NEBRASKA Sustainable Agriculture Society

Features:

Regular Columns:

Promoting agriculture and food systems that build healthy land, people, communities, and quality of life for present and future generations.

By William Powers

NSAS Program News:

NYFN Forging Even More Farmer Connections in 2014

"Here it feeds the soul."

Connecting and building lasting relationships to lay the foundation for an agriculture of the present and the future: That's a major goal of Nebraska Young Farmer Nights (NYFN), a program of the Nebraska Sustainable Agriculture Society (NSAS).

Nebraska Young Farmer Nights began in 2013 with a series of five events. All were a huge success and helped lay the foundation for an expanded NYFN program in 2014.

The 2014 NYFN season began with a postponement due to inclement weather. In Nebraska, no... But yes, it was postponed. The next one, we held at Prairie Pride Poultry at York. Dan Hromas and his family are doing amazing things with eggs.

The How's & Why's of NYFN

What are Nebraska Young Farmer Nights? The idea is to build a community of young farmers, aspiring farmers, and folks interested in food and farming in Nebraska. We see each other at conferences and events, but rarely spend time together or see the amazing work we are all doing. NYFN is a way for us all to see and learn from one another and get off our own farms for an evening.

The model for each event, held on different farms in Nebraska, is to:

- eat dinner together, usually potluck-style;
- have a farm-related activity (e.g. tour the fields or give a presentation on something that works well on your farm);
- hang out together (e.g. bonfire or play cards).

NYFN is meant to be a jumping off place for us to form a community. For the past several years at the Healthy Farms Conference, Sustainability Happy Hour & FSG events, the connections and friends made led to collaboration such as tool borrowing/trading, cooperative purchasing power, swapping of mutual resources, brainstorming on pest management and more.

NYFN is For Everyone

Who can attend and who can host? Anyone and everyone interested in sustainable agriculture can be a part of NYFN. We encourage aspiring, as well as established, farmers and foodies to

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come be a part of the sustainable agriculture community in Nebraska,

Our postponed kickoff NYFN event was held at Big Muddy Urban Farm in Omaha. One of our favorite young and beginning farms, Big Muddy has numerous projects in the works, all geared toward revitalizing the community one eater at a time.

We have held 12 NYFN events so far this season. We have had more than 450 young farmers, aspiring farmers and other folks interested in healthy local sustainable foods attend. While we have had several folks attend multiple NYFN events, a majority of the attendees attended only one or two a year.

Young farmers, old farmers and everyone in between is invited and our demographics have been as wide ranging as the farms and locations. We have held NYFN events across the state of Nebraska, from Gering to North Platte to Hastings to Omaha.

The impact beyond the night is immeasurable. We are changing the world—one farmer at a time!

Young farmers are gleaning useful information about one or another component of the host farm and incorporating it into their own aspirations and dreams. Some young and aspiring farmers may want to utilize biodynamics and were able to see, hear and experience the cool things that Ruth and Evrett are doing at Common Good Farm at Raymond. Others may want to incorporate pastured hogs into their farm plan and saw and heard first-hand the trials, successes and tribulations that Ben and Michelle are experiencing at Paradise in Progress Farms at Omaha.

And all have a new found respect for where, why and how their food is produced!

We have at least two more NYFN events scheduled:

⇒ **On August 21**, we'll visit No More Empty Pots & Truck Farm at Omaha

⇒ Our final event for the season will be **September 10** at Darby Springs Farm at Ceresco.

Please plan to join us for the final NYFN event as we close out the season and look toward the future of sustainable agriculture in Nebraska!

The **NSAS Newsletter** is a bimonthly publication of the Nebraska Sustainable Agriculture Society (NSAS), a private non-profit organization. Our mission is to promote agriculture and food systems that build healthy land, people, communities, and quality of life for present and future generations. The purpose of this newsletter is to inform our readers on sustainable agricultural issues, resources, and activities. This newsletter is a NSAS membership benefit.

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William is the Executive Director of the NSAS and co-owner of Darby Springs Farm at Ceresco with his wife, Crystal, and their two children.

NSAS Member News

Share what's going on in your lives, your communities, and on your farms. We are especially interested in:

- Happenings on your farm or ranch, such as research/experiments you're trying, new practices, varieties or breeds you're putting into place, fields days, successes and lessons learned.
- Community or family events, such as marriages, graduations, births, community activities, and educational pursuits.

Send contributions to healthyfarms@gmail.com or by postal mail to: NSAS, 414 CR 15, Ceresco, NE 68017.

THANK YOU!!

NSAS Supporters Raised $8,000+ at the 2014 Auction

The Nebraska Sustainable Agriculture Society would like to thank the following individuals and businesses who donated items or their time to make the NSAS fundraising auction at the 2014 Healthy Farms Conference a great success again this year. We raised over $8,000 thanks to your support!

Bluff Valley Farm / Thiltges Family
Branched Oak Farm
Buy Fresh, Buy Local Nebraska
Common Good Farm
Terry Gompert Family
Ingrid Kirst
Roberts Seed
The Ross Theatre / Danny Ladely
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Blue River Hybrids
Liz Sarno
Fulton Farms / Kevin Fulton
Hoegemeyer Seeds
Shadow Brook Farm / Kevin & Charuth Loth
The Mary Riepma Ross Media Arts Center
Billene & Richard Nemec
Donald Vetter
Wattermann Family Farm
Clear Creek Organic Farms
Darby Springs Farm / William & Crystal Powers
Bug Muddy Urban Farms
Walnut Creek Organic / Rich & Joe Mazour
Nebraska SARE
Platte Valley John Deere Imp.
Adam Schole
Grosenburg Implement
Scott Willet
Sunny Parson & the Lincoln Secret Supper
Marnie Jensen & Kenny Bogus
Green Cover Seeds
Ben Schole
Denise Trine
Martin and Linda Kleinschmit
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Individual/family memberships only $45 a year

About NSAS

NSAS is a non-profit, grass-roots membership organization. Initiated more than 30 years ago by farmer members, NSAS has grown into a dynamic organization with members from all across Nebraska. We welcome farmers and non-farmers alike… Everyone eats!

Our mission: To promote agriculture and food systems that build healthy land, people, communities and quality of life, for present and future generations.

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NSAS Programs

Healthy Farms Conference, the annual NSAS meeting—**save the date: February 6-7 in Omaha**

Western Nebraska Sustainable Agriculture Conference, a joint NSAS-University of Nebraska-Organic Crop Improvement Association event held annually in the Panhandle

Farm Beginnings Nebraska, a joint NSAS-University of Nebraska 10-week course for beginning farmers

Nebraska Young Farmer Nights, a series of gathering events for beginning/aspiring farmers

Producers Choice Chef Award, recognizing local foods chefs—**save the date: January 25, 2015**

Nebraska Beginning Farmer Mentorship Program, connecting beginning/transitioning farmers with mentors in sustainable practices

Market Nebraska, an online interactive map of Nebraska's local foods outlets

NSAS Memorial Library, a collection of books housed at Ceresco, many donated by the family of the late holistic grazing expert Terry Gompert and by longtime sustainable agriculture advocate George Meyers

Farmer Support Group, an in-person discussion group for all farmers and growers that meets monthly at Ceresco

Western Nebraska Fruit and Vegetable Group, an in-person discussion group for growers in the Panhandle

Nebraska High Tunnel Project, workshops and a webinar educating growers on high tunnels

Farm2School Project, connecting local foods producers with interested school cafeterias

SAVE THE DATE:

2015 Healthy Farms Conference to be February 6-7 in Omaha

The Nebraska Sustainable Agriculture Society is in the midst of planning an awesome, dynamic Healthy Farms Conference for 2015. The dates will be February 6-7, 2015, and it will be held at The Institute for the Culinary Arts at Metropolitan Community College at Omaha.

We are pleased to announce that our keynotes for 2015 will be **Dr. Paul Thompson** from Michigan State University at East Lansing, Michigan, and the ***Growing Cities*** **film team** from Omaha.

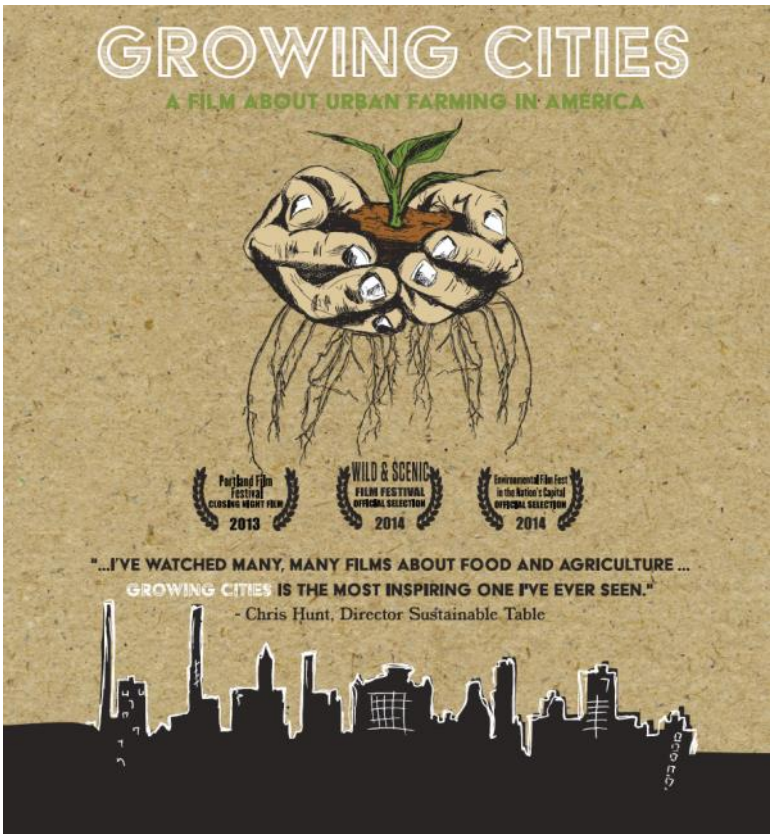
Dr. Thompson holds the W.K. Kellogg Chair in Agricultural Food, and Community Ethics. His research centers on ethical and philosophical questions associated with agriculture and food, and especially concerning the guidance and development of agricultural techno-science.

Growing Cities is a feature-length documentary that examines the role of urban farming in America and asks how much power it has to revitalize our cities and change the way we eat. At its core, *Growing Cities* explores what type of urban growth is important for our future. It asks people to reimagine what's possible in urban settings and consider creating *Growing Cities* of their own: places that are healthier, more sustainable and socially just.

More details of the 2015 Healthy Farms Conference will be announced as they are finalized.

Breakout sessions will include topics on permaculture, working with interns, using greenhouses, farmers as advocates, farming with a family, cooking with local foods and more. We'll also have an entire track of sessions dedicated to urban agriculture issues and will once again feature a full youth session as well as the ever popular and original All Nebraska Evening events.

Stay up to date via the NSAS listserv (email healthyfarms@gmail.com to join) or by visiting HealthyFarms.org.



OCIA News

Organic Crop Improvement Association
Nebraska Chapter #1

By Rita Brhel

Cover Crops Doubling as Forage

Continuing drought conditions force producers to get more creative in finding ways to feed their livestock affordably, and some producers are opting to grow their own forage on acres usually reserved for crop production.

Kim Cassida, a forage specialist with Michigan State University in East Lansing, Mich., explained that because of the profitability of corn and soybeans, these crops are getting the higher quality land so that what hay acreage is available is on marginal land without as much productivity as hay producers have previously experienced. Throughout the Midwest, U.S. hay acreage has shrunk drastically—while hay prices have skyrocketed.

"We've had a pretty tight forage supply the last couple of years, and as a result, the prices are quite high," Cassida said. "And this is a situation that isn't likely to change anytime soon."

At the same time, livestock production has decreased overall quite sharply. The U.S. beef herd is currently at 50-year lows. The livestock producers left are pinching pennies trying to find enough pasture ground and winter forage, and even low-quality hay is considered costly. Cassida said it's time for producers to start looking at alternatives.

"It doesn't have to be just alfalfa, corn silage and perennial grass," she said. "There's a lot more forage types out there."

Using Cover Crops as Forage

One of the latest developments among crop producers to mitigate drought conditions, as well as reduce reliance on herbicide and fertilizer, has been planting cover crops—a plant crop planted between cash crops to protect and build the soil structure. The cover crop is not harvested for market value; rather, the worth is in the soil fertility-building plant residue.

"A cover crop can be planted any time the soil is exposed: after row-crop harvest, into an existing row crop or even as nurse crops to protect new perennial seedlings," Cassida said.

The research shows many benefits of cover crops, from weed suppression and nitrogen fixation to erosion prevention and increased water-holding capablity, but adoption of the practice has been slow. Part of the reason is that, as of now, there are restrictions on cover crops in crop insurance policies, many of which see cover crops as competing with cash crop yields.

Cover crop popularity is predicted to increase as the effects of climate change—namely, longer and more severe droughts—increase, and Cassida said that crop insurance restrictions on cover crops is changing with the new Farm Bill.

There is a long list of cover crops and some examples include alfalfa, triticale, sudangrass, red clover, oats, cowpeas, sorghum, sunflower, beans, radish, sudex and collards. Cassida said that the plant species used for cover crops can also be used for livestock forage and that cover crops could be doubled-up both as an enhancer for cropland as well as low-cost livestock feed.

"The only biological difference between a cover crop and an alternative forage is whether you're going to harvest it for your animals or terminate it for your soil-building," she said.

Additionally, added Karla Hernandez, forages field specialist for South Dakota State University at Brookings: "Producers may also consider some other less-utilized crops for use as forages that can easily be worked into a 'corn-beans-something else' crop rotation. Should unfavorable weather

OCIA News

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restrict the growing season, these forages can also work well as an emergency or rescue crop."

What Could Go Wrong?

Making the best decision means being informed, and while cover crops have great benefits, there are challenges and risks.

Some cover crops can self-reseed, becoming weeds themselves, like hairy vetch, ryegrass, buckwheat and cereal rye. Hairy vetch can also cause a veterinary condition that manifest in neurological abnormalities coupled with dermatitis. Buckwheat and immature forage rape can also photosensitization of grazing livestock.

"Basically it causes the animal to get a bad sunburn," Cassida said. "Buckwheat is an excellent cover crop, but I just tell people to avoid it as a forage."

Also, sweet clover is one to avoid if there are plans to bale or ensile, as it's prone to mold. The toxin produced by the mold is the same found in rat poison.

Depending on the weather, sorghums, small grains and brassicas can develop nitrate toxicity. Certain conditions can also lead to prussic acid poisoning in new shoots of sorghum and sudangrass, or when wilted. Also situational, wheat, clover, medics and brassicas may cause bloat.

There is also concern that animal traffic while grazing cover crops could cause soil compaction on cropland. Cassida suggested using no-till, grazing while the ground is frozen and keeping livestock off of wet ground. Soil compaction from livestock is less of a concern for the Northern Plains because of the natural effects from freeze-thaw action.

"The freeze-thaw cycle tends to correct the compaction, but if you're concerned, when the ground is wet, you can put the animals in a small portion of the field," Cassida said.

However, by doing this, producers are much more likely to see heavy compaction on a smaller piece of land: "It'd be like sacrificing that bit of land," she added.

Which Cover Crops Work Best?

The best cover crops doubling as forage crops are those that are used for short rotations between row crops, Cassida said. Characteristics of ideal plant species include:

- Fast-growing, vigorous seedlings,
- Reaching harvestable biomass within 60 days,
- Doesn't self-seed,
- Acceptable nutritional value for the specific livestock species,
- Low toxicity risk,
- Ability to be preserved as hay or silage,
- Regrows after grazing.

As with any crop, the first step is getting a soil test. Phosphorus and potassium are particularly critical for cover crops, Cassida said. Boron is also required for brassicas in sandy soils or soils with low organic matter. Applying 25 to 50 pounds of nitrogen per acre can help give a head start to a first-time cover crop, particularly brassicas. Ideal soil pH for brassicas and grasses is higher than 6.0, and higher than 6.5 for legumes.

When choosing a cover crop, consider whether it will be grazed only or also hayed or ensiled. If so, good picks are forage sorghum, sudangrass, sudex, triticale or an oats-pea mix. Brassicas are not good for this use, as their in-field moisture level is 80-95%, much too wet. Ideally, a cover crop would be at 70-80% moisture for ensiling, Cassida said.

Her choice of the best cover crops that double as forages are: oats, triticale, wheat, rye and barley. They are ready to graze in 40 to 60 days, and forage quality actually increases in cool weather, which makes them ideal as fall forage when pastures are going dormant.

Sorghum, sudangrass and sorghum-sudangrass hybrids are harvestable in 45 to 90 days, but Cassida said growing conditions have to be monitored to watch for nitrate and prussic acid toxity. Hernandez said that sudangrass and sorghum-sudangrass hybrids grow well with minimal inputs and on marginal land, have high forage yields and can be used for grazing, hay or silage.

"The winter annuals work well as a fall-seeded cover crop in the Northern Plains," she added.

There are also new developments in forage sorghums, Cassida said, where researchers are experimenting with a dwarfing gene that basically shortens the nodes between the leaves, so the resulting plant is more compact yet has as much dry matter as taller varieties. This reduces lodging, or when plants lay over after a high wind, and also allows for plantings at higher densities. Perhaps most interestingly, some of these new varieties are able to be harvested at just 28 days.

Annual and Italian ryegrasses are ready to graze in 60 days and regrow well, but annual ryegrass easily becomes a weed of its own and is Roundup resistant. Italian ryegrass is a biennial, so it's safer to use to avoid the reseeding problem.

Brassicas are ready in 60 to 90 days. They are extremely cold tolerant and so are great for a fall-winter pasture. They are inexpensive to establish and highly productive—rape-kale hybrids are able to produce up to 5.5 tons-per-acre dry matter—but they are not appropriate for baling or ensiling. It is best to plant brassicas as a mix with oats or grasses.

"Brassicas should never be fed as the only forage, because they are too low in effective fiber," Cassida said.

Overall, though, cover crops doubling as forage sources is a win-win situation for farmers.

"By taking advantage of the varying conditions these alternative annual forages prefer, a producer can very easily diversify their crop production portfolio," Hernandez said, "which can lead to additional income streams while contributing to the overall health of their farmland."

By Rachel Verlik

Sustainable Agriculture, Sustainable Mindfulness

It's early summer on the East Coast, which means I'm spending a lot of time in my garden. I'm harvesting spring vegetables, and have planted my summer crop. I spend the majority of my weekends digging in the dirt, weeding, mowing and tending to my plants.

I jokingly refer to my time in the garden as my "therapy." A good sweat and a sense of accomplishment at the end of a long day outside can't be beat. Eating a ripe red tomato still hot from the sun is a little paradise on earth. Not one day goes by in my garden that I don't marvel at how a seed I could barely see on my hand in February is now producing a bumper crop.

And while I'm planting seeds, hauling compost or pulling weeds, it gives me a lot of time to think. I sense myself slowing down, gaining new perspectives on issues, and appreciating the ebb and flow of nature. I think a lot about sustainability and the cycle of the natural world.

During my time in the garden this year, I've contemplated the parallels between sustainable agriculture and what I'll call "sustainable mindfulness." The U.S. Department of Agriculture defines sustainable agriculture as incorporating practices that provide long-term viability and enhance the quality of the environment, the natural resource base, and the lives of both farmers and society as a whole.

So, what if I applied the principles of sustainable agriculture to sustainable mindfulness? Reflection on what ingredients I need to prosper and thrive for the long term would serve me well. As I age, I recognize how important daily periods of reflection and quiet are. Whether you refer to it as prayer, meditation, reflection or other, it allows the rest necessary to rejuvenate and see other possibilities. It is one of many ingredients that help my inner garden thrive.

Admittedly, I do really well for awhile with mindfulness, prayer, reflection and meditation. I feel great—calm, powerful and centered. Then somehow, I don't tend to my practice as much and the weeds start growing in my brain. They choke out the good stuff, and I'm back to a thorny mess. I haven't given my heart, soul, body and mind the nutrients or tending it needs to thrive.

> "Most importantly, realize that just like my vegetable garden, this is trial and error. I will make mistakes, try things that don't work and course-correct. And each time, I will learn from the past and harvest better results."

Just like overwintering my garden, I'm learning to allow myself to rest and recover. My tomatoes don't grow well in the summer if the soil hasn't had time to rest over the winter. Similarly, I don't grow or perform at my best when I don't have time to rest, recover and replenish.

Knowing all this, I still struggle with making mindfulness and meditation as much of a practice as I should (or want to). There always seem to be something more pressing or urgent to attend to. But like sustainable agriculture, I want to enhance my resilience and long-term viability. I want to make sure this is ingrained in me and that I recognize how necessary it is to have the energy to attend to all those "pressing" items.

Or maybe I just realize that some of those pressing items are solely toxic chemicals, choking out the growth.

And just as plants have their season, maybe some of my thoughts and stressors have had a season, too. They fed me for a period of time. But with mindfulness and rest, I can recognize that their time is ready for the compost pile. I can recognize that similar to my gardening ventures, I try things out, they don't work and I make adjustments for the next go-around.

So, time to start working on my inner mindfulness garden. Weed all the garbage away that isn't helping me any. Replenish the nutrients and substance my mind and body needs. Get rid of any toxic materials that will stunt growth. Build a sustainable practice of mindfulness and rest that can prosper over the long term.

Most importantly, realize that just like my vegetable garden, this is trial and error. I will make mistakes, try things that don't work and course-correct. And each time, I will learn from the past and harvest better results.

Rachel Verlik. blogs at Huffington Post. She is an avid gardener in Washington, D.C. Follow her at Twitter.com/Rachva01

From the USDA

New Data Reflects Demand for Farmers Markets

The U.S. Department of Agriculture's Agricultural Marketing Service (AMS) Administrator Anne Alonzo has announced that USDA's National Farmers Market Directory now lists 8,268 markets, an increase of 76% since 2008. The data reflects continued demand and growth of farmers markets in every region of the country.

Alonzo also announced that AMS is developing three new local food directories that will expand USDA's support for local and regional foods by providing easy access to the most current information about the local food market.

She attended the Dane County Farmers Market in Madison, Wisconsin, the country's largest producer-only market, where she kicked off the 15th annual National Farmers Market Week, Aug. 3-9.

"The National Farmers Market Directory numbers reflect the continued importance of farmers markets to American agriculture," Alonzo said. "Since its inception, the directory has proven to be a valuable tool for accessing up-to-date information about local farmers markets. Farmers markets play an extremely important role for both farmers and consumers. They bring urban and rural communities together while creating economic growth and increasing access to fresh, healthy foods."

The USDA National Farmers Market Directory, available at FarmersMarkets.usda.gov, provides information about U.S. farmers market locations, directions, operating times, product offerings and much more. The data is collected via voluntary self-reporting by operating farmers market managers and is searchable by zip code, product mix and other criteria. The National Farmers Market Directory receives over 2 million hits annually.

In addition to USDA's National Farmers Market Directory, AMS is adding the:

- **National Community-Supported Agriculture (CSA) Enterprise Directory**—A CSA is a farm or network/association of multiple farms that offer consumers regular deliveries of locally-grown farm products during one or more harvest seasons on a subscription or membership basis.
- **National Food Hub Directory**—A food hub is a business or organization that actively manages the aggregation, distribution and marketing of source-identified food products to multiple buyers from multiple producers, primarily local and regional producers, to strengthen the ability of these producers to satisfy local and regional wholesale, retail and institutional demand.
- **National On-Farm Market Directory**—An on-farm market is a farm market managed by a single farm operator that sells agricultural and/or horticultural products directly to consumers from a location on their farm property or on property adjacent to that farm.

USDA invites local food business owners who fall within these categories to list their operational details in the new directories located USDALocalFood Directories.com. These new directories will be available online early in 2015, giving potential customers, business partners and community planners easy, one-stop access to the most current information about different sources of local foods.

2014 Directory Highlights

According to USDA's 2014 National Farmers Market Directory, the states with the most farmers markets reported are:

- California—764 markets
- New York—638 markets
- Michigan—339 markets
- Ohio—311 markets
- Illinois—309 markets
- Massachusetts—306 markets
- Pennsylvania—297 markets
- Wisconsin—295 markets
- Virginia—249 markets
- Missouri—245 markets.

"Farmers markets bring urban and rural communities together while creating economic growth and increasing access to fresh, healthy foods."

All geographic regions saw increases in their market listings, with the most growth in the South. The 10 states with the biggest increases in the numbers of farmers markets include:

- Tennessee
- Louisiana
- Texas
- Hawaii
- Massachusetts
- Arkansas
- North Carolina
- Montana
- Florida
- Nebraska.

Five of these states—Tennessee, Louisiana, Texas, Arkansas and North Carolina—are part of USDA's StrikeForce for Rural Growth and Opportunity, where USDA has increased investment in rural communities through intensive outreach and stronger partnerships.

Farmers market development is a cornerstone of USDA's Know Your Farmer, Know Your Food initiative, which coordinates the USDA's policy, resources and outreach efforts related to local and regional food systems.

U.S. Secretary Tom Vilsack has identified strengthening local food systems as one of the four pillars of USDA's commitment to rural economic development.

By Rita Brhel

New Test Better Measures Soil Carbon

There is a lot of discussion globally on the best way to conserve natural gas, oil and water, but there is another natural resource just as critical to the future of industrial agriculture yet rarely the center of conversation: soil carbon.

Now available are a specialized soil carbon test to help farmers reduce their commercial fertilizer use by taking advantage of natural soil fertility.

Conventional crop production has effectively been able to conserve arable land by increasing yield per field without expanding production land area, but it has been at the expense of natural soil fertility, says Ray Archuleta, conservation agronomist with the U.S. Department of Agriculture's Natural Resources Conservation Service's National Soil Health and Sustainability Team based in Greensboro, N.C. And now most of the soils worldwide are in a degraded state.

Archuleta explains how in one demonstration field, 17 years of intensive tillage led to a 62.8% loss in organic matter in the soil. Depleting the soil carbon means that farmers must then add something back to the soil for it to work as intended, and commercial fertilizer doesn't come without consequences. Conventional agriculture relies on a considerable consumption of natural gas and oil, whether through machinery fuel or by manufacturing fertilizer. In the case of replacing natural soil fertility, for example, it took 1.5 billion gallons of diesel to make the commercial fertilizer to grow the 84 million acres of corn this past year in the United States, Archuleta adds.

Knowing more of what's going on underground helps producers make better decisions for their fields and operations.

"That's enough to run all the cars in the U.S. for four days," he said. "Why can't we do that with the soil? We can, but in order to do that we need to understand the ecosystem. The rule is of an ecosystem is, everything is connected. Everything affects everything else, and there's no such thing as a free lunch."

An ecosystem requires balance of inputs and outputs as well as recovery from stressors like tillage. The soil ecosystem is always "on," meaning there is no break when the growing season ends. The soil microbes and macro-organisms, solar energy flow, water cycle, nutrient cycle and soil-food web are all interconnected, always going and in flux according to the environment. This is why even after a 17-year depletion of soil carbon—if given the opportunity—the soil ecosystem will rectify the situation.

"Even as a farm, it never stops trying to grow as a forest. It never stops wanting to grow this way," Archuleta said.

Soil carbon is not only the foundation for the soil ecosystem but also the byproduct of the biological processes going on within. When crop producers take into account the natural systems in their field management through such practices as no-till and cover crops and grazing livestock on stubble, they are able to balance their commercial fertilizer applications to reduce waste and take advantage of the naturally occurring soil carbon renewed free of charge and virtually labor-free.

Soil tests are a staple management strategy that helps farmers determine the soil's fertility potential and deficits. The most widely used soil tests include measurements for nitrogen, phosphorus and potassium. Depending on the soil type and other factors, producers may opt to test for certain micronutrients.

There are now specialized soil tests available to measure certain soil properties, and one of these measures water-extractable carbon, the specific form of nitrogen used in microbial activity that is required to break down field residue into organic matter to be used by crops. The unique aspect of water-extractable carbon is that it measures only the nitrogen that is readily available for that purpose.

Water-extractable carbon can help farmers determine how much nitrogen needs to be applied. For example, a long-time no-till field likely has plenty of water-extractable carbon available for soil microbes to release the nitrogen bound in the plant residues, making that available for crop use. However, a recently transitioned no-till field may have high soil nitrogen tests but not high water-extractable carbon. So the nitrogen is there but is not being released by microbial activity for crop use. And adding nitrogen to the field won't help that situation.

Knowing more of what's going on underground helps producers make better decisions for their fields and operations.

By Rita Brhel

Some Ideas for Farming with Arthritis

The average age of the American farmer is nearly 60 years old, so it's not inconceivable that many producers may be suffering from arthritis, a medical condition that can affect people of any age but is more common as adults age.

That said, more than half of the individuals with arthritis are younger than 65 years old, said Amber Wolfe, the AgrAbility project coordinator at the Arthritis Foundation in Indianapolis, Ind.

The hallmark of the more than 100 arthritic diseases is swollen, painful joints, especially during movement. Most forms of the disease are chronic, can be progressive, can affect any joint, and have no cure. Understandably, arthritis makes life harder for the 50 million Americans affected—in fact, it is the most common cause of disability in the U.S. workforce, limiting nearly 2 million working Americans—especially those who work more physically active jobs, like farming and ranching.

In some ways, agricultural production can worsen arthritis. Stress—such as planting conditions or volatile markets—can worsen arthritic symptoms.

"Arthritis is just as much mental as it is physical," Wolfe said.

But, surprisingly, in other ways, farming can actually help those with arthritis—to a point. Movement encourages joint flexibility and range of motion, but everyone has a threshold of joint use, which once crossed actually worsens the arthritis.

"Rushing yourself can irritate arthritic joints," Wolfe said. "Remember, movement is medicine. Staying in a state of movement is very good for arthritis. However, excessive movement or high-impact exercise isn't as good for arthritis as low-impact and stress-free exercise."

To ease arthritic symptoms as much as possible, she recommends these guidelines:

- Pace work.
- Stretch and warm up joints before working, and stretch joints after working.
- Use proper tools.
- Wear gloves.
- Change positions frequently.

> If you start to feel pain, stop and move onto another type of activity with a different part of the body, or stop completely and rest.
> You have to take care of your body just as you would with anything else in your equipment shed.

- Use the largest, strongest joints possible for the job, such as carrying heavy objects close to the body and living with the legs rather than the back.
- Keep tools nearby.
- Use a stool or knee pad when needing to do work at the ground level.
- Work at the best times of the day for each individual's arthritic symptoms.
- Make modifications to tools as needed.

Additional ideas are to keep good posture, avoid twisting joints, reduce use of vibrating tools, change position often but avoid repetitive tasks for long periods of time, wear wrist and back braces when lifting and carrying heavy items, choose footwear with a hard sole, good traction, and that supports the ankles and knees, take breaks to flex fingers, stay hydrated and avoid caffeine.

Some arthritis sufferers find that sun exposure helps their joints, but overexposure could cause overheating and dehydration, which makes joint pain worse.

Some, though not all, people with arthritis require modifications to their tools to manage their pain. Steve Swain, assistive technical specialist with the National AgrAbility Project's Breaking New Ground Resource Center at Purdue University in West Lafayette, Ind., says there are a wide range of ergonomic options available.

"Careful tool selection can make [farming] easier, while protecting you from unnecessary and unwanted stress, strain, and injury," he said.

Examples of ergonomic features include longer tool handles, cushioned handles, reaching devices, rolling carts, thumb rests, smaller-diameter grips, spring-loaded or power-assisted hand tools, two-handed grips, bag-carrying handles and tools that extend.

Every person knows their limit and experience teaches what is needed to manage both arthritis and the farm. The best piece of advice, Wolfe says, is for producers to listen to their bodies to know when to slow down or stop.

"If you start to feel pain, stop and move onto another type of activity with a different part of the body, or stop completely and rest," she said. "Everybody's threshold is different. You may even have to stop for the day and come back the next day, even when you feel you have to get it done because it's going to rain or you need to get it planted or whatever."

Producers need to remind themselves that of all the equipment on their farm, the most important resource is themselves, Wolfe adds.

"You have to take care of your body just as you would with anything else in your equipment shed," she said.

Opinion: Robotic Bees Better than the Real Thing?

Ah, humans—we are destructive creatures, aren't we? If our actions destroy something, it seems to be mankind's way not to repair what is broken but instead to create an entirely new gadget to bridge the gap caused by the thing we broke. Let me explain.

We all know by now that the mysterious Colony Collapse Disorder (CCD), the phenomenon where honey bees were suddenly abandoning their hives, as well as equally mysterious bee deaths from other causes, is believed to be the result of various agricultural pesticides. It was long suspected, and despite pesticide manufacturers shaking their heads at accusations that their products were at least partly to blame, the evidence ended up pointing in their direction anyway.

The thing is, we need bees. Even with all of our technology, we still rely on so much of the natural world for survival. Bees provide pollination, which is the root of so many plants' ability to reproduce and, therefore, to grow food for us. The commercial beekeeping industry is built directly upon the importance of honey bee pollination. It's almost mind-blowing to think that honey bees—a small, winged insect that we find buzzing around our gardens—are responsible for pollinating crops worth at least $15 million each year. It really made me think the last time a bee got trapped in the back seat of the car and my children were screaming at me to squish it. I let it fly out a window.

But there is a problem. The U.S. agricultural industry is not going to willingly give up on using pesticides. These chemicals make it possible to produce the amount of crops that our nation is producing. These chemicals are very effective at doing their job. I get that.

But I also get that bee pollination is in significant danger. Something somewhere is going to have to give. And I was thinking, either the pesticide and/or agricultural industry has to change or the bees will be gone. But, it turns out, someone had found a door number 3: robotic bees.

The Harvard School of Engineering and Applied Sciences with the Wyss Institute for Biologically Inspired Engineering at Harvard have created the "RoboBee," an electronic device smaller than a quarter, weighing just a tenth of a gram, that can hover and follow a preplanned flight path. The team feels that these prototypes are at least 20 years out from actually being used in pollination, because of all of the refinements to the design that will need to happen as technology advances. The team also feels that RoboBees would only be appropriate as a stop-gap measure while a solution to bee deaths and CCD was being implemented to restore natural pollinators. Hopefully that would actually be how they were used, and RoboBees wouldn't be expected to completely fill the gap left by a decimated honey bee population. A lot can happen in 20 years.

Hopefully a CCD solution is found way before 20 years from now. Sometimes, I think we humans get lulled into a false sense of security that what is happening in our natural world, from global warming to CCD, is either too slow to worry that much about or will fix itself on its own by adapting to the environmental changes that mankind creates. Either way, there doesn't seem to be much urgency when problems like this arise.

Not that CCD should, or could even be, fixed tomorrow even if drastic measures like stopping pesticide application all together happened, but our response should be somewhere in the middle of the two extremes: The pesticide/agricultural industry should take some responsibility, while the environmental sides of things need to realize that there needs to be some give on that part, too. Otherwise, we may be foolish enough to think that robotic bees are the answer to CCD.

Opinion piece by Rita Brhel