



# Climate Change & Agriculture

The consequences of rising global temperatures are showing all around us, with ever-increasing effects on farmers, agriculture and the future of our food supply.

This exhibit shows creative ways farmers and others in the food sector are adapting and fighting back, as well as things YOU can do to help in the struggle against climate change.

In this exhibit, we'll explore the relationship between climate change and agriculture, and share how responsible soil and water management, grazing, continuous cover, and the prevention of food waste can play a role in helping mitigate the climate crisis.

We'll share stories of innovative farmers, foodmakers and organizations who are building successful businesses and tackling the climate problem head-on.

## Healthy Local Food Exhibit Partners


 HealthPartners

**power  
up**



**SACRED  
BLOSSOM**  
living herbal teas



Made with support from  
 MINNEAPOLIS COLLEGE  
OF ART AND DESIGN





# renewing the countryside

interested in creative  
farm financing?

Renewing the Countryside recognizes the need for several structures to be altered to revitalize rural economies, ecosystems, and education. To this end, we are coordinating a state wide effort to identify and implement alternative financing mechanisms for farming and local foods based businesses.

[renewingthecountryside.org/grow\\_a\\_farmer](http://renewingthecountryside.org/grow_a_farmer)

want healthier food  
for children?

Farm to School & Farm to Early Care: Helping connect our children with healthy local food. We have designed a farm to early care activities guide around different local foods - "Pint Size Produce". This tool is designed to give child care providers the skills, tools and confidence to implement Farm-to-Early Care systems, activities, and curriculum for the children they care for across the entire state of Minnesota.

[www.renewingthecountryside.org/pint\\_size\\_produce](http://www.renewingthecountryside.org/pint_size_produce)

are you interested in  
becoming a farmer

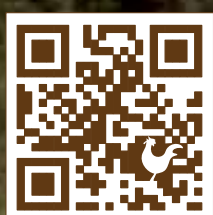
New farmers are vital to our future. Our nation is counting on a new crop of farmers to grow our food, revitalize the countryside and protect our natural resources. Renewing the Countryside is leading a hub of organizations to help beginning farmers navigate the process of attaining land tenure. We connect new farmers, provide educational opportunities, and seed inspiration for sustainable, organic production. Farmland Access is for any young or beginning farmer who is aspiring to be or currently involved in organic and sustainable farming.

[www.renewingthecountryside.org/farmlandaccess](http://www.renewingthecountryside.org/farmlandaccess)

looking for local foods?

FEAST! Festival and Tradeshow: A regional local foods festival and tradeshow at the Rochester Civic Center in December. The two-day event will showcase the best local food producers and makers from Minnesota, Iowa and Wisconsin.

[www.local-feast.org](http://www.local-feast.org)



[f/renewingthecountryside](https://www.facebook.com/renewingthecountryside)  
[@RtCountryside](https://www.twitter.com/RtCountryside)



# Food Waste



## Did you know?



of all food  
produced globally  
gets thrown away

With 7.9 billion people on the planet, Globally, we waste about 1.4 billion tons of food every year, 30-40% of the entire US food supply. 219 pounds of waste per person.<sup>1</sup>

### Wasting Energy Through Food?

When we waste food, we waste all of the energy and water it takes to grow, harvest, transport, and package it. When food waste goes to landfills to rot, it produces methane, which is a greenhouse gas that is even more potent than carbon dioxide.

25%

25% of freshwater used in the world goes to grow food that is wasted<sup>2</sup>



### Ways to reduce food waste in your own home:

- Shop smart and realistically
- When cooking, don't prepare too much food
- By avoiding clutter in your fridge, pantry, and freezer, you can clearly see what you have and are less likely to waste food in the long run
- Food is often fine to eat after expiration and sell-by dates, trust your senses of sight, smell, and taste
- Challenge yourself to keep track/journal what you throw away
- Use reusable produce and grocery bags instead of plastic



# Climate Champions



“One of the great things about the Organic Produce World, is that it is possible to thrive while doing what you know is the right thing to do. When buying product, both regionally and from distant farms, we try to source from farms that are strong stewards of the soil and that care about their works and community. We recognize that the farms we get our product from are the key to our business’s continued success. We want them to do well, so we treat them with respect on all levels. Between the members, stores, farms and warehouse, we have developed a unique, viable, and truly alternative food distribution system.”

— Rick Christianson, Coop Partners Warehouse



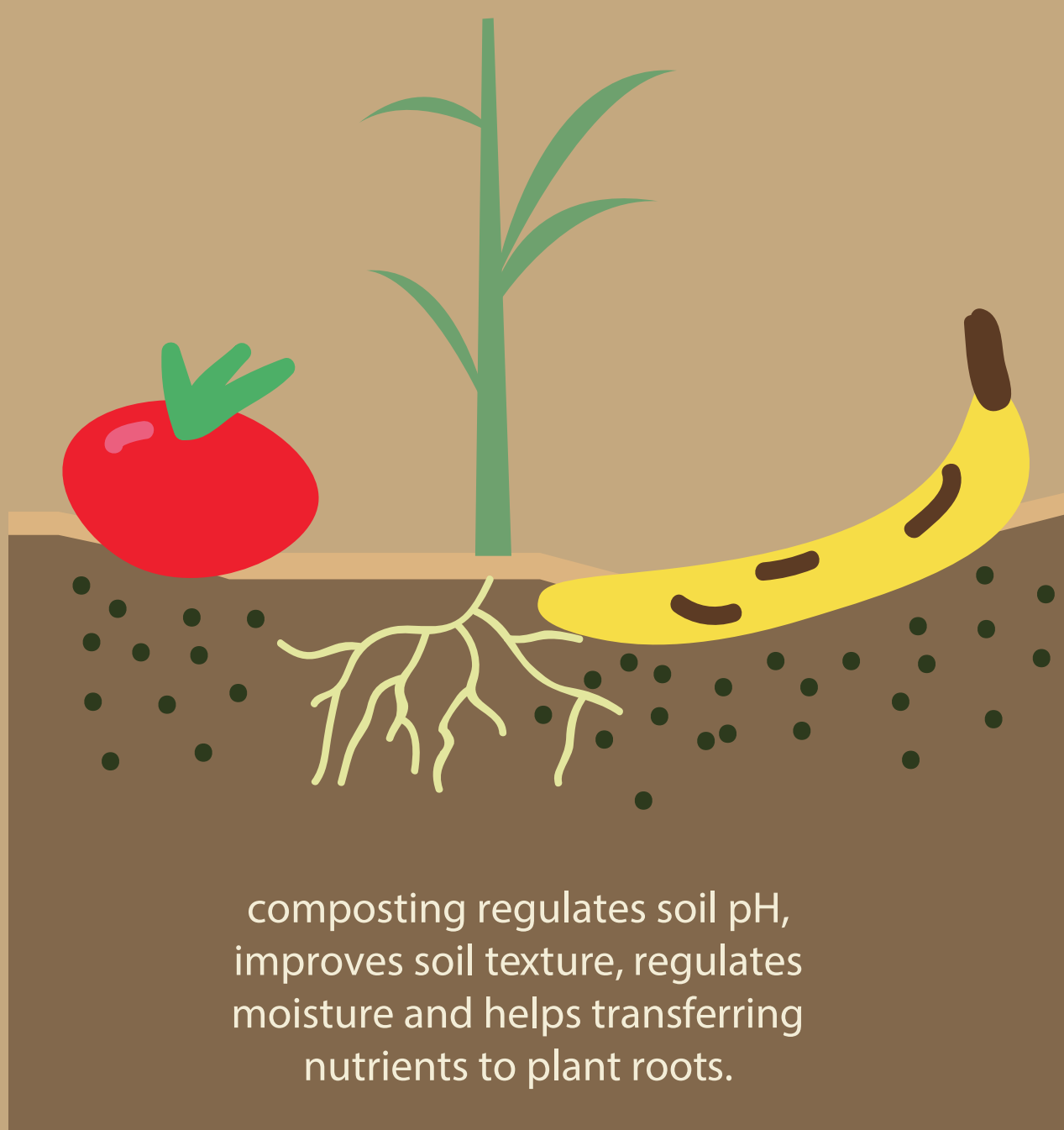
# Composting



## The Cost to Eat:

Food-related energy use accounts for over 12% of the national energy budget.<sup>1</sup> Transportation accounts for approximately 14% of the total energy used in the U.S. food system.<sup>2</sup> 52% of US land base is used for agriculture.<sup>3</sup> 80% of all US freshwater consumption is dedicated to the production and distribution of food. With so much food thrown away, a huge amount of these resources are wasted completely.

## Composting for Soil Health



## 7 tips to reduce your food waste:

### 1. Only buy what you need:

Don't always give into sales on perishable foods.

### 2. Understand 'use by' vs 'best before' dates:

"Best before" is more flexible than "use by"

### 3. Use what you have:

Pay attention to expiration dates at home, freeze fruit that would go bad, rotate your fridge when you get new things to make sure you finish things close to expiration.

### 4. Avoid serving too much:

Serve small portions instead of a large one to avoid throwing away good food you can eat tomorrow.

### 5. Know your molds:

Sometimes "hard" foods like hard cheeses, and vegetables like potatoes or root vegetables can have their mold scrapped off and they are still good to eat. Soft foods on the other hand should be thrown out if they get moldy.

### 6. Share extra food with others:

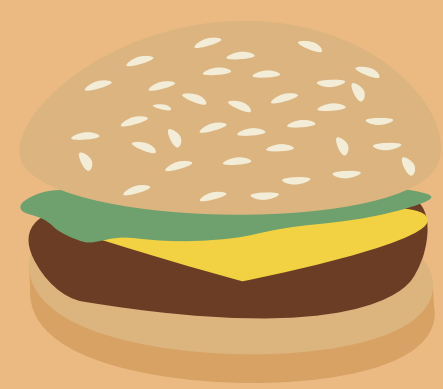
Ask around, invite others over for dinner!

### 7. Repurpose waste where possible:

As a last resort for any excess food, compost it at a community site or in your home garden! (Though, avoid composting meat products.)<sup>2</sup>



# Plant Based Protein



Plant-based proteins tend to be lower in calories and fat than animal proteins and higher in fiber and other essential nutrients!



## Plant-based protein alternatives

Numerous plant based foods contain protein usable by humans.

- Nuts
- Seeds
- Beans
- Soybeans (and products such as tofu, tempeh, seitan, and soymilk made from soybeans)
- Hi-protein corn
- Hempseed
- Sprouted whole grains
- Grain and bean-based alternative meat and dairy products
- Almost all vegetables have some level of protein. (Check nutrition charts for values. )

**Note:** When choosing processed non-meat alternatives, beware of high sugar or fat content or overly processed products.

## Gas Factor:

Producing fruits and vegetables doesn't create as much greenhouse gas as livestock production. One serving of beef has more associated greenhouse gas emissions than 20 servings of vegetables! Moving to consume more sustainably raised plant-based foods is a vital move to combat climate change.



## 12 Meatless Meal Recipes Courtesy of "A Couple Cooks"





# Plant Based Protein

## Hazelnuts



**A 1 ounce serving will provide you with around 8% of your daily protein requirement.**  
*that's like 10 nuts!*

Minnesota is not known for its nut crops. Only a few of varieties of hazelnuts have any productivity in our far northern climate. But a handful of researchers have been crossing northern-hardy, native hazelnuts with domesticated varieties for the past 30 years. The result is that we are on the verge of hazelnut bushes that provide both ecosystem services and a profitable crop.

Hazelnut bushes have deep root systems that prevent soil erosion and protect water quality. They are also wildlife magnets, providing shelter and food to an array of pollinators, birds, and mammals. Hazelnuts keep their leaves well into the fall which increases carbon sequestration and oxygen production.

From whole nuts to extra virgin hazelnut oil, consumers and food companies are ready to snap up this new Minnesota crop when it becomes commercially available. And did we mention Nutella? Try making that out of soybeans!



# Climate Champions

The **American Hazelnut Company** was launched in November of 2014 and is located at the Kickapoo Culinary Center in Gays Mills, WI.

They are grower-owned with 24 members working together to process and market their hazelnuts to customers: customers that value quality, superb flavor, and a chance to participate in something bigger.

Instead of miles of corn and soybeans, they envision perennial polycultures of woody plants modeled after the oak savannah ecosystem that once thrived in the Upper Midwest. Great food, clean water, healthy soil.



They currently buy in-shell hazelnuts from grower-members and process them into a range of products including whole kernels, cold-pressed unfiltered oil, and hazelnut meal.



# Soil Health



## Importance of Soil Health:

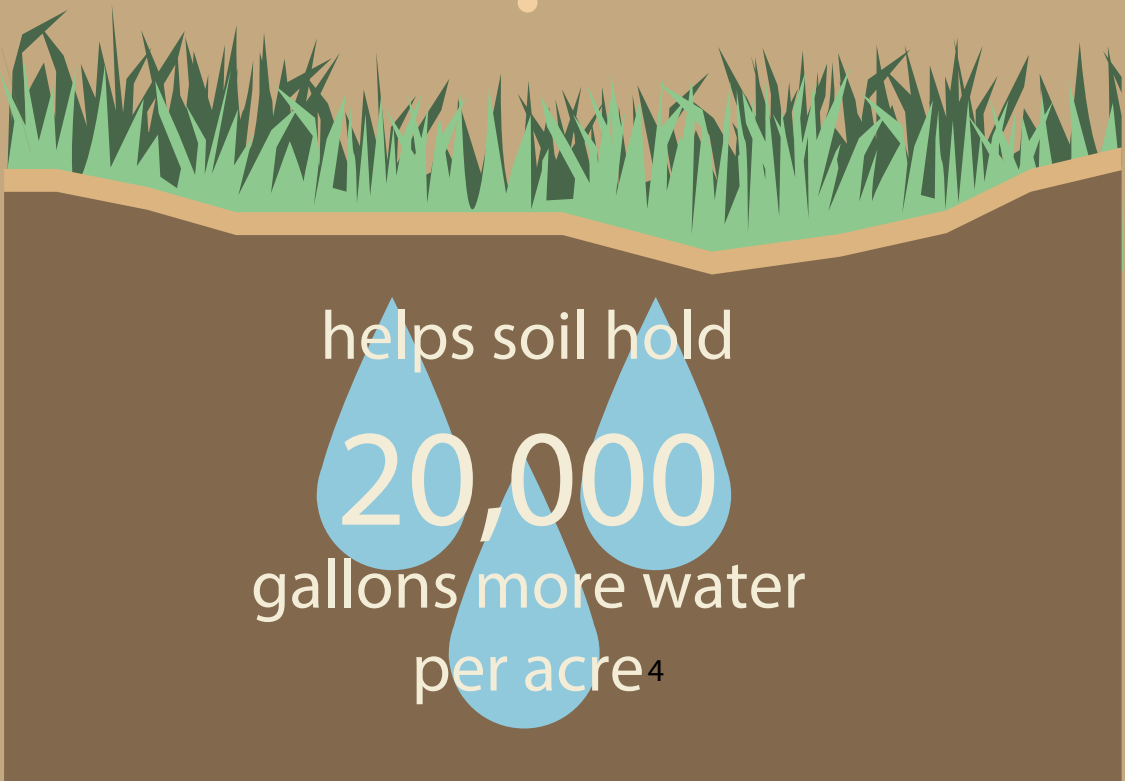
Healthy soil is critical for producing healthy crops. Creating a balance of minerals and nutrients in the soil leads to strong and healthy plants and good food.<sup>1</sup>

## Natural Fertilizer:

One solution to helping soil is cover crops! Cover crops help keep the soil safe and prevent erosion while helping fertility. Making and using compost can be very beneficial for your home garden. Decomposing organic matter has lots of nutrients that help soil thrive. If you have a home garden, rethink using harmful pesticides that could harm the soil and other organisms.<sup>2</sup>

## Soil with high organic matter content retains more water.

Each  
**1%**  
increase in soil  
organic matter



Agriculture and forestry together are estimated to account for 10.5 percent of U.S. greenhouse gas emissions in 2018. This can be balanced by crop management practices that increase carbon in agricultural soils and sustainable forest management.<sup>3</sup>





# Climate Champions

Hannah and Brady Barnstable discovered muesli while trekking in New Zealand on their honeymoon. When they returned home, they missed this breakfast tradition made of oats, fruits, nuts and seeds. The few versions available in stores didn't compare to what they had discovered in New Zealand, so Hannah decided to re-create it. What started as a personal quest to have great muesli at home has now turned into **Seven Sundays**: a successful and growing business.

The core of their muesli recipe, organically-raised oats are high in protein and gluten-free. Additionally, they build soil health, reduce erosion, and help suppress weeds. By providing a market for organic oats, Seven Sundays is helping drive change at the landscape level as farmers are willing to plant crops they can sell.



Hannah and Brady also aim to drive change in people's morning routine by getting them hooked on this simple, whole food breakfast.



# Climate Champions



"I didn't start farming to get rich but to follow a dream of living and working in harmony with nature. Sustainable is so difficult in the modern age with easy access to tractor power and soil consultants recommending adding tons of amendments to the acre. We try to minimize inputs, tractor usage and are soon to phase out our clear plastic canisters for more sustainable packaging.

In the fields, we are developing innovative polyculture systems, inter-seeding strategies, small scale weeding tools, using minimum tillage, intensive cover cropping maintained by animals, long term sequential no-till plantings, pig tillage, soil health and fertility strategies. What can we say... it's our passion. And our herbs are dried largely with solar power too."

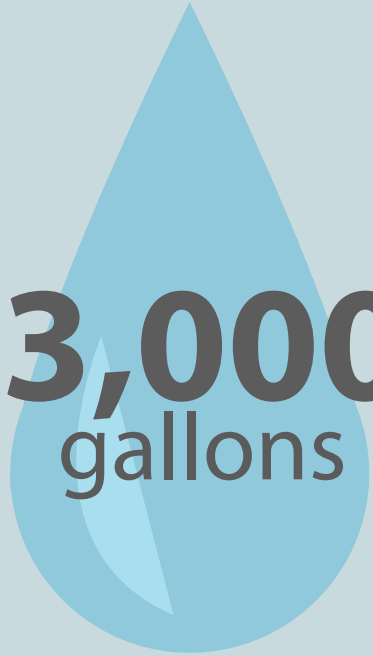
—Tony Dimaggio, Sacred Blossom Farm and Herbal Tea



# Water



1 acre of corn  
gives off  
**4,000**  
gallons per day  
in evaporation



**3,000**  
gallons



of water used to produce  
**1** day's food for a family  
of **4** in the US

## Altering Our Water Cycle:

Climate change is altering the water cycle by affecting the amount, distribution, timing, and quality of available fresh water.

A warmer climate causes more water to evaporate from both land and ocean. In addition, a warmer climate holds more water in the atmosphere, roughly 4% more water for every 1-degree rise in surface temperature.<sup>1</sup>



Less than  
**1%**  
of all water  
on earth is in  
drinkable form

## Top U.S. Freshwater Use:



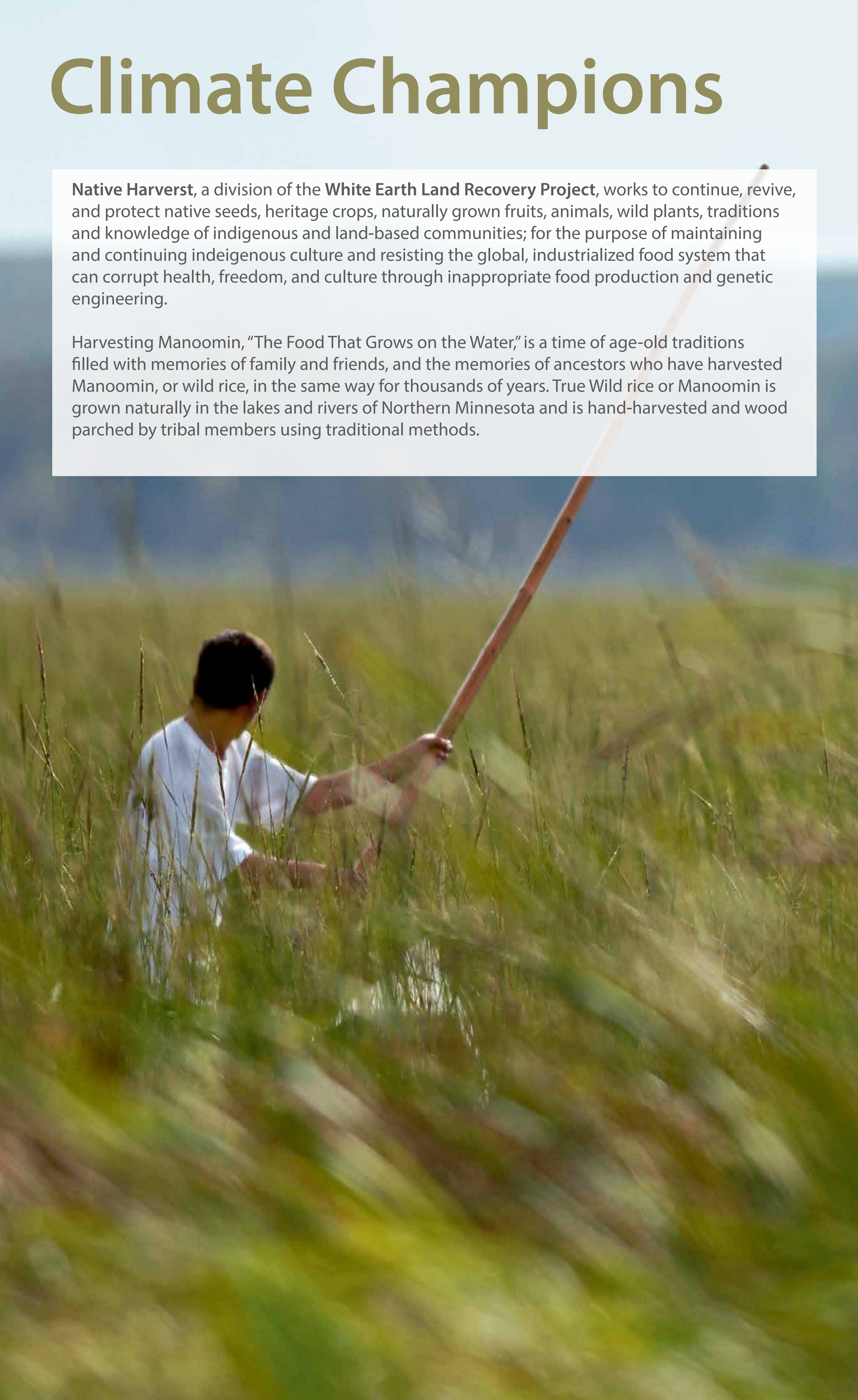
Declining water quality is another consequence of climate change. Water temperature will rise in streams, lakes, and rivers as air temperatures rise. This leads to lower levels of dissolved oxygen in the water column which in turn places stress on fish, insects, crustaceans, and other aquatic animals that rely on oxygen to survive.<sup>1</sup>



# Climate Champions

**Native Harverst**, a division of the **White Earth Land Recovery Project**, works to continue, revive, and protect native seeds, heritage crops, naturally grown fruits, animals, wild plants, traditions and knowledge of indigenous and land-based communities; for the purpose of maintaining and continuing indeigenous culture and resisting the global, industrialized food system that can corrupt health, freedom, and culture through inappropriate food production and genetic engineering.

Harvesting Manoomin, “The Food That Grows on the Water,” is a time of age-old traditions filled with memories of family and friends, and the memories of ancestors who have harvested Manoomin, or wild rice, in the same way for thousands of years. True Wild rice or Manoomin is grown naturally in the lakes and rivers of Northern Minnesota and is hand-harvested and wood parched by tribal members using traditional methods.





# Climate Champions



**Kilimo Minnesota** is a certified organic incubator farm in Cambridge, Minnesota with a mission to empower emerging and African immigrant farmers, socially and economically, through mentorship, land access and community engagement.

Founded in 2020 by Minnesota farmers and Kenyan immigrants Moses and Lonah Momanyi, Kilimo supports African immigrant farmers transition to farming in Minnesota. The program is made up of hands-on growing and marketing experience at Dawn2Dusk Farm, as well as business and production classes, field days at other farms, networking, and one-on-one business coaching.

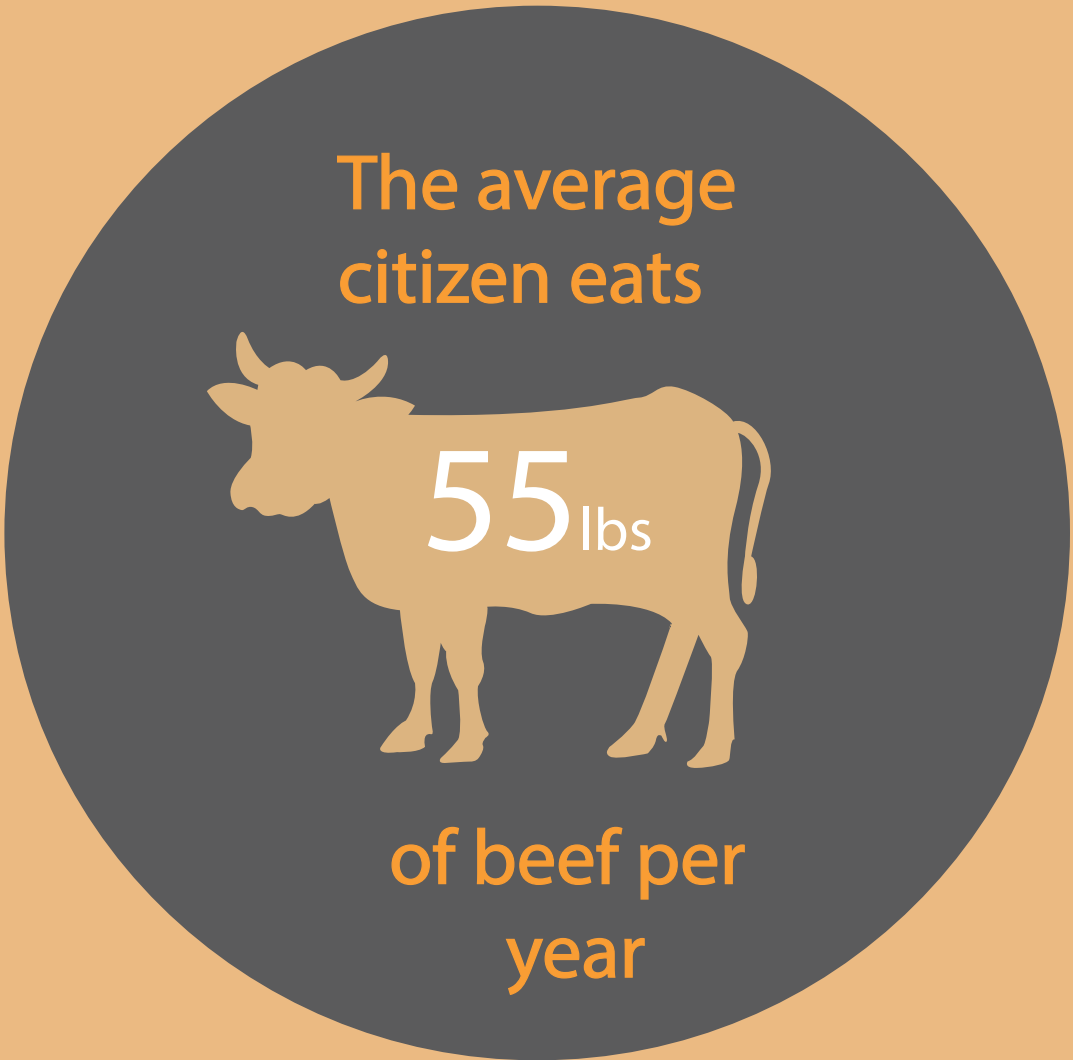
Kilimo (which translates to agriculture in Swahili) is uniquely situated to train program participants in a comfortable peer setting that eliminates many language and cultural barriers. Emerging farmers are able to speak their own languages; focus on culturally specific crops, farming traditions and

customs; and ultimately build a supportive, community network.

In addition to empowering African immigrant farmers, Kilimo aims to build and strengthen the local organic food system, raise awareness of immigrant farmers' role in the food system and build relationships between family farmers, youth and low-income consumers.



# Meat and Grazing



## Continuous Grazing



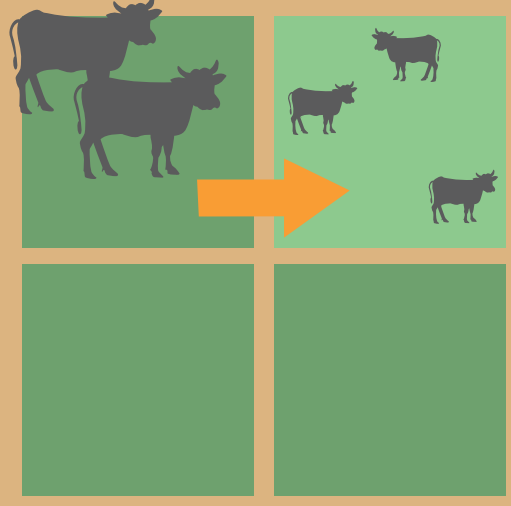
The animals are given continuous, unrestricted access to an area throughout the year

## Rotational Grazing



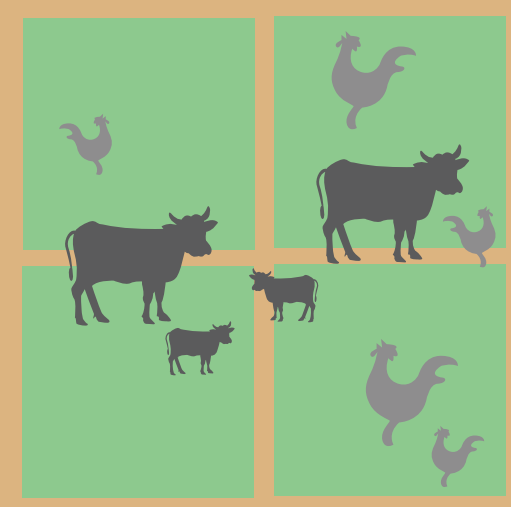
Animals are moved between pastures as needed, or on a regular basis

## Creep Grazing



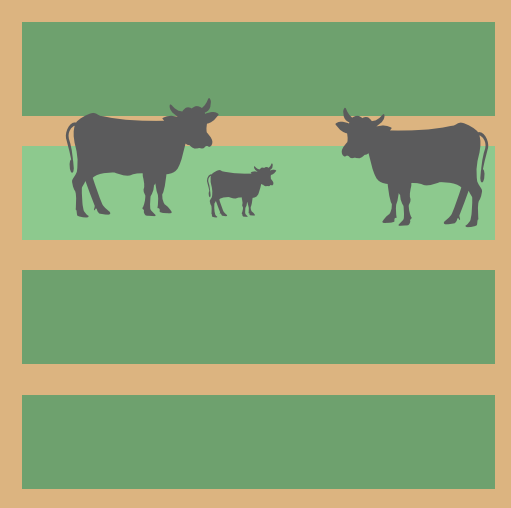
Younger farm animals to graze on the land before the adults of the group

## First-Last Grazing



Two groups of animals with different nutritional needs are allowed to graze in the same area

## Strip Grazing



The animals are given a fresh patch of the pasture each day

**Grazing for Carbon Capture?**  
Grass-fed cows are eating pasture for a majority of their lifetime. Grazing helps the cattle industry move towards a carbon neutral footprint.<sup>1</sup>



Cattle that are not grass-fed are generally fed water-reliant harvested crops in a feed lot. Livestock production overall contributes about 14.5% of global greenhouse gas emission, with beef accounting for 41 of the percentage.<sup>2</sup>

Sources: 1- Oklahoma State University 2-UN Food & Agriculture Organization, 2019  
Photo: Top- Pixabay (Pexels.com) Bottom- Malidate Van (Pexels.com)



# Climate Champions

Sister and brother team Kathy and Nick Zeman run **Simple Harvest Farm Organics** - a 20-acre organic farm, where the land, crops, produce, and livestock inputs are all organic.

They keep livestock on pasture and feed a vegetarian diet; so no antibiotics, no hormones, and no additives. Just corn, oats, wheat, barley, soybeans, vitamins, minerals, and apple cider vinegar. And all the livestock get hay!

Since they raise livestock on pasture, poultry and pigs are only raised in the warmer months. Even in winter the animals are not raised in confinement; although the hens do not like to venture out of their coop when there is too much snow on the ground!

**“We like how the animals and plants on our farm complement each other – and how together they are building a stronger and healthier environment. Our animals produce manure that fertilizes the plants and builds the soil; the plants provide food for the animals and help hold soil and water in place. We feel fortunate to work beside them.”**

**— Kathy Zeman** “Princess Kay of the Milky Way - 1976”



# Climate Champions



Copyright 2017 David Nevala for Organic Valley

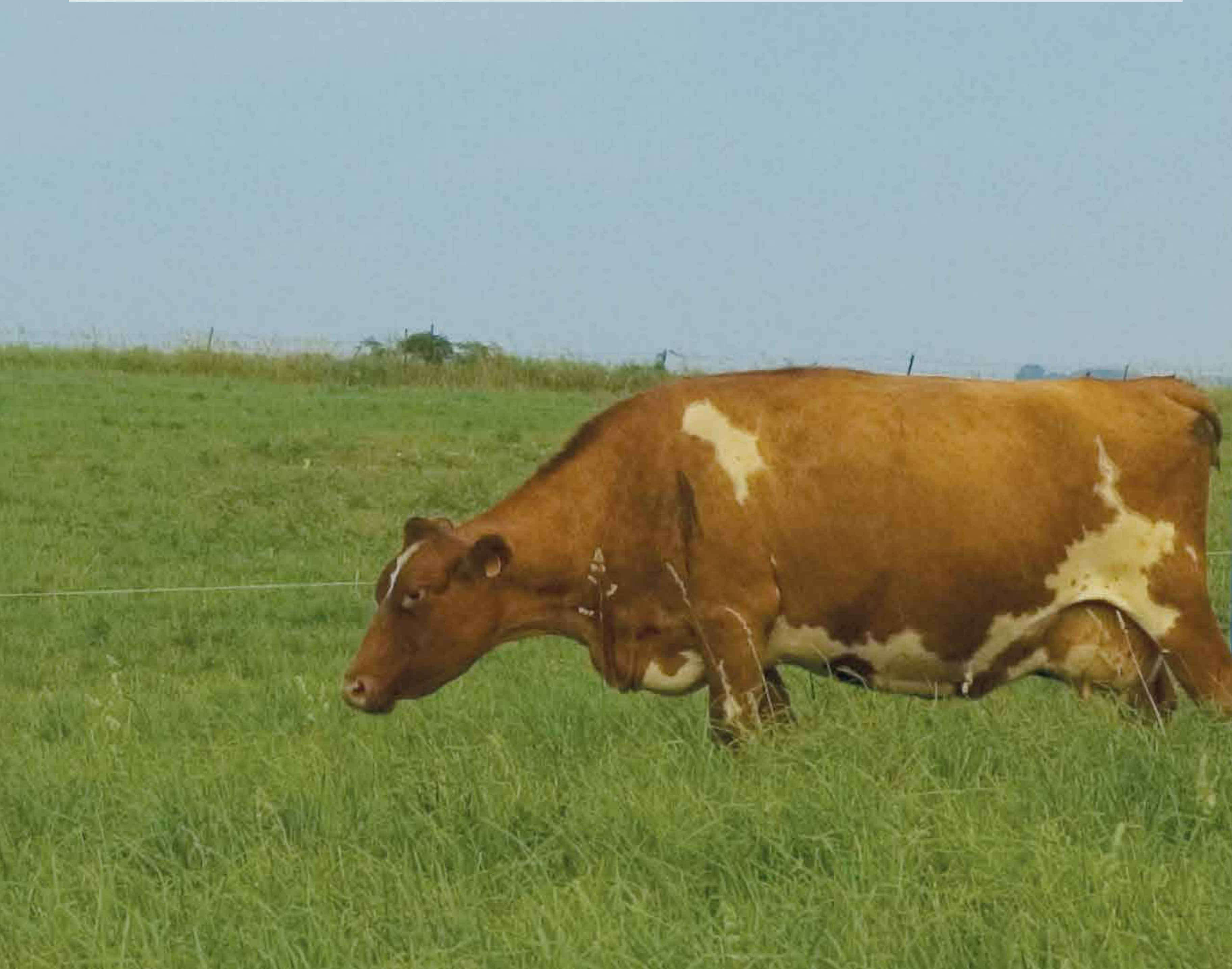
around in the summer. We saw health benefits even from that little bit of pasturing. Now, I don't think I'll ever go back."

**Organic Valley** suppliers Dan and Luke are the fifth generation brothers who work their Wright County Minnesota land.

Between their two young families, the sixth generation is coming on like gangbusters.

They farmed conventionally until 2006 when they completed their transition to certified organic.

"Dan was all for it," Luke says, "but I was skeptical. I was young at the time, 24, and thinking of my pride and how it would go over in the area. But once I did more research on it, I said the heck with the pride thing. We decided to turn it around. We quit spraying chemicals and let Mother Nature take her course. Before we went organic, we made a couple of small pastures just to get the cows out of the barn and moving





# Continuous Cover

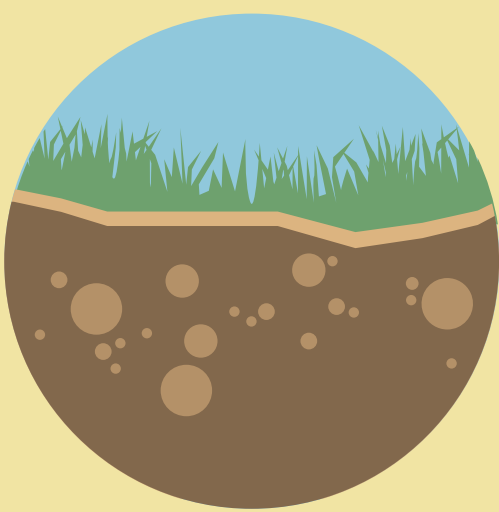


## Continuous Cover results in healthier soils by:

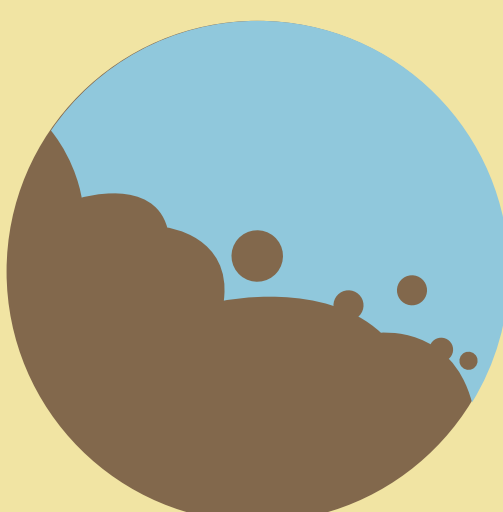
Reducing runoff



Keeping nutrients in the soil



Reducing erosion



### What are Cover Crops?

“In agriculture, cover crops are plants that are planted to cover the soil rather than for the purpose of being harvested. Cover crops manage soil erosion, soil fertility, soil quality, water, weeds, pests, diseases, biodiversity and wildlife.”<sup>2</sup>

### Crop Rotation:

Planting a sequence of different crops in the same field over time helps to balance soil nutrients and break up weed and pest cycles.

**Perennial Crops:** Kernza wheatgrass, pasture

**Winter Annual Crops:** Camelina, Winter barely, hairy vetch

**Native Woody Crops:** hazelnut, elderberry<sup>1</sup>

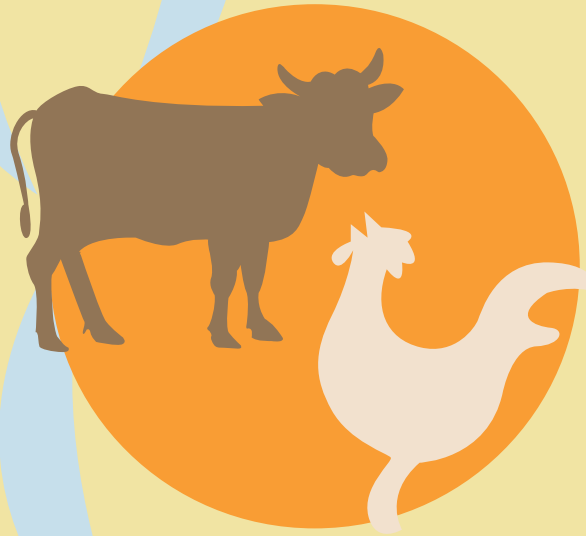
Growing



fruits & vegetables

produces less greenhouse gasses than raising

cattle & livestock



Minnesota has 27 million acres of farmland, occupying nearly half of the 55.6 million acres in the state!<sup>1</sup>

(Forests occupy 17.7 Million Acres)

Sources: 1- Forever Green (UMN) 2- Wikipedia  
Photo: Adobe Stock



# Continuous Cover

## Kernza<sup>®</sup>



### BENEFITS

**Perennial crop with nutritious grain and low input requirements**

**Reduces erosion and enhances soil health**

**Prevents nitrogen contamination of surface, ground, and well water**

### USES

**Food and Brewing**

**Forage harvest and grazing**





# Climate Champions

Noreen is the fifth generation to work her family's century-old property, **Doubting Thomas Farms**. There, she raises pork, chickens, turkeys, and grains and produces hay and eggs. Her background as a chemist helped her family decide to transition to organic.

"With chemical applications, sometimes there are effects you cannot see, on a cellular level," she explains. "Women are usually the caretakers, and they come from a place of wanting to provide the best environment for their children."

Noreen doesn't feel that organic methods have negatively impacted her grain yields. In fact, with the development of better hybrids—accomplished through careful breeding rather than genetic modification—she finds "yields have actually increased to put us on par with conventional farming."

