquiries can be directed to the Interim Assistant Director of Equal Opportunity and Diversity, 3280 Beardshear Hall, (515) 294-7612.

Research Results

On the web: www.leopold.iastate.edu/news/results

Summaries

Easy-to-read summaries are available for these recently completed projects funded by Leopold Center grants:

- Blurring the lines between working and conservation lands: Bird use of prairie strips in row-cropped watersheds
- Column study to access bioretention cell filter mixtures for urban stormwater management
- Developing permaculture techniques for increased production and profit in sustainable year-round agriculture for beginning farmers and ranchers in southwest Iowa
- Development of an online food safety training for employees of university farms and school gardens
- Fostering healthy diets in children through vibrant school gardens
- Grass-finished beef pilot project: Cattle performance and welfare
- Increasing Iowa farmers' resiliency through the Practical Farmers of Iowa Cooperators' Program
- Increasing visibility of energy conservation and renewable energy on Iowa's small to mid-sized farms
- Local food in every pot: Growing farmers in northeastern Iowa through public and private partnerships
- Procurement tools to develop sustainable local food purchasing models for Farm to School chapters
- Recordkeeping education and insurance benchmarking for Iowa fruit and vegetable producers
- The Long-Term Agro-ecological Research (LTAR) experiment: Ecological benefits of organic crop rotations in terms of crop yields, soil quality, economic performance and potential global climate change mitigation

News & Notes

The Leopold Center has issued its Summer 2014 Request for Pre-proposals, which seeks ideas for new research and projects to be funded in 2015. The deadline to submit a two- to three-page concept paper is July 8. Get the RFP on the Leopold Center website: www.leopold.iastate.edu/grants/rfp.

Leopold Center Director Mark Rasmussen is among the 2014 graduates of the Conservation Legacy Leaders academy conducted April 11-13 at the National Conservation Training Center operated by the U.S. Fish & Wildlife Service in Shepherdstown, West Virginia. The Aldo Leopold Foundation was among the organizers of the training, which involved leaders representing nearly 30 conservation heritage organizations.

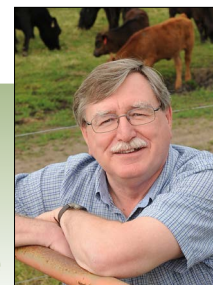
A new Leopold Center paper shows how northeast Iowa farmers have adapted to change in the past 80 years, and how geography of the region played a large role in those changes. The paper, *Diversity of Conventional Farming in Northeast Iowa: Why*

Do Farmers Farm the Way They Do?, was written by French researcher Alice Topaloff as part of her internship with the Leopold Center in 2013. Find it by title on the Leopold Center Publications & Papers page: www.leopold.iastate.edu/pubs/alpha.

Decorah schools celebrated May, Beef Month in a special way this year. NE Iowa Food and Fitness Initiative partners navigated the complex farm-to-table chain of sourcing a local beef animal that ended up on the plates of local school children. This remarkable journey started with a cow, who spent her life grazing the hills of Sattre (north of Decorah). She was processed by a local locker into a product that was delivered by the food hub, prepared and served by school cooks and fellow cattlemen, and celebrated by students, staff and parents on a beautiful late-spring day. Less than 50 miles from farm to plate! Read the rest of the story: <http://iowafoodandfitness.org/wegrow/2014/06/05/bringing-local-beef-to-school/>.

Conversations

WITH DIRECTOR MARK RASMUSSEN



Environmental consequences: The limitations of our science

One hundred years after the 1914 extinction of the passenger pigeon, Elizabeth Kolbert wrote *The Sixth Extinction: An Unnatural History*, and I have been considering what causes the loss of a species. Daily we hear about elephant poaching, the honey-bee Colony Collapse Disorder, and the Monarch butterfly migration failure with a sense of loss and frustration. Most explanations avoid assigning direct blame and credit a complicated list of factors such as disease, parasites, reproduction, habitat, critical co-species, over-harvesting and social inertia. There is no doubt that humans are playing the dominant role in biodiversity loss. Worn-out explanations that “extinction happens and have always happened” just don’t cut it anymore given the accelerating rate that life is being extirpated from the planet. A few celebrity species in the “going, going, gone” book of life get attention while many other species don’t as they quietly fade from the scene.

I recognize that many factors have an impact on biodiversity and survival, but one particular area needs more attention: the combination of toxicology, multi-chemical interactions, sub-lethal dosages and environmental consequences. The products we use, the medicines we take, the chemicals we apply ultimately end up in our soil, water, and air. The complicated mix encompasses drugs, hormones, cleaning products, agricultural and garden pesticides and personal care products.

In my work on the metabolism of toxins by microbes, I learned never to underestimate the power of microbes to degrade and detoxify. We depend on this mighty multitude in more ways than we can appreciate. However, I also know from my research that life (even microbial) has limits and that numbers matter which is why we struggle with these issues. Complications multiply when mixtures of compounds are involved. Often we are looking at a chemical soup of active ingredients, many designed specifically with a potent biological activity.

Consider antibiotics. Depending upon the class of compound, 20-80 percent of the drug is excreted into the environment by humans and animals through urine and feces. We assume that most is subsequently degraded in waste treatment plants or manure lagoons, but these compounds exert biological effects while still active. Dilution is not always an adequate treatment for we now know that chronic sub-lethal concentrations can exert strong effects upon microbes.

Active ingredients applied to our crops are relevant to this discussion given the quantity used in open field environments. For example, glyphosate and Bt proteins have both pesticidal and antibacterial activities and the broader environmental impacts of these active ingredients remain poorly documented.

Other crop protection products like the strobilurin fungicides

also are applied widely to cropland. Originally discovered as natural products produced by some types of fungi, these compounds were found to have produced limited activity and were susceptible to photodegradation. Synthetic derivatives suitable for commercial use were developed to be stronger with greater environmental stability. Most compounds in this class appear to degrade rapidly in nature and have limited impact upon beneficial fungi like soil mycorrhizae. This is an example of our improved analysis of broad environmental effects. However, I am still frustrated when I read in a journal paper: “There is limited published literature on the degradation of compound X.” This tells me that little may be known about possible interactions of these chemicals and their impacts on non-target forms of life.

Many times we have been surprised by unanticipated consequences, such as how a compound affects species very distant from those of interest studied in the original research objective. The chemistry of life is vastly complicated.

So there it is, in all of its complexity. I welcome (and share) your frustration. For some, this multifactorial research dilemma may be cause for despair and surrender to the idea that we can never figure this out, so why try. Others say; “Forge ahead. We need this product and nature will take care of it.”

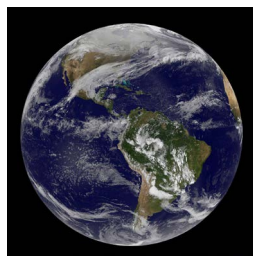
Still others respond; “Stop now! Ban them all.”

None of these responses are helpful. I would argue that we need thorough, deliberate decision-making and we need to double down on research and knowledge formation. We need support for research studying the environmental aspects of these multi-chemical interactions, and less suspicion and more encouragement for those scientists. We also need broader life cycle analyses and an emphasis on green chemistry.

The relevant, responsible industries need to fully provide metabolic, toxicological and degradation data before a product is released into the environment. We also need to stop pressuring or harassing the regulatory system into premature decisions (historical accounts on Dr. Kelsey and thalidomide as well as Rachel Carson and DDT come to mind).

Finally, for those who are quick to criticize our regulators and scientists for being too slow with review decisions or for doing just one more experiment, here’s my question: What are you doing to help find the answers besides complaining? Life on earth and our own health and well-being depend on good answers to these questions. For too many species, time is running out.

Mark Rasmussen



Satellite image taken 22,300 miles above the Earth courtesy of the National Oceanic and Atmospheric Administration.

CULTIVATING LOCAL BIOMASS FOR RENEWABLE ENERGY

BIOMASS (continued from page 1)

renewable biomass energy fuel. Oat hulls from the Quaker Oats factory in nearby Cedar Rapids will continue to be a source of biomass energy, but as the plant increases its use of biomass, the University's biomass portfolio will be diversified to ensure the long-term sustainability of its renewable energy system.

UI's Main Power Plant co-fires oat hulls with coal. Likewise, new sources of biomass must be suitable for use in a solid fuel boiler and be sourced locally. The local fuel shed is defined as the area in a 50-mile radius from Iowa City.

"Iowa is blessed with good soil, abundant rainfall, and knowledgeable farmers and landowners, so the idea of growing our own fuel, in proximity to its point of use, made a lot of sense to us," said Liz Christiansen, director of the University of Iowa Office of Sustainability.

The BPP team focused on seven areas:

Dedicated Energy Crops. The team explored several perennial plant species that yield biomass as well as ecological benefits. One such species is Giant Miscanthus, a sterile hybrid grass cultivated in Europe as a biomass crop since the early 1980s. The team took a particular interest in how Giant Miscanthus could take advantage of marginal land not well-suited for row-crop production. In June 2013, they began planting miscanthus test plots and have since established two pilot fields in Muscatine and Johnson County. They hope to have additional production plots in 2015 and 2016, with a goal of 2,500 acres of miscanthus in the ground by 2016.

Timber Stand Improvement (TSI). The BPP team also considered how selective removal of organic material from forests could provide additional biomass in the form of wood chips. This could support forestry conservation and management goals while providing a limited amount of biomass to supplement other sources.

Intrusive/Undesirable Species Removal. A third source of biomass includes selected plant species that out-compete native

flora. Due to the relatively low yield delivered by this process, the amount of processing required, and the limited

amount of managed land available to harvest, however, the team concluded that other biomass sources should be developed first.

Geographic Information Systems (GIS). The BPP team used GIS to determine the amount of "marginal" land in the fuel shed currently in corn or soybean production. They identified up to 6,000 acres of "marginal" land that could be used for energy crop production, enough to satisfy 30 to 60 percent of the University's renewable energy demand.

Procurement and Logistics. The team also considered issues related to biomass handling, processing and storage. Biomass fuel is less energy dense than coal and requires up to twice the number of trucks to transport the same amount of energy. As the amount of biomass being co-fired increases, the University will need to consider densifying some or all of the biomass. The team is investigating alternative fuel delivery processes, such as an off-site fuel yard and rail transportation.

Regulatory and Policy. Environmental regulation of combustion sources is complex and requires specialty consultants to prepare permit applications for submission to the Iowa Department of Natural Resources. These processes and procedures have been integrated into the work team's plan for increasing biomass fuel

consumption.

Ecological Services. The team also is exploring the ecological benefits of biomass fuel: improved soil conservation, reduced agricultural chemical use, and increased soil carbon inventory.

"This is a model that can be replicated in other communities," said Malcolm Robertson, leader of the Leopold Center's Cross-Cutting research program. "They are outlining the steps you need to take, the players you need to have at the table, and what issues need to be considered. It's a blueprint for the process that other communities can follow to move away from fossil fuels to biorenewable fuels to meet their energy needs."

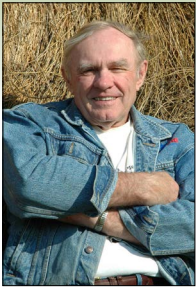
Since completing the initial planning grant, the team has received a second Leopold Center grant to create an index for evaluating the sustainability of various biomass fuel options based on economic, environmental and social measurements.

The most recent pilot field of miscanthus was planted on May 7 near Iowa City. Native to Japan and several other southeast Asian countries, Giant Miscanthus (*Miscanthus x giganteus*) is a hybrid of two other Miscanthus species: *M. sinensis* and *M. sacchariflorus*.



Giant Miscanthus is a sterile hybrid species most often planted from divided rhizome pieces. The perennial plant's inability to produce seeds—and, therefore, to invade—is one of many reasons why it is an attractive source of biomass energy.





TOWARD A SUSTAINABLE

Future

Practical strategies for a hotter, scarcer, more open world

Sustainability originally meant “capable of being maintained” regardless of circumstances. Perhaps that led us to develop strategies primarily designed to build greater resilience into current systems. As a result, we remain mostly focused on how to tweak current systems, or at least to make them *appear* to be more environmentally friendly. This approach often equates sustainability with “greening up” current systems, including our current agriculture system.

Some thoughtful individuals, however, are beginning to challenge that perspective, mostly due to changes already taking place. In this regard, the work of business consultant Andrew S. Winston is among the most prescient. While he primarily addresses the business community, his message is equally applicable to educational institutions, nonprofit organizations and certainly farmers. Winston works with major corporations and points out that some of them, at least *internally*, already recognize that major changes soon will occur and that they will need to adapt. They also know that eventually their input suppliers (including farmers) will need to adapt.

In his book *The Big Pivot: Radically Practical Strategies for a Hotter, Scarcer, and More Open World*, Winston articulates some of the fundamental changes we will experience in the decades ahead. These changes will require radically redesigned strategies that are practical, not only for business success but also for human survival. (Winston, 2014)

At the heart of his analysis is the fact that “business as usual” cannot continue. We must consider a “Big Pivot,” namely adoption of profoundly different strategies based on acceptance of three realities about the future.

One, we will be (and to some extent, already are) living in a world deeply affected by climate change. To put it succinctly, Earth’s life-support systems will be “irretrievably damaged.” According to the most recent Intergovernmental Panel on Climate Change (IPCC) report, we only have about 15 years to put a cap on carbon and significantly reduce carbon emissions if we are to “sustain” a planet that can support human life. The report points out that already ice caps are melting, water supplies are stressed, heat waves and heavy rains are more common, coral reefs are dying and all of these changes are having considerable impact on the world’s food supply. (IPCC, 2014)

While these changes seem extreme and expensive, “a big part of making the Big Pivot change is taking a hard look at what ‘expensive’ really means,” and considering “short- and long-term value” and how to create it. Part of that task explores the true “quality of life.” We often assume that capping carbon emissions to reverse the results of climate change will be too costly to the

economy, and, therefore, reduce our quality of life. In fact, failure to take such actions *already* is beginning to cause significant economic pain and probably is preventing us from exploring pathways to a better life. Dramatic increases in insurance costs due to increased flooding, droughts and severe weather, for example, are beginning to affect the economy and severely jeopardizing the quality of life for many people.

Two, we live in a world where it is “getting harder to find and extract traditional resources,” including adequate amounts of fresh water and minerals. The fact that the “easy dirty energy is gone” has begun to drive up energy costs. A new report to the Club of Rome by Ugo Bardi, *Extracted: How the Quest for Mineral Wealth is Plundering the Planet*, sharply reminds us that our world of unlimited material growth is ending and that a “big pivot” redesign of our livelihoods is imperative. (Bardi, 2014) Such a “big pivot” must include a vision for a new way of life that enhances well-being while dramatically reducing consumption. Marjory Kelly, a fellow with the nonprofit Tellus Institute, offers practical examples of how to accomplish such a “big pivot.” (Kelly, 2012)

Three, we live in a more “open” world where there is “nowhere to hide.” What this means is that public relations efforts to convince a skeptical public that we know how to manage all these changes will be futile. Messages that “new technologies will solve these problems and keep the current system afloat” will fail miserably in our new, transparent world. Information moves at a rapid pace and embarrassing videos go viral, undermining even the most sophisticated PR efforts. The only effective, practical strategy is based on truthfulness, relationships, transparency and engagement.

These are important realities to consider as we prepare for a sustainable future. Our future must include “a big turning” if we want to be successful in our efforts.

Andrew S. Winston

References:

- Winston, Andrew S., 2014. *The Big Pivot: Radically Practical Strategies for a Hotter, Scarcer, and More Open World*. Boston: Harvard Business Review Press.
- IPCC Report 2014, www.globalchange.gov.
- Bardi, Ugo, 2014. *Extracted: How the Quest for Mineral Wealth is Plundering the Planet*. White River Junction, Vermont: Chelsea Green Publishing.
- Kelly, Marjory, 2012. *Owning Our Future: The Emerging Ownership Revolution*. San Francisco: BK Publishers.

EDITOR'S NOTE:

We received many comments in response to “Who speaks for the soil,” an essay in our last newsletter by Jerry Hatfield, who leads a federal research facility in Ames. Reflecting on 25 years as a soil scientist, he noted the degradation of this resource, and asked that we all pay more attention to protecting and building soil health. The Leopold Center is funding research related to several aspects of soil health.

Here are reactions from five of those researchers, collected by Jacqueline Nester, a master's candidate in the ISU Graduate Program in Sustainable Agriculture. She opened each interview with the same question, followed by discussion on each area of study. Their full interviews can be found on the Leopold Center website:
www.leopold.iastate.edu/news/leopold-letter/2014/summer

MATT LIEBMAN: CROP PRODUCTION

In Jerry Hatfield's latest article, he notes that soil health is ignored, and that “we are satisfied with the occurrence of soil degradation because our overall productivity continues to rise.” What is your reaction to this?

He's right. We are going to face problems over the longer term unless we make some important changes in our approach to soil management. The big problem is that on most croplands, the rate of soil loss exceeds the rate of soil regeneration. Even when we think we are doing a good job, often the soil is being lost at a rate of 7-10 times faster than it is being regenerated. We have been able to get away with soil degradation in places like the central Corn Belt because the soil was originally so rich and so deep, and because we have been able to compensate by adding fertilizer.

How would you justify implementing projects like low-external-input and prairie conservation strips, which have several long-term environmental

benefits, but do reduce the amount of land in row crops directly?

I would ask the question: how do people that are involved in practices that only focus on short-term productivity and short-term benefits justify their actions to future generations and to people living downstream?

If we're engaged in practices that fail to protect the soil and water, then there is something wrong with the production economics. We need to figure out ways to make sure that being a good steward of soil and water is also profitable.

Take-home message:

I think one tactic that is vital for improving soil quality is to identify places within farms that are best suited for more intensive conservation practices. I think the advent of precision farming technologies is offering better opportunities to see which parts of land are profitable and which are not; unprofitable areas, then, can be more easily targeted for conservation.



Liebman leads ISU research on expanded crop rotations using a low-external input (LEI) model and he is a member of the prairie conservation strips (STRIPS) research team. His current project: Impacts of conventional and diversified rotation systems on crop yields, soil functions and environmental quality [XP2014-01]

JIM RUSSELL: LIVESTOCK AND GRAZING

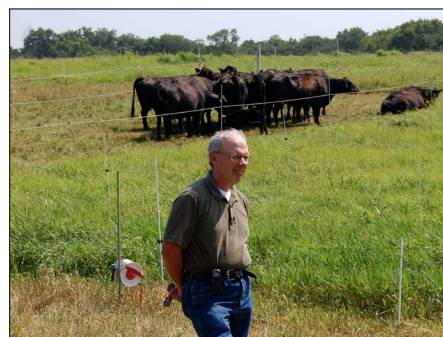
In Jerry Hatfield's latest article, he notes that soil health is ignored, and that “we are satisfied with the occurrence of soil degradation because our overall productivity continues to rise.” What is your reaction to this?

I agree with this statement, particularly where we have highly erodible land in row crop production. From 2007-2012, we lost 1.7 million acres of grassland in this state, particularly in southern Iowa where the land is highly erodible. This is an issue since most of this land conversion is affecting the amount of forage area in the state, which typically exists in areas, like southern Iowa, where soils are lower quality.

Do you think that soil quality is an important farm indicator for your livestock and grazing audience?

It certainly is. Soil quality is going to determine forage productivity, and that will affect carrying capacity for livestock on the land. The relationship between soil quality, hydrology, and adequate organic matter can reduce the effects of soil compaction, and thereby increase water infiltration/ water holding capacity of the soil, making pastures more resilient in times of drought.

Grazing deals with the interface between the soil, forages and animals. If you take care of your soils, then you will improve forage productivity, which will improve animal production.



Russell is professor of animal science at Iowa State and leads rotational and management intensive grazing research. His current project: Use of grazing management to mitigate greenhouse gas emissions while increasing soil organic matter and water-holding capacity of cool season pastures [E2012-08]

Advice from experts: How can we protect, improve soil?

cont. from page 6

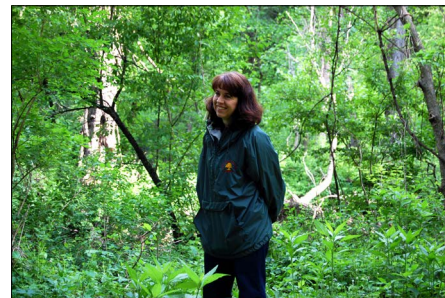
JAN THOMPSON: WOODLANDS AND URBAN AREAS

In Jerry Hatfield's latest article, he notes that soil health is ignored, and that "we are satisfied with the occurrence of soil degradation because our overall productivity continues to rise." What is your reaction to this?

I have a little different take on it because my focus is on urban systems. In urban systems, we are less interested in overall productivity and more interested in promoting plant growth through soil health. However, the same thing that leads to soil degradation in rural settings is also a problem in urban areas. It is the similar idea that people do not tend to think about things beneath the surface. So, thinking about it as an agricultural system, we are still getting production - no problem; similarly, if the aesthetics in urban settings look good, we think there is no problem.

Given your experience with riparian forest understory in Iowa, how would you describe this benefit to the general public? What are the main challenges for measuring/evaluating changes in soil quality in your work?

Water, especially in urban environments, is where the symptoms of poor soil quality show up. In any environment, the thinking is that the more perennial vegetation, the greater likelihood that you will capture nutrients in the terrestrial habitats and minimize water and sediment movement into water systems. To the extent that landowners can strategically incorporate perennials, including woodland species, from trees to understory, in any landscape that should help with porosity, organic matter and overall, holding soil in place.



Thompson is professor in ISU Natural Resource Ecology and Management. Her research looked at plant communities in urban woodlands: Getting the most from Iowa's forests: Linking forest understory composition to stream water quality and enhancing nutrient capture in forest remnants in agricultural landscapes [E2011-05]

AARON GASSMANN: PEST MANAGEMENT

As an entomologist, how does this concept of 'soil health' come in play in your research?

When thinking about interactions between agricultural pests and crops, soil can be important for several reasons. One reason is that the quality of the soil will affect the health of plants, which in turn will affect the extent to which feeding injury from pests may diminish yield. Additionally, several pest insects feed on roots, so the soil is their habitat, but the soil also harbors beneficial nematodes and fungi, which kill pest insects and reduce pest outbreaks. By enhancing soil quality, there are multiple avenues by which the

harm caused by pest insects to crops may be diminished.

What about the comment that, "because soils are below ground, people tend to not focus on it"?

I think it is a valid assessment because people tend to focus on things they can observe. However, there are visible manifestations of good soil; factors such as the quality of waterways near fields and yields of crops are, in part, due to soil health. Maybe it is a matter of making links between what people can see and what they can't see that will ultimately frame the importance of soil quality.



Gassmann is ISU associate professor of entomology and studies integrated pest management. His recent project: Improving soil quality by conserving insect pathogens [E2010-18]

AJAY NAIR: FRUIT AND VEGETABLE PRODUCTION

In Jerry Hatfield's latest article, he notes that soil health is ignored, and that "we are satisfied with the occurrence of soil degradation because our overall productivity continues to rise." What is your reaction to this?

My perspective is that even though productivity is increasing, we have to still focus on sustainability. As we all know, "You don't feed your plant, you feed the soil, and the soil feeds your plant." We must not refer to soil as just the medium through which nutrients are taken up,

but focus on how to revive the soil, and allow the breakdown of nutrients already present.

Take-home message:

In the area of fruit and vegetable production, I think we will see more growth in terms of markets for local food. As farmers try to meet this demand, they must be careful that the increased production should not come at the cost of detriment to the soil.



Nair is assistant professor of horticulture at Iowa State and directs the Sustainable Vegetable Production Lab. His current project: Quantifying nitrogen credits and impacts of cover crops on soil biology and health in vegetable cropping systems in Iowa [E2014-16]

Jacqueline received a B.S. in Natural Resource Management and Sustainable Agriculture from Ohio State. She is Co-President for the Sustainable Agriculture Student Association, which spearheads such activities as the annual Ames Edible Garden Tour, Food at First garden and soup kitchen and other sustainably-minded activities.



Making a point

Here is what happens when soil is disturbed – as illustrated during several experiments that were part of Ray “The Soil Guy” Archuleta’s presentation on soil health in April for the Shivers Memorial Lecture. Volunteers used Silly String to hold together several different-sized Styrofoam balls, representing soil particles. When Archuleta smacked the conglomeration (he is on left in first photo, in the background in second photo), foam balls flew off the stage.

“If you want to make it in this next century, you must farm like nature,” he told the audience of nearly 400. “The natural ecosystem sets the rules. You either obey them or you go broke.”

A conservation agronomist for the USDA’s Natural Resources Conservation Service, Archuleta has entertained audiences throughout the country, speaking for the soil. His Iowa lecture, “Soil Health and Sustainability,” is recorded and available on the Leopold Center website: <http://www.leopold.iastate.edu/news/calendar/2014-04-01/shivers-soil-health-archuleta>

Bio-Dome imagines future of food in space

What will future space colonists eat in their trek across the galaxies?

A new bio-dome display at Iowa State University’s Reiman Gardens looks into the future of farming in space. The bio-dome is the main attraction in the Hughes Conservatory through November 15 as part of this year’s Reiman Gardens’ space and science fiction theme.

The bio-dome showcases aquaponics research conducted by Allen Pattillo in ISU’s Department of Natural Resource Ecology and Management and supported by the Leopold Center’s Cross-Cutting Initiative. Reiman Gardens also received a small Leopold Center grant to develop the exhibit.

Plants such as lettuce, basil, tomatoes, kohlrabi, mustard greens, sage, rosemary, cucumbers, pole beans and many others are grown using hydroponic technologies. Fish, including Nile tilapia and redclaw crayfish, are grown with aquaculture technologies, and when combined with plants the system is known as aquaponics. Pattillo built his experimental system in a campus greenhouse in 2013, and designed the system in bio-dome exhibit.

The exhibit features a 120-gallon tank for tilapia, one of the world’s fastest growing species of fish. Fish waste provides nutrients for the vegetables and

herbs, fed by continually circulating water in the system.

The exhibit also demonstrates four types of soil-less plant systems. Two floating rafts hold plugs of lettuce and mustard greens. Tomatoes and herbs mature in individual Dutch pots, each connected to a water line. Water moves through a pyramid of plants custom-built from Nutrient Film Technique (NFT) channels and five vertical towers, including one that travelers may have seen at O’Hare Airport’s urban aeroponic garden in Chicago.

Pattillo said a handful of commercial-scale aquaponics systems now operate in Iowa. His research has generated a lot of interest, and the Reiman Gardens exhibit, which opened April 15, already has increased the number of inquiries.

“People are enamored at the potential for these systems,” he said. “Many people want to know how much we could produce this way. We really don’t know, but we’re

going to find out. Data collected from this exhibit will help us know what to expect from this type of agriculture in the future.”

The display is supported by equipment donations from FarmTek Growers Supply.

The Hughes Conservatory is open daily from 9 a.m. to 4:30 p.m. Reiman Gardens is located on a 17-acre site south of the ISU Jack Trice Football Stadium in Ames.



Above: The centerpiece of the Bio-Dome is a 120-gallon tank that holds dozens of tilapia fish.

Right: Lettuce grows in a raft that floats on 200 gallons of water. Fish waste provides nutrients for plants.



www.leopold.iastate.edu

Explore our photo galleries:
www.leopold.iastate.edu/news/photos

Learn more about the exhibit,
“2014: A Garden Odyssey”:
www.reimangardens.com

Program reaches landowners with conservation advice

Evaluation of a unique, five-year-old partnership between the Leopold Center and Drake University Agricultural Law Center shows that nearly 3,000 acres of farmland have the use of conservation practices specified in their lease agreements.

Since the partnership began in 2009, more than 2,100 landowners have received information from the Sustainable Agricultural Land Tenure (SALT) Initiative. An evaluation of the program showed that of 23 landowners and their tenants, 20 adopted a conservation lease and seven improved their conservation practices. The agreements affect 2,290 acres of agricultural land not previously included in a conservation lease agreement.

At least half (55 percent, or 17 million acres) of Iowa agricultural land is farmed under some form of a lease, primarily cash rental agreements. The SALT Initiative looked at how conservation provisions could be included in lease agreements, long-term arrangements that share risk between landlord and tenant, and other legal options that promote farming systems that benefit landowners, tenants, the land and the community.

As part of the SALT Initiative, Drake Ag Law Center staff also created a variety of educational materials including brochures, videos and resource guides. They are available free of charge on a new website launched in March 2011, sustainablefarmlease.org. The most comprehensive resource is a 56-page printable *Landowners Guide to Sustainable Farm Leasing*. Different sections cover the basics of sustainability and farm leases, determining priorities, talking to tenants,

contract law and related topics.

The evaluation showed that more than half of those who received SALT materials were women, a population that owns 47 percent of Iowa farmland and 52 percent of rented farmland in Iowa. Drake Agricultural Law Center staff prepared information used by several learning circles of women landowners.

Leigh Adcock, executive director of the Women, Food and Agriculture Network, said SALT materials have been valuable for their “Women Caring for the Land” program, which is designed for non-operator female landowners who are interested in conservation.

“The most important element is empowerment,” Adcock said. “Women may not have been decision makers [on the farm] in the past, so they need to hear other women landowners are doing conservation with their tenant, making choices, and maybe finding new tenants.”

A California educator whose family owns 10 farms in Iowa, recently visited the state and talked about her options with Drake Ag Law Fellow Ed Cox who has done extensive work on the SALT Initiative. “I am so impressed with the resources and feel empowered to use the lease and communication with our tenants to accomplish our goals for healthy soil,” she wrote. “I’m sure another conversation is not too far away.”

Evaluation of the SALT Initiative was conducted earlier this year by Leopold Center program assistant Arlene Enderton and assistant scientist Corry Bregendahl. They reviewed project reports, interviewed project investigators and key staff and compiled a list of partners, findings,

 www.leopold.iastate.edu

A summary of the evaluation:
www.leopold.iastate.edu/change

SALT website:
<http://sustainablefarmlease.org>

products generated, funds leveraged and future opportunities. The Leopold Center invested \$225,000 in SALT from 2009 through 2013, which includes the initial partnership funding, two competitive grants from the Leopold Center Policy Initiative, and a special policy project grant.

Worth the watch

A good way to preview the materials and learn about the issues is to watch some of these short, introductory videos. The videos look at Iowa laws pertaining to land tenure, land management, helping farmers through a lease, and issues affecting women landowners. Here are the titles:

- Introduction to SustainableFarmLease.org
- Iowa's Land Tenure and Stewardship Policy
- The Landowner's Duty of Stewardship
- Farm Lease Termination Law
- Helping Farmers Fulfill the Land Ethic
- Leasing Land to New Small Farmers
- Conservation Easements
- The Importance of Timber Management
- Prairie Strips in Row Crop Production
- Women Landowners: Land Management and Conservation Conversations
- New Farmers and Women Landowners
- Conservation on Leased Land: The Landlady-Tenant Relationship
- Testing a Trio: Prairie Strips, Row Crops and Birds
- Integrating Prairie into Cropland

“Conservation of the farm is the responsibility of the landowner because it’s a long-term process, but the tenant has a responsibility for stewardship and implementation of that plan,” says Jerry Peckumn, who rents land from Chris Henning. In a video, they discuss what has worked for them to help other landowners put their conservation goals and practices into land leases and rental agreements.



FOOD AT WORK: MORE THAN VENDING MACHINES

FOOD HUB (continued from page 1)

schools can be easier on farmers if they rely on an intermediary – someone who will take orders, handle products, provide delivery services, and offer marketing and branding that ensures a fair price for the farmer.

To fulfill this role, more than 260 businesses and organizations across the United States have launched food hubs. The USDA defines a food hub as “...a business or organization that actively manages the aggregation, distribution and marketing of source-identified food products, primarily from local and regional producers to strengthen their ability to satisfy wholesale, retail and institutional demand.”

The rapid growth of food hubs has greatly increased local food sales, and also has posed operational challenges. Focused on paying a fair price to food producers, food hubs wrestle with issues such as finding the right markup for products, maintaining cash flow, and offering the right combination of services to balance their values-based commitments with fiscal sustainability.

About Iowa Food Hub and its research

The Iowa Food Hub, operated by the 501(c)3 nonprofit organization Allamakee New Beginnings, was founded as a “research hub,” seeking solutions to common challenges facing food hubs. In partnership with ISUEO and the Leopold Center, the Iowa Food Hub tests innovative strategies for local food aggregation and distribution and shares findings with the public. One purpose is to reduce start-up risks for other businesses that wish to use the same strategies. Focus is placed on determining whether each strategy, if applied in an ordinary business environment, would be capable of turning a profit. The food hub is currently working with the Leopold Center on a series of toolkits to share lessons learned.

The first toolkit focuses on what’s been learned about food

boxes available at work sites. A Worksite Food Box program offers deliveries of healthy, pre-packed food boxes that can be picked up weekly by employees at their workplaces. Food box contents are purchased and aggregated from multiple farmers by the food hub. Marketing of the program is aimed at employers, such as businesses, universities or hospitals, that wish to make healthy food more accessible for their employees.

Around the country, such programs are becoming a popular strategy to reach customers who might not otherwise purchase local foods from traditional outlets such as Community Supported Agriculture (CSA) enterprises or farmer’s markets. Ease of pickup and simplicity of ordering are cited as reasons for the appeal of these programs. In 2014, results from an Iowa Food Hub survey of new Food Box customers showed that 91 percent of the respondents had never participated in a CSA program, and 48 percent reported shopping at farmers markets once or twice each year or not at all. In our interviews, food hubs in New York and Pennsylvania made similar observations about the ability of their worksite programs to recruit new local food buyers.

Right: Locally-grown watermelons await distribution.

Below: An example of what could be in a Worksite Food Box.



 www.leopold.iastate.edu

Visit our Cool Tools page
to find the new toolkit online:
www.leopold.iastate.edu/cool_tools



Susan Schwieger checks over a sweet potato that was in the food box she picked up at the University of Northern Iowa. On the left is Rachel Wobeter, who works with the local food group serving Black Hawk and the surrounding counties.

Additionally, the Worksite Food Box program appeals to food hubs because it offers higher gross margins than wholesale distribution – that is, food box customers are willing to pay a larger portion of their food dollar for the delivery service. For this reason, a food hub afford to take on other kinds of distribution activities where margins are narrower, such as farm to school sales.

For a food hub dealing exclusively in wholesale marketing, research suggests that \$1 to \$3 million in gross revenues may be necessary to break even. Worksite programs have been shown to break even at lower sales levels, making them a strategy that food hubs can use to pay the bills as they scale up to wholesale.

The “Developing a Worksite Food Box Program” toolkit describes lessons learned in implementing a Food Box program, including a review of program costs and revenues, labor needs, marketing strategies, management of gross margins, decisions about whether to rent or own equipment, and more.

Upcoming toolkits will focus on other topics related to food hubs including Farm to School and cash flow management.

Annual local food conference looks at next-steps for Iowa

By LAURA MILLER, Newsletter editor

Local food production, marketing and distribution in Iowa beyond CSAs and farmers markets is growing to make local food more widely available at supermarkets, restaurants and schools.

More than 100 farmers, service providers and others interested in expanding local food offerings in the state gathered in April for the 2014 Iowa Local Food Conference hosted by the Leopold Center and Iowa State University Extension and Outreach.

The conference focused on food hubs to aggregate supplies, processing centers for value-added products, and effective ways to market these new businesses. Speakers outlined activities and new resources that contribute to a stronger local and regional food system.

"We know that producing food for local and regional markets is a viable business option and a way to retain young people who love the land and want to be involved in our food system," said conference coordinator Lynn Heuss. "People in Iowa are ready for the next step of building the infrastructure to provide these products for retail and wholesale markets."

Bill Menner, USDA Rural Development director for Iowa, summarized ways that the federal government is working in the local food arena.

"Local food has gotten a lot of attention in the new Farm Bill and that's reason to celebrate," he said. "The beginning farmer aspect is really important. [Growing local food] is a pathway to agriculture for those who cannot afford to start farming 1,000 acres."

In May, the USDA announced an historic \$78 million investment to support loan guarantees for local food projects through the Business and Industry Loan Program and the Farmers Market and Local Foods Promotional Program. Menner said the 2014 Farm Bill also restores funds to the Beginning Farmer and Rancher Development Program and that value-added producer grants can support local food enterprises.

"People are seeing local foods as smart growth," Menner said. He said local and regional food

systems are one of four "pillars" the USDA is using to build the rural economy. One goal during the current fiscal year is to create 100 new local/regional market opportunities, and to help launch at least one new food hub in every state.

Reaching markets and rising above the competition isn't luck, said keynote speaker Lucie Amundsen, whose two-year-old free-range egg business recently enjoyed some national attention. Her Minnesota company Locally Laid was second among 15,000 businesses vying for a free commercial during the 2014 Super Bowl.

"Social media has changed the landscape for farmers," she said. "We used it to build our brand, the personality of our business, and have made it part of everything we do."

She said she and her husband hired a designer to create a logo and carefully wrote their mission statement to represent their values. Locally Laid plants a tree with every delivery. The trees are planted by the Nature Conservancy in their region.

"The cost to us is only 35 cents a tree but people really like it," she said.

Amundsen also writes a blog and posts numerous photos, telling people about life on their farm near Duluth. Although their company does not sell directly to consumers, they still have a following in the community.

"What you do is interesting, there's romance in that story," she said. "We also share some of the hard stuff, like when our water lines froze and we had to transport water in buckets. They know they can trust us and be more forgiving of your follies when you are forthright with them."

Amundsen said humor helps. She said that their motto, Local Chicks Are Better,

was one of the reasons they generated so many votes in the Super Bowl competition. "It just shows we're chicks who want to have fun," she said. "I feel that by keeping things light, I can reach more people."

Kamyar Enshayan, director of the University of Northern Iowa's Center for Energy and Environmental Education, said he's noticed growth in the availability of

locally-grown and processed food in the past 20 years.

"We've come a long way with several pivotal events in Iowa," he said. "Food hubs and development of infrastructure are taking place to make this local food system the 'normal' food system."



More about food hubs

One of the more popular sessions at the local food conference involved food hubs.

"Food Hubs: What Do We Know?" was presented by Savanna Lyons and Joanna Hamilton. Lyons is pursuing a master's degree in Sustainable Agriculture from Iowa State University, and is visiting food hubs in other states this summer as part of her research. Hamilton, who recently received her graduate degree from Tufts University, also is evaluating various aspects of food hub enterprises.

Lyons and Hamilton discussed various models for food hubs and what was learned from a survey of 220 food hubs in the United States. The survey was conducted last fall by the Michigan State University Center for Regional Food Systems in cooperation with the Wallace Center at Winrock International.

Results of the survey and other resources are available from the National Good Food Network: <http://www.ngfn.org/resources/food-hubs>.

The Regional Food System Working Group is gathering information and strategies for possible food hub development in Iowa. A statewide meeting is planned for later in the summer. The group will be focusing efforts on possible food hub projects in north central Iowa: <https://sites.google.com/site/iowarfwsg/home>.

Locally Laid's Lucie Amundsen with her daughter.





LEOPOLD CENTER

LEOPOLD CENTER
FOR SUSTAINABLE AGRICULTURE
209 CURTISS HALL
IOWA STATE UNIVERSITY
AMES, IOWA 50010

Highlight Events

More details, events

Check Leopold Center Web calendar:
www.leopold.iastate.edu/news/calendar

Learn about how to get support for events: www.leopold.iastate.edu/grants/education

Field Day Season

It's time to visit a farm! Check the Leopold Center calendar for field day events hosted by Iowa Learning Farms, Practical Farmers of Iowa, ISU Research and Demonstration Farms and other organizations. Many events feature the work of Leopold Center-supported research teams or projects.

Map of My Kingdom • July 12, West Branch

Practical Farmers of Iowa commissioned Iowa Poet Laureate Mary Swander to write a play about farmland transfer, "Map of My Kingdom." The Leopold Center is a co-sponsor for the play's premiere at Scattergood Friends Farm and School near West Branch.

Ground Operations • July 13, Jasper Winery

This new documentary about military veterans will be shown at the Jasper Winery in Des Moines. The Leopold Center joins Women, Food and Agriculture Network and Drake Ag Law Center in hosting the event.



Doing conservation

Pauline Drobney (left) talks about ways to add prairie conservation strips to crop fields, which has been done on land managed by the Neal Smith National Wildlife Refuge in Jasper County. Researchers, landowners and others met for an annual stakeholders meeting in June. Drobney works at the refuge and is a member of the Science-based Trials of Rowcrops Integrated with Prairie Strips (STRIPS) research team.

Annual Seed Savers Exchange Conference • July 18-20

Thanks to a Competitive Educational Support Program (CESP) grant from the Leopold Center, Seed Savers Heritage Farm near Decorah is offering scholarships for new or minority farmers to attend this event.

Midwest Conference for Farmer Veterans • July 25-26

Farm tours, workshops and networking are planned for military veterans who are interested in ag-related careers. It is planned by the Farmer Veteran Coalition of Iowa with support from Drake University, the U.S. Department of Agriculture and the Leopold Center.