

McCARTY FAMILY FARMS

# Sustainability Analysis

## ON-FARM PRACTICES REPORT

2022

An Evaluation of Actual  
Performance by



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# About Sustainable Environmental Consultants

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With a mission to promote planetary health for the future, Sustainable Environmental Consultants, SEC, is a leader in the sustainability movement with a true passion for agriculture. By promoting the use of measurable management practices, SEC engages and inspires agricultural, food and beverage companies to integrate the best sustainability tools into their business. The result is greater transparency, reduced risk, reduced environmental impacts and greater efficiency of natural resources while producing agricultural commodities.

SEC’s risk management platform, EcoPractices®, identifies, collects, verifies, documents and generates environmental impacts from conservation practices. Through this platform, agricultural producers are able to transform their operation to have verification and quantification of the efforts made each day on the farm and effectively deliver this science-based story to any audience.

For additional information please checkout [sustainableenviro.com](https://sustainableenviro.com).

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# DANONE NORTH AMERICA - SOIL HEALTH PROGRAM

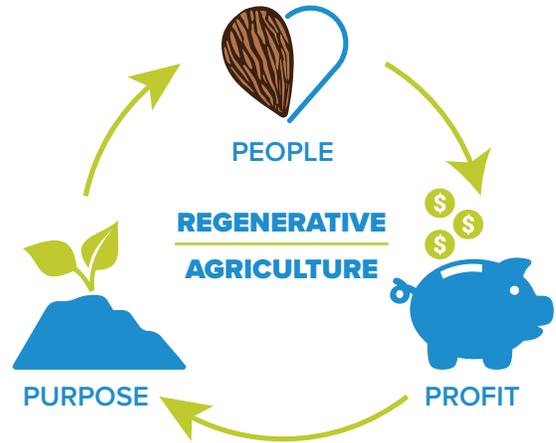
## An Introductory Message from Danone North America

Danone North America believes that sustainable agriculture does not simply mean working for a better environment, but also to improve the life of farmers by delivering strong profitable returns. Danone North America aims to prove our Soil Health Program will be self-sustainable and profitable in the long run.

Thanks to our longstanding relationships with our farmer partners, Danone North America is able to achieve these goals. The outcomes learned from this report are a vital step for all of us as we join together in this journey!

EcoPractices will be alongside Danone North America to collect, verify, analyze and generate environmental impacts from practices taking place in the field and on the dairy. The EcoPractices process will help us establish a best in market sustainability baseline, and build a strong, meaningful, sustainable and continuous improvement plan for the next five years.

Thank you for making the planet better every day!



The Soil Health Program kicked off on January 1, 2018 with an official announcement from Danone North America on March 7, 2018: DanoneWave Puts a Stake in the Ground with Commitment to Regenerative Agriculture and Soil Health Research Collaboration with Renowned Research Partners.

## 5 Pillars of Regenerative Agriculture

Danone North America’s 5 Pillars of Regenerative Agriculture are Soil Health, Water, Biodiversity, Carbon & Energy and Economy & Productivity. Key Performance Indicators have been established in order to measure each of the 5 Pillars.

### Key Performance Indicators



#### SOIL HEALTH

- › Monitor and decrease nitrogen, phosphorus and potassium
- › Increase organic matter through cover crops and no/reduced till
- › Use Comprehensive Assessment of Soil Health (CASH) test to monitor and improve
- › Soil erosion and sediment control



#### BIODIVERSITY

- › Promote and increase cash and cover crop diversity
- › Monitor and decrease pesticides, chemical fertilizers and herbicides



#### CARBON & ENERGY

- › Increase carbon sequestration by having more organic matter in the soil

#### ECONOMY & PRODUCTIVITY

- › Increased return per acre
- › Better crop yields
- › Cost breakdown of each component
- › Efficiency of each input
- › Prove self-sustainability



#### WATER

- › Use of technology to reduce water consumption (water probes, milk condenser, etc.)
- › Soil becomes more resilient to drought and flooding because of water absorption ability
- › Reduce surface water degradation

# LETTER FROM THE FAMILY

We are proud to be a farmer partner with Danone North America and support their Sustainable Agriculture Pledge. Although we focus on Soil, Water, Carbon and Energy, Biodiversity, Economy and Productivity and Animal Welfare in this report, our family, along with Danone, has always had a commitment to care for cows, people and the land.

We are proud to provide dairy foods in a sustainable manner and are proud to release this report verifying our commitment and achievements at Rexford. We are excited to develop sustainability goals and show our continuous improvement in areas that are and always have been important to our family.

**Ken McCarty**

McCarty Family Farms



Tom and Judy McCarty with sons (left to right) Mike, Clay, Ken and David.



The McCarty family moved from Pennsylvania to Rexford, KS and opened the dairy in 2000.

# FARM SNAPSHOT



**More than 100 years ago**, the McCarty family started and ended every day milking cows by hand in a small barn without electricity in northeast Pennsylvania. Four generations later, the headquarters has moved to western Kansas. There are three dairies in western Kansas comprising McCarty Family Farms. At the end of 2022, McCarty began milking at Rexford 2.0, an expansion and addition across the street from their original dairy

In 2012, the McCartys entered into a unique business partnership with Danone North America to directly supply milk to make Dannon yogurts. This direct arrangement allows McCartys to target their farm to meet the specific needs of a customer and its end-product instead of selling a commodity product. The addition of an evaporative cooling milk processor next to the Rexford milking parlor, also in 2012, allows for notable resource conservation. The McCartys are the first to have such a processor in North America.

Safety is a core mission every day at McCarty Family Farms. There have been no reportable OSHA incidents since the locations' opening in 2012.

## Key Information

**Mission Statement:** As a family and organization, McCarty Family Farms, LLC, strives to create wholesome products in a sustainable manner. Using best management practices, our farm works to achieve the utmost in animal welfare, environmental stewardship, sustainable communities and the creation of a safe and rewarding work environment.

**Type of Ownership:** Family

### Locations:

- › Rexford, KS
- › Bird City, KS
- › Scott City, KS

**Year Started Dairy Farming:** 1914

**Cows in Production:** 8,501

**Total Cattle:** 9,527

**Total Acres:** 14,472 acres included that form the conclusions of this report

**Employees:** 93

### Certifications:

**B Corp Certified**

**Beef Quality Assurance**

**Non-GMO Project Verified**

### Validus

- › Certified responsible producer (first dairy in the U.S. to achieve)
  - › Animal Welfare Review
  - › Environmental Review
  - › On-Farm Security Review
- › Worker care review
- › Traced, segregated and controlled audit (processing plant)

### Recognitions:

- › On-site signing of Kansas Dairy Month [proclamation](#) by Governor Laura Kelly (June 2022)
- › Awarded [Best for the World: Environment](#) by B Lab in 2022 (also received in 2021)
- › Featured in [PR Newswire](#), DNA's Soil Health Initiative Exceeds 2022 Goal, Further Advancing a Leading Comprehensive Program in Dairy Industry (Jan 2022)
- › [Certified B Corp](#) in 2020
- › Featured in [Farm Journal](#), Families Join Forces and Form MVP Dairy (Feb 2020)
- › Featured on [YouTube](#), Where Food Comes From (April 2020)
- › Awarded 2020 [Innovative Dairy Farmer of the Year](#)
- › Awarded 2019 Holstein Association USA Progressive Genetics Herd (also received in 2018: Rexford and 2017: Rexford, Bird City, & Scott City)
- › Featured in [Forbes](#), The Hardest Things to Change is What Most Needs to Change: Expanding our Duty of Care (May 2019)
- › Tom and Judy McCarty awarded [Kansas Master Farmer Award](#) (Feb 2019)
- › Future of Agriculture Podcast [interview](#), Building a Family Dairy Business through Commitment to Sustainability (Jan 2019)
- › Featured in [National Geographic](#) (Jan 2019)
- › Showcased in 2018 [Virtual Farm Tour](#) at World Dairy Expo
- › Awarded 2018 Danone Nature Award
- › Awarded 2018 Danone Milk Cycle Days Excellence in Production

# GROWER SPOTLIGHT

**F**DK Partnership credits its employees' willingness to adapt to new technologies with its ability to build on the success of three previous generations of farmers. Variable rate seeding and fertilizer application, irrigation, water probes, weather stations and cover crops are normal routine for the regular and seasonal workers, including H2A VISA workers from South Africa who return annually to help with harvest, making even seasonal employment "sustainable."

The Baalman Family defines sustainability as improving processes to help future generations, and Mitchell Baalman serves on the Northwest Kansas Groundwater District #4, where he has spent 20 years working to put procedures in place to stabilize the Ogallala Aquifer.

## Key Information

**Mission Statement:** We are a multi-generational farm that achieves sustainable and best management practices for our future generations. We produce agricultural products with intent of being profitable and efficient, while managing natural resources responsibly.

**Type of Ownership:** Partnership of three corporations

**Location:** Hoxie, KS

**Year Started Row Cropping:** 1991

**Crops in Production:** Corn grain, corn silage and soybean

**Total Acres:** 26,000

**Acres Sourcing McCartys:** 3,345

**Employees:** 8 full-time, 6 seasonal



Strip tilled ground by FDK Partnership.



Howard Baalman, Founder of FDK Partnership has farming in his blood. Pictured left to right: Keith, Howard, Grandpa Ed, Charlie and Gary Baalman.



# GROWER SPOTLIGHT

**W**T Partnership cares. Second-generation farmer Wade Carmichael and his wife Tami care about raising quality products and they care about how they treat their natural resources. For them sustainability means growing a beneficial product without compromising the environment, and that means keeping crop inputs to a minimum.

The Carmichaels value the challenges and rewards of farming and work to maintain the land for future generations. They are happy to partner with McCarty Family Farms and Danone North America in focusing on a green future for quality dairy products through sustainable farming methods enhanced by the reduced transportation needs of local feed sourcing.

## Key Information

**Type of Ownership:** Family-owned partnership

**Location:** Bird City, KS

**Year Started Row Cropping:** 1976

**Crops in Production:** Corn silage

**Total Acres:** 7,300

**Acres Sourcing McCarty:** 496

**Employees:** 1 full-time, 2 part-time



Wade Carmichael and wife, Tami, with their two children.



WT Partnership fertilizing a field with high residue left from previous corn crop.



WT Partnership injecting dairy effluent on field to grow feed for the dairy.

# GROWER SPOTLIGHT

Circle C Farms takes pride in knowing their land will be in better shape with each year. They strive to produce crops in the most agronomically efficient way possible, utilizing grid soil testing prior to fertilizer application to ensure application accuracy. This practice can reduce nutrient loss yet ensures the most productive crop possible. Cover crops are used in an effort to reduce runoff and improve soil health.

This fifth generation farm family operated in southeastern Nebraska and northeastern Kansas before settling near Scott City, where Ted Compton and his son, Steve Compton, oversee the current operation. They are proud to be able to harness the challenges of nature to claim their place among the two percent of the population growing the world's food.

## Key Information

**Mission Statement:** Bring tomorrow's technology to today's farming

**Type of Ownership:** Family-owned corporation

**Location:** Scott City, KS

**Year Started Row Cropping:** Five generations ago

**Crops in Production:** Corn silage

**Total Acres:** 15,000

**Acres Sourcing McCarty's:** 1,044

**Employees:** 5 full-time, 3 seasonal

**Certifications:** Commercial applicator and chemigation license

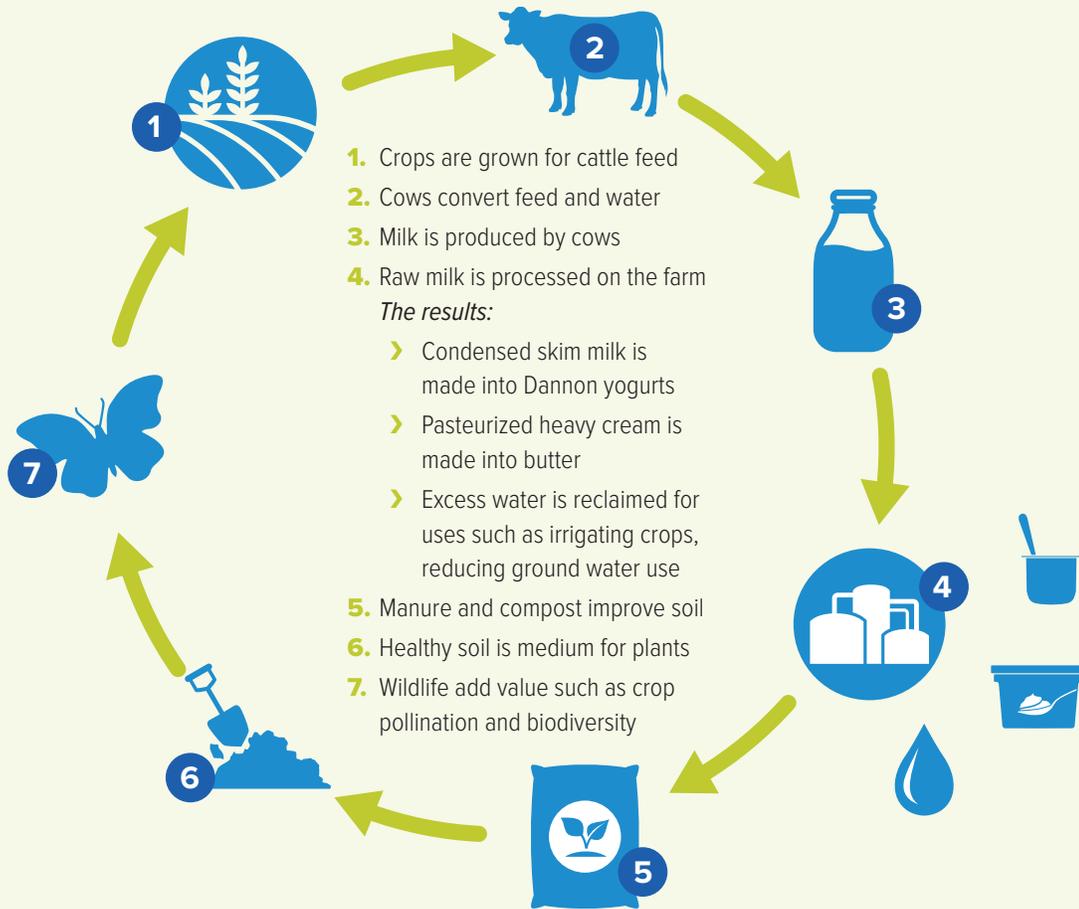


Circle C Farms moved to Scott City in 1985.



Todd Compton (left) with Steve Compton (right) of Circle C Farms received a water conservation award in 2018.

## McCarty Family Farms EcoCycle



## MCCARTY FAMILY FARMS MILK PROCESSING INPUTS AND OUTPUTS

### Daily Production Stats:



**102,117 gallons per day** of raw milk are processed from the four McCarty dairy farms.

Three approximate end products from processing:

**19,949 gallons** of **condensed skim milk** which are trucked to the Danone North America yogurt plants.



**6,901 gallons** of **pasteurized heavy cream** which are trucked to a plant and made into butter.



**51,615 gallons of water** from the condensing plant for reuse on the Rexford farm.



# SUSTAINABILITY BENEFITS

## Quantifying the Impact of Actual Farm Practices

While agricultural practices have progressed to better care for natural resources, the ability to quantify the influence these practices have on sustainability has not kept pace. The McCarty family seeks to put evidence-based measurements to its farm practices. Having such data brings more depth to decision-making. Short- and long-term goals can be based upon more meaningful information.

The benefits included in this section were determined through Sustainable Environmental Consultants' unique process that is able to pinpoint the influence of specific agricultural practices on such factors as carbon dioxide reductions. For more detailed information on this process, please see the Data Collection and Verification section.

**3 dairies** with **fields** comprising **14,472 acres**



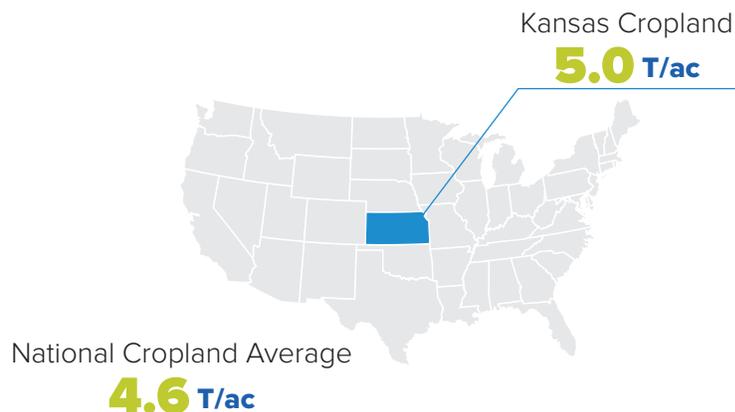
## IN-FIELD ENVIRONMENTAL OUTCOMES

The data is reflective of weather and soils influence in addition to implemented in-field management practices for the project year.<sup>†</sup>

	OVERALL FARM
<b>Net GHG Emissions</b>	<b>-2.25 T CO<sub>2</sub>e/ac</b>
<b>Soil Carbon Sequestered</b>	<b>0.83 T C/ac</b>
<b>Soil Erosion Rate</b>	<b>8.01 T/ac</b>

## EROSION AVERAGE (USDA)

The USDA National Resources Inventory provides estimates on average erosion for different systems across the United States.



## IN-FIELD PRACTICE COMPARISON IMPACTS

When compared to conventional practices (i.e. conventional tillage, no cover crop scenario), in-field farm practices generated:<sup>‡</sup>

 **6,826** fewer tons of CO<sub>2</sub>e, which is the same as

 **1,325** average passenger cars off the road for a year

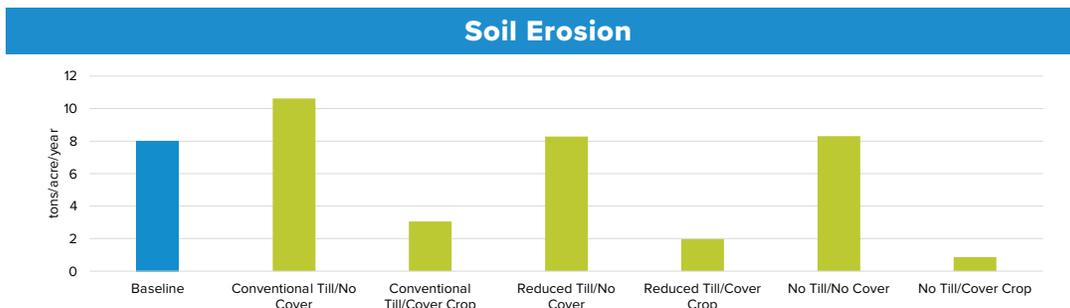
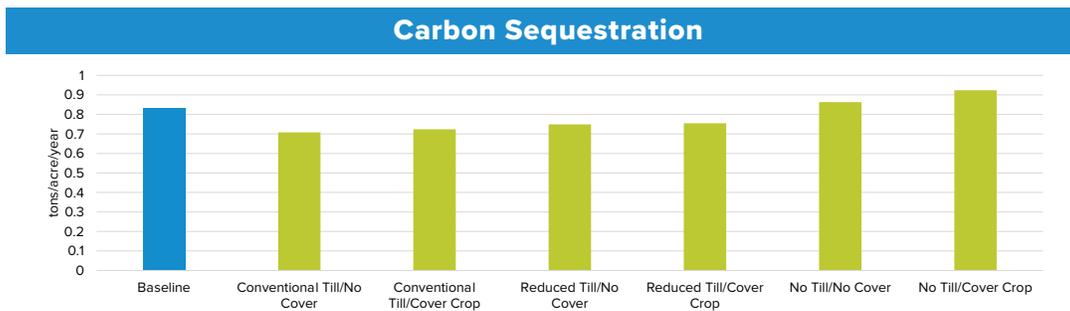
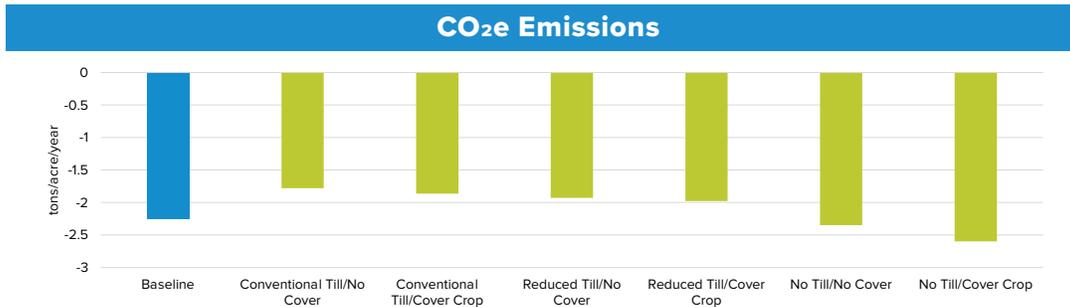
 or **34** rail cars of coal saved from being burned

 **1,816** tons of carbon sequestered

 **37,143** tons of soil saved instead of being lost to erosion, which is the same as

 **2,321** dump trucks of soil

The graphs below represent the impact of cover crops and tillage practices on the fields. The baseline represents current practices. These graphs are meant to show perspective on outcome values based on in-field practices, weather and soil types.



# Sustainable Continuous Improvement Plan™

MOVING THE NEEDLE ON REGENERATIVE AGRICULTURE



## Soil Summary



### PROGRESS

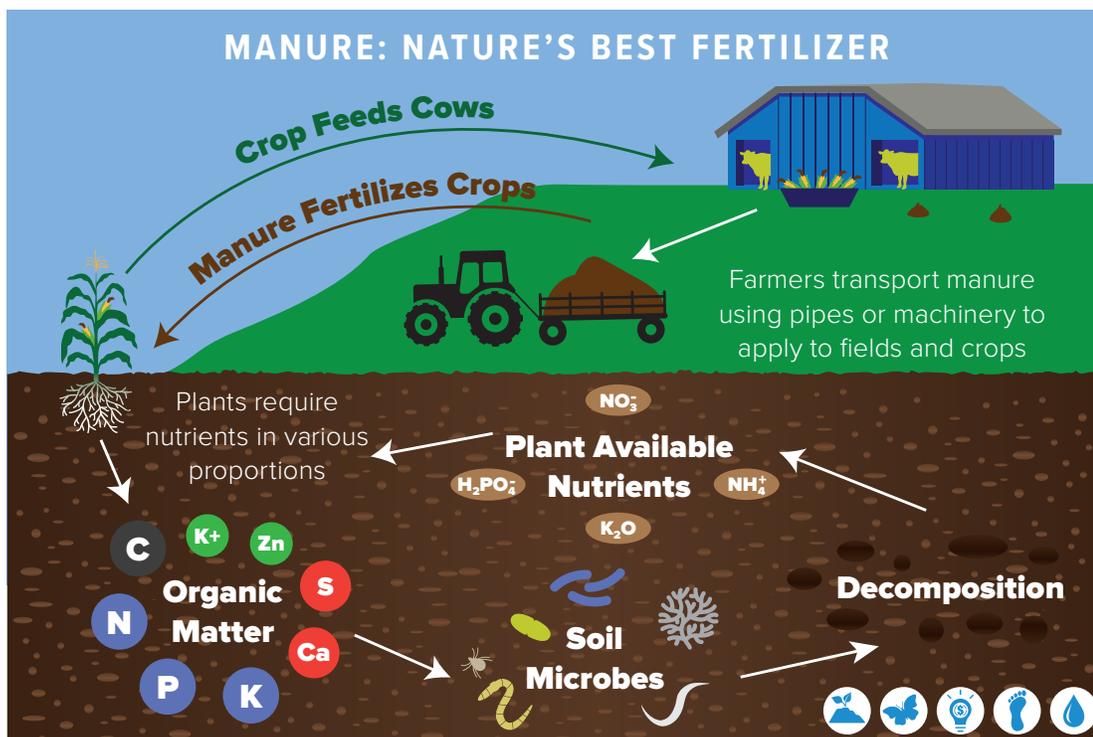
- › The McCartys have been participating in the Danone Soil Health Program since 2016. They include all owned farming operations and 11 local growers participate that grow feed for the cows.
- › No-till was implemented on 61% or 8,887 acres.
- › 100% of owned acres are no-till or strip till.
- › Reduced tillage was implemented on 31% or 4,454 acres.
- › 38% of acres were in a cover crop.
- › Soil tests readily available for all fields managed by McCarty Family Farms every fall with all KPIs.
- › Updated NMP annually.
- › 17% of acres received effluent in 2022, reducing the need for commercial fertilizer.
- › Corn grain, corn silage, fallow, hay, sorghum silage, soybean and winter wheat were grown at the dairy in 2022.
- › \*Experimented with cover crop interseeder from local coop.

### SHORT TERM GOALS

- › Plant cover crops on owned and rented fields.
- › Determine additional cover crops to increase the bioaccumulation level of phosphorus so more solid manure can be used as fertilizer.

### LONG TERM GOALS

- › Seek options to increase crop residue and compost to increase SOM/SOC levels as the NMP allows.
- › Actively analyze options to reduce the number of field passes needed for both tillage and applications such as fertilizer, pest and weed control products.
- › Utilize potential funding programs to improve farm sustainability and economics while exploring local, state and federal funding options.
- › Standardize soil sampling protocols with Danone.
- › Utilize drone to scout for pests, fertilizer, or irrigation issues and apply pesticides/biologicals accordingly.
- › Install floater tires on pivots to reduce tracks in fields.
- › Utilize intensive tissue and soil sampling to reduce nitrogen input on corn fields.



Manure is a great source of nutrients for crops and a readily-available resource at dairy farms. Instead of treating it as a waste product, farmers know that manure is one of nature's best ways of improving soil and plants. Commercial fertilizers offer controlled application of nutrients in exact amounts and rations. While manure fertilizer contains those same nutrients, manure also has many advantages; such as close proximity to fields, adds organic matter to the soil and provides cost-savings.

## Water Summary



### PROGRESS

- › 20 million gallons of water were reclaimed in 2022 from the evaporative cooling processor.
- › Using effluent as crop irrigation water provides fertilizer benefits and reduced 91 million gallons of fresh water from being pumped for irrigation.
- › Fresh water pumped from the ground to cool milk for chiller plate system is reused after cooling. Reusing water for on-farm activities reduces freshwater needs.
- › All MFF dairies have flow meters to monitor effluent.
- › 13 AgSense units and 38 soil moisture probes installed in 2019.
- › Advanced cow comfort fans installed in parlor to save fresh water.
- › Identified at Bird City a 10 acre wetland that provide water quality benefits.
- › Beaver City added a pipeline from the north end of the lagoon to the south to recycle water for easier allocation to the lagoon pumps in 2018. A filter system was also added to the pumps for more efficient pivot irrigation.
- › Partnered with NRCS on Irrigation Water Management Plan.
- › Added underground irrigation, sprinkler system and moisture monitors at Rexford.
- › Upgraded all nozzles to drop low and reduce evaporation and water loss.
- › Kansas Water Office Water Technology Farm continued to serve as pilot for emerging technology.

- › \*To reduce irrigation cost per field, McCarty Family Farms switched to Phytch, which includes a soil probe, 3 plant sensors, rain bucket and flow meter on pivot.
- › \*Increased efficiency of lagoon irrigation and nutrient use by adding dewater line at Bird City.
- › \*Upgrades completed at processing plants for reverse osmosis and polisher to reduce water use by 60% through wastewater reclamation.

### SHORT TERM GOALS

- › In conjunction with Danone, the dairy will complete a water risk assessment.
- › Experiment with Italian ryegrass.
- › Partner with Kansas State University to optimize feed line sprinkler settings.
- › Implement in-line filters on pivots that receive effluent to avoid plugged nozzles.
- › \*Grow forage sorghum on wells with less capacity.
- › \*Continue to add soil moisture probes to additional fields.

### LONG TERM GOAL

- › Actively work with all farmer partners that receive effluent to improve water use efficiency.
- › Add additional Smart Cow Cooling technology systems.
- › Experiment with variable rate irrigation, different nozzle styles and other center pivot upgrades.
- › \*Evaluate water use at Rexford 2.0 and surrounding operations to enter into new WCA in 2026.

## Biodiversity Summary



### PROGRESS

- › Utilized manure as organic fertilizer benefiting the biodiversity of life below the soil.
- › 10 acres at Rexford are planted to pollinator habitat.
- › A total of 79 wildlife boxes are around the dairies.
- › 38% of acres covered in fall 2021 for the 2022 growing season with oats, triticale and winter wheat.
- › Experimented oats after corn silage to reduce erosion.

### SHORT TERM GOALS

- › Convert 1 acre on SE corner of North Large Pivot Field near Rexford dairy due to wet spot caused by abandoned tail water pit into CRP.

- › Partner with NRCS on Integrated Pest Management Plan.
- › Identified 3 field corners to convert to Pheasants Forever habitat.
- › \*Add pollinator habitat at Rexford 2.0.

### LONG TERM GOALS

- › Continually improve and support native habitat.
- › Introduce solitary bees to the farm as a pollinator.
- › Experiment with remote monitored pest control boxes.
- › Plant diverse cover crops on fields farther from the dairy that will not be utilized for spring silage.

## Carbon & Energy Summary



### PROGRESS

- › The dairies saved fuel from the CAT fleet in 2020 due to improvements made in 2018.
- › Evaporative cooling processing reduced volume, which reduced transportation emissions.
- › 100% LED lighting at the dairies and 100% on the plant have been installed.
- › Continued to track and collect propane usage reports on the farm with 2020 as the fourth year.
- › Recycled cardboard at facility four miles from the dairies.
- › Grain is sourced within a 15-mile radius and hay is sourced within a 75-mile radius of the dairy.
- › Aligned with multiple vendor partners that have commitments to sustainability and environmental progress through efficiency.

### SHORT TERM GOALS

- › Pilot remote utilities monitoring and management.
- › Purchase renewable energy credits from utilities.

- › Work with farm equipment partners to use machinery and fleets with advanced technology that result in positive sustainability outcomes.
- › \*Bird City is working to implement solar energy as a part of the REAP Program, this is set to be completed by the end of 2023 or beginning of 2024.
- › \*On track to have the biodigester completed by 2024, beginning work in April/May of 2023.

### LONG TERM GOALS

- › In partnership with Ruan, upgrade trailer fleet for improved aerodynamics.
- › Upgrade to electric tractors and loaders.
- › Achieve climate neutrality.
- › \*The processing plant will implement grid stabilization for real time monitoring of energy use.
- › \*Rexford 2.0 is assessing opportunities to implement technology platforms to see real time energy use.

## Economy & Productivity Summary



### PROGRESS

- › Performed own mastitis testing on location as well as own pregnancy testing, which reduces the need to ship samples out, saving cost and transportation.
- › Installed a corn grinder on location an investment savings \$0.30 a bushel.
- › On-farm evaporative milk condensing plant to reduce transportation to processing plant.
- › Harvested wheat for cover crop seed.
- › Upgraded air compressor in 2018.
- › McCarty Family Farms produced 36% above the national average at their four dairies.
- › Piloted the EcoPractices R3 ROI model.
- › Completed energy audit.
- › Expanded processing plant to increase milk capacity.
- › Milk Specialties Global, bypass fat provider, aligns with sustainability goals.
- › Purchased grain elevator along rail tracks.
- › Secured energy contracts for diesel (through 2023), natural gas (through 2023) and E10 (through 2022).
- › \*Began operations at Rexford 2.0 in December 2022 with 4,500 head capacity.
- › \*Upgraded technology platforms including VAS OneFeed and Pulse for feed and herd management.

- › \*Purchased fertilizer spreader and excavator in 2021.
- › \*Installed manure tumbler, the first Kansas dairy to do so.
- › \*Rexford 2.0 installed two 120 stall rotaries, setting the dairy up for future success.
- › \*Added barn music at Rexford 2.0 to increase milk production and create a calm environmental for cattle.
- › \*Increased feeding and dosing accuracy via cattle scales.
- › \*Increased accuracy of ingredients in feed via mineral mixing system at Rexford 2.0.

### SHORT TERM GOALS

- › Continue to utilize the EcoPractices R3 ROI model to evaluate SCIP recommended sustainable practices.
- › Improve silage packing to protect feed quality utilizing drone monitoring.
- › Upgrade yield monitoring equipment in harvesters.

### LONG TERM GOALS

- › Increase “milk per acre” through hybrid selection and increased yields.
- › Install reverse osmosis system at processing plant.
- › Secure long-term relationships with contract growers and source protein from them.

\*New Progress or Goal

# ENVIRONMENT

## Overview

Each McCarty dairy depends upon local land owned by the McCarty Family as well as land owned and managed by their grower partners to grow crops needed to support their dairy cow herd of 7,800 lactating cows and 701 dry cows. Currently, 153 fields totaling 14,472 acres associated with the dairies form the basis for the conclusions of this report.

The grower partners grow alfalfa for hay, corn grain and silage, sorghum silage, soybeans and winter wheat. Non-GMO feed needed is grown by partners and neighbors, such as Circle C Farms, WT Partnership, FDK Partnership and many others.

The dairy operations have taken great steps to create and maintain a Nutrient Management Plan (NMP). The program describes the fields based and how many nutrients it can legally handle. The goal of the management plan is to safely and accurately apply manure from the dairy to the fields while being environmentally responsible.

Rexford Dairy has taken it upon themselves to have a collection water storage pond and solid separators to safely store the manure. The three additional McCarty dairies have similar manure management systems. In 2022 3,348 acres received a total of 91 million gallons of effluent from the dairy, which is a reduction of 167 tons of commercial nitrogen fertilizer, 162 tons of phosphorus fertilizer and 532 tons of potassium fertilizer. The manure applied has a value of \$136 per acre. See Nature's Best Fertilizer infographic on page 11.

All McCarty dairies lay atop of the Ogallala Aquifer, which provides 30% of all U.S. agriculture irrigation water. Annual recharge in the more arid parts of the aquifer is estimated to be only about 10% of annual withdrawals.

The dairies have passed reviews by Validus Verification Services, Animal Welfare, Environmental Review, On-Farm

Security as well as Worker Care. McCarty Family Farms was the first dairy farm to earn the Validus highest recognition as a Certified Responsible Producer. The processing plant at Rexford has also passed the Validus Traced, Segregated and Controlled audit.

## Permitting Status

All McCarty Family farms operate under both state and national permit requirements:

- › Kansas Agriculture and Waste Water Permit
- › Nebraska General Permit for Livestock Waste Management
- › National Pollutant Discharge Elimination System (NPDES) Federal EPA Permit

Kansas Department of Health and Environment (KDHE) oversees the Kansas Agriculture and Waste Water Permit Program for the state and is delegated to oversee the NPDES-EPA permitting program. The permits are issued on a five year basis with a renewal process every five years. KDHE does routine inspections of all Confined Animal Feeding Operations (CAFOs).

The farms are designed to collect and contain the 25 year/ 24 hour storm runoff into livestock waste management containment structures. The liquid and solid manure is accounted for in a developed and implemented NMP, which is required by the permit. The NMP is submitted to the State Regulatory Authority for review and approval. Monthly operations reports are maintained at the farm, which record liquid and solid manure application amounts specified by field. Precipitation is also recorded.



Silage being cut in August of 2021.

# Performance

## KEY INDICATOR: SOIL

Species	Nitrogen Source	Nitrogen Scavenger	Soil Builder	Subsoil Loosener	Topsoil Loosener	Erosion Preventer	Lasting Residue	Weed Fighter
Oats	P	VG	VG	P	VG	E	G	E
Triticale	P	VG	VG	G	G	E	E	VG
Winter Wheat	P	VG	VG	G	G	E	E	VG

Key	Poor	Fair	Good	Very Good	Excellent
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Information found in Midwest Cover Crops Field Guide provided by Midwest Cover Crops Council and Purdue Crop Diagnostic Training and Research Center (2014).

### Cover Crops

The benefits of cover crops include, but not limited to, soil erosion control, improved water quality, increased soil health, reduced greenhouse gas emissions and wildlife restoration.

The roots of the plant may contribute to an increase of pore space within the soil allowing for increased aeration. The roots will also contribute to reducing nutrient loss due to it either holding onto the soil and nutrients or uptakes the nutrients to prevent it from leaching into waterways.

The above ground biomass will accumulate carbon dioxide (CO<sub>2</sub>) and reduce the total amount of greenhouse gases being lost to the atmosphere. Cover crops in the field can also be utilized as nesting material by local wildlife during cold winters.

A group of plant species known as cover crops are utilized during times cash crops cannot be grown. The cover crop is normally planted in the fall prior, during, or shortly after harvest to instill living biomass above and below ground. The cover may be a single plant species or a mixture of a few or several. The biomass will persist from its planting to the first killing frost. Depending on species, growth will continue after initial thawing of the soil.

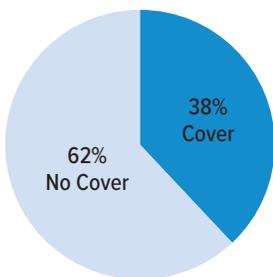
Prior to the 2022 cropping season 2,888 acres were planted with oats, triticale or winter wheat by the McCartys and associated growers. Last year, in the fall of 2021, cover crops such as winter wheat or triticale were planted on 7,576 acres. Acre expansion has been considered for the future.

### Tillage Practices

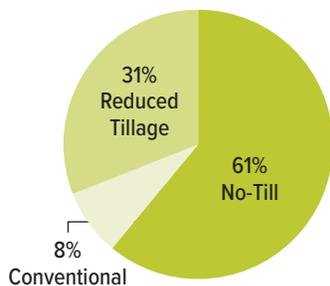
Tillage is a tool for incorporating manure to reduce nitrogen volatilization, warming or drying the soil in a cold and wet spring and weed management. A negative effect of excessive tillage is the loosening of the soil to the point of being susceptible to excessive erosion from wind or rain, loss of biological activity and deterioration of soil structure.

The environmental benefits of reduced tillage include reductions in erosion and nutrient runoff, significant soil health improvement, reduced greenhouse gas emissions, increased wildlife habitat and improved air quality. A reduced tillage system has been implemented on 31% of acres and

### COVER CROPS

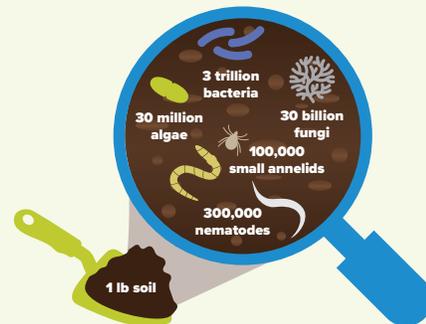


### TILLAGE



According to the 2017 U.S. Ag Census, the national average is **4% cover crop adoption**, **37% no-till adoption** and **35% reduced till adoption**.

### SOIL LIVES



Soil is home to an abundance of living organisms, most of which we cannot see without magnification. These organisms contribute to the natural world by converting unusable debris, such as dead grass or corn stalks, into available nutrients needed for plant growth. Because of these organisms, the soil builds organic matter and provides nutrients for plants to grow.

Data source: 2016 Global Soil Diversity Atlas

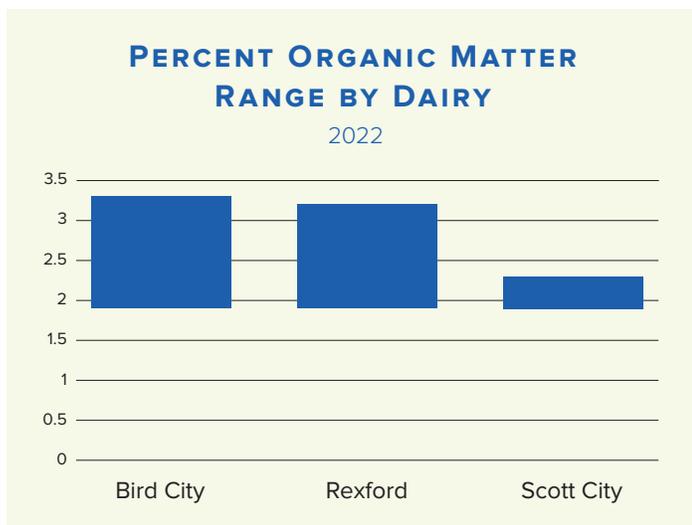
61% of acres were no-till. The fields incorporate the stubble from previous crops and if present, the cover crops. A few examples of implements used are strip till, disk, harrow and vertical till. On some of the no-till fields the growers inject manure to reduce nitrogen loss. The field will only see a 2% loss of nitrogen compared to a 5% loss using incorporation.

### Soil Organic Matter and Soil Organic Carbon Levels

According to Cornell University, productive agricultural soils have between 3% and 6% OM content. OM improves soil structure, increases water holding capacity of sandy soils, improves drainage in clay soils, provides a source of slow-release nutrients, reduces wind and water erosion and promotes growth of earthworms and other beneficial soil organisms. Compost increases OM which in turn increases cation exchange capacity (CEC) of the soils. This all leads to better soil structure, porosity and density, thus creating a better plant root environment.

The McCarty’s prominent soil type is an Argiustoll, defined as a dry, developed soil. The tested soils surrounding the dairy have a historic range of 0.49% to 1.83% OM according to the Web Soil Survey, a Natural Resources Conservation Service (NRCS) database, using an area around the dairy of about 100,000 acres with the dairy as a central point. Compared to a historic range of 0.49% to 1.83%, the acres tested at a range of **1.9% to 3.3%** for **organic matter**. Soil amendments such as manure are important for maintaining and increasing SOM.

SCI, Soil Conditioning Index, an NRCS tool, predicts trends in soil organic matter in the top few inches of soil based on current management practices. If the calculated index is a negative value, the level of soil organic matter is predicted to decline under the production system. If the index is a positive



McCarty Family Farms’ organic matter results by dairy.

value, the level is predicted to increase under the system. Values near zero (i.e.,  $0 \pm 0.05$ ) suggest that organic matter will be maintained near the current level. From 2019 to 2021 this value was positive. As of 2022, the **weighted average SCI value** is **1.29**, predicted from current management, soil type and climate for future years.

### Soil Sampling

Soil sampling is an important part of crop production to understand soil chemistry to properly apply nutrients. Soil sampling is typically done in the fall after harvest but as long as timing is uniform year-on-year, it can be done in the spring as well. At the dairy, soil sampling is important to know nutrient availability from manure because manure has a variable analysis. Soil sampling can reduce negative effects of overapplication or underapplication of nutrients. Overapplication of nutrients has adverse effects to water quality and return on investment for the dairy. Underapplication likely means a decrease in yield. Between the McCartys and the growers, soil sampling frequency varies. The McCarty soil sample almost annually so they can assess how much manure they are able to apply.

### Haney Soil Tests

The McCartys utilize soil testing from the Haney Soil Health Test conducted through the Regen Ag Lab. This test can offer a comprehensive look at soil health, delivering many indicators like soil pH, organic matter and N, P and K content. What makes this test unique is the ability to use different soil extracts, like H3A and H2O, to estimate what quantity of nutrients are available to soil microbes, as well as the ability to determine soil respiration. The test then assigns a soil health score based on soil respiration and water extractable carbon and nitrogen. This score can be used as a benchmark to compare management practice performance on soil health over time.

NRCS USDA PRACTICES AT MCCARTY FAMILY FARMS	
Soil	Cover Crop (CPS Code 340) Residue and Tillage Management, Reduced Till (CPS Code 345) Residue and Tillage Management, No-Till (CPS Code 329)
Water	Waste Storage Facility (CPS Code 313) Grassed Waterway (CPS Code 412) Solids/Liquid Waste Separation Facility (CSR Code 632) Waste Utilization (CSR Code 633) Nutrient Management (CPS Code 590) Irrigation Water Management (CPS Code 449)
Biodiversity	Conservation Crop Rotation (CPS Code 328) Structures for Wildlife (CPS Code 649) Critical Area Planting (CPS Code 342) Upland Wildlife Habitat Management (CSR Code 645)

## KEY INDICATOR: WATER

### Nutrient Management

Nutrient management at McCarty Family Farms uses effluent as an organic waste source to irrigate and fertilize fields. This system allows the waste water to be reclaimed and used again for crop irrigation, which decreases the amount of ground water needed. Repurposing the nutrients in the effluent also reduces the need for commercial fertilizers, which has a positive effect on water quality while reducing farm costs.

### Vanguard Partnership

McCarty Family Farms plans to partner with Vanguard Renewables Ag to install a manure-only anaerobic digester. Vanguard Renewables Ag is the nation's leading developer and operator of manure-only anaerobic digesters. An anaerobic digester can take livestock manure and convert the material to renewable natural fuel or manage the waste for other beneficial uses. The benefits of this type of manure management can be diversifying farm revenue, improving soil health by converting the nutrients in manure to a more accessible form for plant use and protecting local water resources by reducing nutrient run-off. Other uses include to generate electricity on-farm and to capture methane gas emissions that otherwise may have been emitted.

### Fertigation

The crops need for nitrogen is existent throughout the growing season but can be out-competed by other forces of

nature. If the ground is too dry, then the nitrogen will volatilize. If the ground is too wet, then the nitrogen will denitrify. If the ground water is actively flowing, then the nitrogen will be lost to leaching. The nitrogen in leaching scenarios could have negative effects on the environment and all nitrogen losses have negative economic impacts.

The enterprise has taken steps to reduce their impact by applying nitrogen (as either manure or commercial fertilizer) at different times during the year. Most of this in the form of effluent released from pivot irrigation systems. Most pivots for the McCartys have the ability to pull from either fresh water or effluent for fertigation. The ecosystem services and reduced synthetic fertilizer cost outweigh the cost of extra management.

### Partnership with Source®

McCarty Family Farms is working to consistently improve their nutrient management and efficiencies, partnering with Source® to explore its ability to activate microbes at the root zone that could fix atmospheric nitrogen and unlock phosphate. There are two main ways to use Source®, first is to maintain nitrogen levels in the soil by using Source® to boost yield, the other is to reduce nitrogen by 25 pounds by using Source® to protect yields. This product can strengthen soil with microbial activity, while reducing nitrogen runoff, providing efficient nutrient management. The Source® Performance Optimizer uses real data year after year to provide precise application information resulting in the best ROI for the operation, this can be useful for increasing yields and reducing synthetic nitrogen.



Pivot irrigation at Rexford.

## Water Quantity

McCarty Family Farms works with Tri-State Irrigation for precision agriculture and water management solutions. Tri-State Irrigation offers technology services and solutions for maximum yield and water efficiency by specific fields. Tri-State Irrigation installs soil moisture probes in an optimum location of the dominant soil type and scouts the area of placement to be sure it is the most representative of the whole field as possible. They are installed directly into the soil with an auger drill to a 36-inch depth. The soil is not disturbed or mixed with water for installation in order to produce the most accurate results possible. Probes are extracted before harvest and installed.

The McCartys use this technology to minimize the use of water and resources but also for other purposes such as scheduling the end of irrigation prior to chopping of silage to ensure the soil will be dry and not as susceptible to compaction during harvest.

Beaver City added AgSense units in 2018 to better monitor pivot activity. Rexford Dairy added soil moisture probes in 2019, totaling 38 soil moisture probes and 10 AgSense units. Plans are in place to install more in future years. Bird City had a soil moisture probe installed per field in 2018, with 12 soil moisture probes. Soil moisture probes are able to stay in place year round for alfalfa fields at Bird City. Scott City currently does not have any soil moisture probes or AgSense units on pivots.

## Reclamation and Reuse

Beaver City was originally designed as a scrape and flush flume system, meaning manure from pens is flushed into a pit with fresh water and solids are mechanically separated from liquid waste going to lagoons. This process used a substantial amount of fresh water, so the McCartys installed a process to flush with greywater and utilize a gravity sand separator in 2016. This reduced fresh water, electricity use and the need to source new sand to the dairy.

Beaver City currently utilizes fresh water pumped from the ground to cool chiller plates to cool milk produced daily. The newer system is able to reclaim water pumped from the ground to chill milk. This water is reused at the dairy for drinking water, wash water, parlor cleaning and cow cooling.



New fans installed in the barns at Scott City in the spring of 2018.

In the spring of 2018, Beaver City Dairy installed a buried pipeline from the north end of the lagoon to the south end. The purpose of the line is to recycle water moving through the dairy and for easier allocation to the lagoon pumps. In addition to the pipeline installation, a filter system was added directly to the pumps feeding into the irrigation pivots to increase efficiency.

## Redesigned for Efficiency

Water is conserved at Scott City with a new, advanced cow comfort system. Special fans were installed in 2016 in the parlor and will be installed throughout the freestall barns in the coming years. These fans sense the temperature and automatically adjust the speed and amount of water released depending on the intensity of the temperatures. This process reduces electricity use as well.



AgSense online monitoring system allows access to all probes and pivots at once to successfully monitor water needs. Photo courtesy of Tri-State Irrigation.

## Water Savings with In-House Processor

The evaporative cooling milk processor at the Rexford farm saves about 51,615 gallons of water a day by condensing the skim milk before it is transported. This equates to 20 million gallons of water per year. The processing facility is rare in the U.S., but the McCarty Family acknowledge an economic and environment benefit because of the unique relation with Danone North America.

## Ogallala-High Plains Aquifer Recharge

The Rexford Dairy location as well as the Bird City Dairy location are located in the Northwest Kansas Groundwater Management District No.4 (GMD4) over the Ogallala-High Plains Aquifer. The other two McCarty dairies are also on the Ogallala-High Plains Aquifer, but are not in the same district as Rexford and Bird City. As of April 13th, 2018, [GMD4 entered into an official Local Enhanced Management Area \(LEMA\)](#). A LEMA is a five year plan structured to have state and local water authorities along with local producers within the GMD, work together to agree to establish water use reduction goals in order to extend the useful life of the groundwater source. Before the LEMA was established, the McCarty Family took it

upon themselves to start a conservation plan and had been working on plans for a Water Conservation Area Agreement (WCA). A WCA is a voluntary program that seeks to reduce groundwater pumping beyond state and local water allotments in order to sustain a local community by extending the life of the aquifer. The state opened up the opportunity to enter into these types of conservation plans due to the ground water levels declining as the rate of withdrawal is exceeding the rate of recharge. A WCA grants the water right owner flexibility in the time and point of use of the water in exchange for reduced usage. As of July 2018, McCarty Family Farms at Rexford and the Kansas Department of Agriculture, Division of Water Resources entered into a WCA.

McCarty Family Farms have paused their Water Conservation Agreement at the end of 2022. They are in process of tying their wells together to understand and reflect their water usage more accurately. With Rexford 2.0 beginning operations in late 2022, the McCarty's will evaluate water use over the course of the next three years at the new dairy, original dairy, processing plant and fields. This will allow them to enter a new WCA in 2026 informed by updated data.



The main condensing unit in the processing plant, which provides significant sustainability benefits.

## KEY INDICATOR: BIODIVERSITY

### Danone North America’s Movement to non-GMO

The Danone North America Policy on Biodiversity and GMO Use of ingredients containing GMO crops depends on the agriculture, existing biodiversity risks and opportunities in the countries where they operate. In the U.S., Danone North America has decided to declare the presence of GMO ingredients with the movement of fewer ingredients in their products being more natural and non-GMO.

### Root Structures

Crop management in North America is prone to monocropping systems. The same species may be utilized in a field for years. If it occurs, then the soil within the field may degrade due to the same root system. The degraded soil can impact the crops growth and potential yield. To reduce the impacts on the soil and crop, growers are encouraged to plant cover crops, increase crop rotation and reduce deep tillage practices.

### Crop Rotation

Crop rotation has many conservation benefits such as nutrient cycling and helping to break insect, disease and weed cycles. In addition, alternating crops adds to the farm’s overall diversity, often reducing economic and environmental risks.

There are multiple crop rotations that source feed to the dairy. Perennial alfalfa is grown for multiple years in a row, some examples of row crop rotations are corn then wheat, occasionally with soybean or sorghum grown as third crop in the rotation. Additional cover crops are also utilized in between row crops.



New insect and bird boxes deployed at all McCarty Dairies.

## Pollinators and Wildlife Areas

Animal pollinators are needed for the reproduction of 90% of flowering plants and one-third of human food crops. Planting select plants such as wildflowers, trees, shrubs and grasses enhances pollinator populations throughout the growing season and benefits the farm’s conservation plan.

As of 2022, the dairies have a total of 79 wildlife boxes to provide habitat for important species of birds, bats and insects. 10 acres at Rexford are planted to pollinator habitat. They have plans to expand this acreage. They have identified 3 field corners to plant to habitat in partnership with Pheasants Forever.

Conservation Practice	Fields	Acres
 Grassed Waterway	1	2
 Pollinator Habitat	-	10
 Wetland	1	10

### ADDITIONAL ENVIRONMENTAL BENEFITS FROM CONSERVATION PRACTICES\*

 **33%** of nitrogen fertilizer saved from runoff into streams

 **58%** estimated reduction of phosphorus saved from runoff into waterways from buffers

## KEY INDICATOR: CARBON & ENERGY

### Energy Reductions

The smart cow cooling system increases fan speed and water released as misting with the increasing temperatures. This is done automatically with an auto turn-on sensor and does so starting at 68°F. The previous model would use the same amount of water at 68°F as it would at 98°F. The new model reduces fresh water needs. As of 2017, these have been installed at all four McCarty Family Farms dairies.

Investments in high efficiency pumps, better lighting and other operational system improvements have resulted in improved electrical and natural gas efficiencies.

Beaver City utilizes propane instead of natural gas like the other McCarty dairies. In 2018, Beaver City averaged 364 gallons of propane per month, down 20 gallons from 384 per month in 2017. In 2019, propane usage went up to an average of 469 gallons per month.

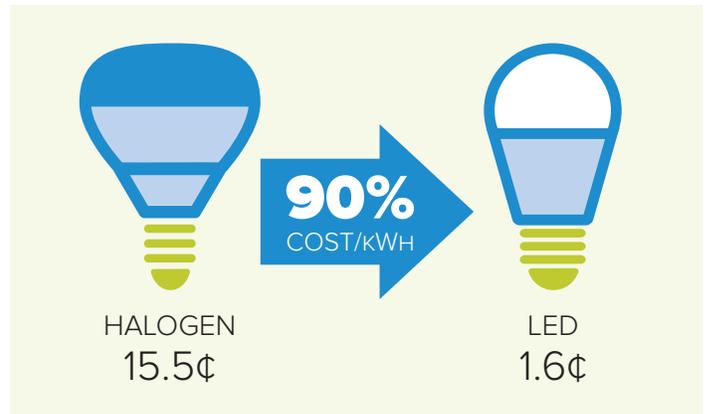
All dairies are monitored for energy usage. While 2019 saw increase in energy usage in most of the operation, 2020 brought a decrease in less energy used since 2017 for electricity and natural gas.

### Lighting

The McCartys have taken steps to reduce their carbon footprint and improve efficiency. LED lighting has been installed in 100% of the buildings at all four McCarty dairies and 100% of the plant to increase the amount of light produced for less energy. According to the University of Minnesota Dairy Extension, a dairy can see a savings of almost 90% per kWh used if bulbs are transitioned to LED.



LED lighting installed at McCarty Family Farms.



### Caterpillar Partnership

The McCartys have a partnership with **Caterpillar**. Their account managers Dustin Daniels from Foley equipment and Charlie Watts from Caterpillar work with them on what equipment best fits their needs and delivers reports on total hours ran for efficiency evaluations. The McCartys retired 4 of their tractors at the end of 2018 and gained 4 new tractors for 2019. They increased their fuel efficiency from **2.4 to 2.3 gallons per hour** in 2019. The four dairies saved a total of **1,659 gallons of fuel** in 2019.



### Efficient Transportation

McCarty's approximate **haul** to its processing plant is **57 miles**.



The national average distance to a processing plant is **275 miles**.

## John Deere Partnership

The McCartys utilize John Deere tractors every day for feeding, cleaning pens, storing feed and regular maintenance at the farm. Working with their local dealer, American Implement John Deere, the McCartys have the majority of their fleet on the smaller side of the 8,000 series. Although the larger tractors in the 8,000 series are more efficient with diesel fuel per hour. Their local dealer, Dick Dempewolf, has worked with them to identify current needs to find them the right fit for safety with stability, load efficiency rate and cost effectiveness. The fuel efficiency saved from the different models would not pay for itself in the overall cost as they currently do not utilize the horsepower provided by the larger tractors in this series.

The McCartys benefit from JD Link, which is a program to remotely connect to each compatible piece of equipment from any computer with real time monitoring. They are focusing on the idle time to working time ratio with their account manager and providing training to operators to insure their fleet is operating safely and efficiently. The McCartys

“I take pride in caring for our customers, like the McCarty Family Farms, in providing for their needs with the highest level of technology available on the market.”

– Dick Dempewolf  
*American Implement - John Deere,  
McCarty Family Farms Account Manager*



Silage cut in August of 2021.

changed tractors in 2020 which shows varied results in the tractor efficiencies. The average fuel rate for the four tractors (as opposed to the previous seven) is 7.9 gallons per hour accounting for idle, working and transportation time. The idle time has decreased to 23%.

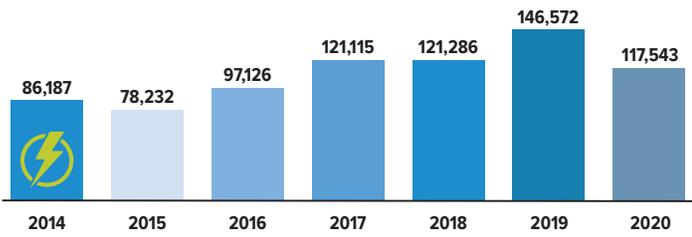
## Ruan Partnership

The McCarty's have a partnership with Ruan, an environmentally focused transportation company. Ruan has **received multiple awards in environmental excellence**. They have been serving the dairy industry for 78 years and brought their expertise to the table to customize a transportation solution for McCarty Family Farms. The **special order smaller 6,200-gallon tank** ensures product integrity by reducing unused tank volume to cut down on sloshing. Their lightweight aerodynamics improve fuel consumption and their Auxiliary Power Unit, APU, usage reduces engine idle time. Their idle time is a maximum of five minutes, after which the engine is shut off to save on fuel. They have also enforced a 62-mph cap on their fleet to increase fuel efficiency. Their driver training, continued learning, trailer skirts, wheel covers, super single tires, aerodynamic mud flaps, idle time cap and mph cap all contribute to an impressive **7.81 MPG in 2021, down 0.09 MPG from 7.89 MPG in 2020** at McCarty Family Farms operations. According to the McCarty Family Farms report from 2018, due to their light weight tractors and increased payload reduces annual loads and annual miles from the four farms and to their final destination, **they reduced 6,745 gallons of diesel fuel equating to 66 tons of CO<sub>2</sub>e emissions**.

“Ruan values their partnership with McCarty Family Farms at the highest level. Over the partnership's tenure, and in conjunction with McCarty Family Farms, Ruan has made great strides in maximizing our efficiencies within the operation. Our trailer specifications, automatic idle shut off on tractors, reduced maximum speed and continuous driver training have combined to help with sustainability efforts, directly correlating to reduced diesel gallon usage and CO<sub>2</sub> emissions.”

– Matt Fleming  
*Ruan, McCarty Family Farms Account Manager*

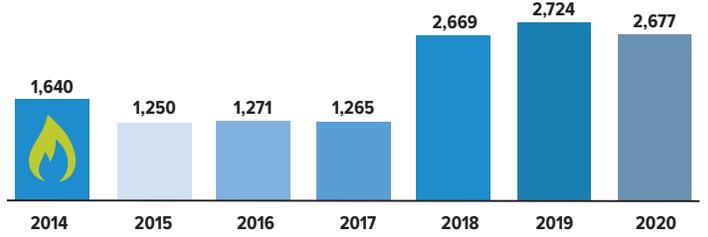
**REXFORD AVERAGE ELECTRICITY USAGE 2014-2020\***



**MONTHLY AVERAGE KILOWATT HOUR (KWH) USAGE/YEAR**

\*Additional records provided in 2019.

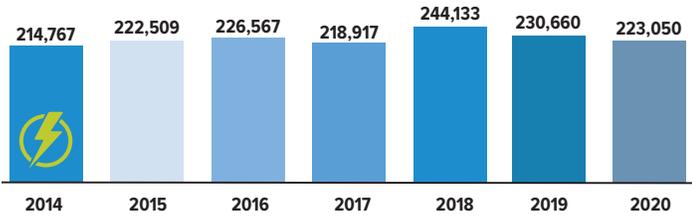
**REXFORD AVERAGE NATURAL GAS USAGE 2014-2020\***



**MONTHLY AVERAGE THERM (CCF) USAGE/YEAR**

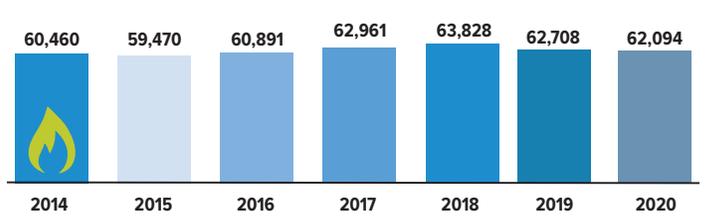
\*Additional records provided in 2019.

**PLANT ELECTRICITY USAGE FROM 2014-2020**



**MONTHLY AVERAGE KILOWATT HOUR (KWH) USAGE/YEAR**

**PLANT NATURAL GAS USAGE 2014-2020**



**MONTHLY AVERAGE THERM (CCF) USAGE/YEAR**



Converting lighting to more efficient systems has contributed to reductions in kilowatt usage.

## KEY INDICATOR: ECONOMY & PRODUCTIVITY

### Utilizing Manure Fertilizer

Manure is a by-product of any animal feeding operation. Manure is a combination of carbon, nitrogen, phosphorus, potassium and other elements that plants need to survive. Exchanging manure for commercial fertilizers on the fields will reduce overall crop growing cost on any field.

### Healthy Animals

The McCartys understand that a dairy can only be successful if the cows are happy and healthy. Reducing cow stress is of the utmost importance to have high quality and quantity of milk production. Precautions are taken to reduce disease, discomfort and improve animal well-being. These are top priorities for all farmers, but especially those producing for Danone North America. The average dairy cow at McCarty Family Farms will produce 36% more milk than the national average (USDA: National Agricultural Statistics Service, 2020).

### Corn Grinder

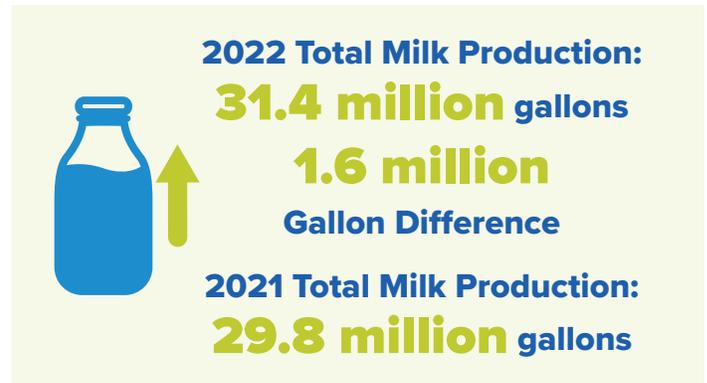
All locations installed a grain grinder in the fall of 2016. Grinding on-site results in a better quality feed because the McCartys control the corn source. Today, the dairy has a higher compliance rate for non-GMO feed. Bringing this process on site reduces freight cost and carbon emissions. Also, cows productivity increases with quality ground grain, therefore better utilization of resources to produce the end product. This increased efficiency also reduces cost.

### Yield

Crop yields surrounding the dairy reflect the productivity on the fields, in turn impacting the quantity and quality of the feed. The growers optimize their efficiencies to produce quality feed for the dairy without having exorbitant costs. To understand the effectiveness of a single field one can compare it to the surrounding area. The graph shows the average yield by crop type for the 2022 growing season.



McCarty Family Farms **cows** produce approximately **36% more milk than the national average.**



### Precision Technology

Precision technology is utilized in many ways in agriculture. Variable Rate Technology (VRT), for both planting and fertilizer operations, optimize inputs and decrease product costs. Mapping software, GPS and soil samples dedicate where and how much seed and fertilizer is needed.

Mitch Baalman of FDK Partnership uses My John Deere to manage his farm's fields. In addition, Mitch recently purchased a new sprayer so that his whole fleet can connect to the My John Deere platform for data tracking. This allows for better use of resources and produces efficient feed to the dairy while keeping records on management.

### Grain Elevator

When the grain elevator across the road from the dairy went up for sale, the McCarty family was intrigued. They evaluated the return on investment of the grain storage potential as well as the ability to receive and ship along the railroad tracks. In addition to the infrastructure, there was adjacent land that the farm could utilize. They completed the purchase and now have an additional asset that improves transportation, provides additional grain storage and land.

CROP	YIELD
Corn Grain	211 bu/ac
Corn Silage	16.5 T/ac
Fallow	-
Hay	5.2 T/ac
Sorghum Silage	5.7 T/ac
Soybean	50 bu/ac
Winter Wheat	60 bu/ac

Yield from crops grown for McCarty Family Farms in 2022.

## KEY INDICATOR: ANIMAL WELFARE

Danone North America's Animal Welfare Policy is recognized by Five Freedoms developed with the Farm Animal Welfare Council.

The combination of all five freedoms (freedom from hunger or thirst, freedom from discomfort, freedom from pain, injury or disease, freedom to express normal behavior and freedom from fear or distress) allows cows to be productive without limiting their physical, mental or social health.

Since the beginning of the Rexford farm in 2000, the McCarty's have believed that their most important contribution to sustainability is through animal care so that the cattle use feed and water most efficiently.

- › The cows' diets are determined by a nutritionist and monitored daily. Cows are fed a mix of chopped forages, such as alfalfa hay and silage. Grains and a mixture of vitamins and minerals are added to the forages to supply nutrients needed for optimum milk quality and cow health.
- › Experts such as veterinarians, animal nutritionists and facility technicians augment the skills of the family and co-workers.
- › The dairy features barns and outdoor pens developed specifically for cow comfort. Inside pens are cleaned at least once a day.
- › The cows being milked are kept outside and in "freestall barns" with deep sand for them to lie in and room to roam whenever they want. Sand bedding is used for cows being milked because of the comfort it provides in addition to preventing mastitis.
- › Cows are cooled in the hot summer months with shade, sprinklers and fans. In the winter, straw is used to keep the cows clean, warm and dry.
- › Employees have special training in animal care and handling, nutrition and milking ensure that every animal receives proper attention and respect.

### Feeding the Herd

The cows on location are fed a wide variety of products to fuel the herd. The largest feed component by weight is corn silage. The fermented grass stock provides a variety of nutritional benefits for the animals. Other portions of the feed are ground corn, dried distillers' grains, etc. Each component

contributing differently to the needs of the herd. The diets are formulated by a dairy nutritionist that balances the animals diet based on life stage. The lactating cows and the dry cows may be offered the same kinds of feed but will be rationed differently due to needs of the cow. Each animal, regardless of life stage, is fed appropriately to maintain and improve the herd.

### Feed Efficiency

The McCarty Dairies continues to encourage economic success by reducing the total amount of feed needed to produce a pound of milk. This is achieved through effective breeding, vigorous care and proper diet for each individual dairy cow that lives in the barns.

### Merck (MSD)

Merck (MSD) is one of the top suppliers of veterinary medicinal products to McCarty Dairy on an annual basis. McCarty Dairy utilizes Merck's innovative veterinary pharmaceuticals, vaccines and health management solutions with tools like identification, traceability and monitoring to provide adequate care to their dairy. With ventures in Pharmaceutical and animal health segments as part of Merck's company operation and a global reach, Merck is committed to providing 75% of countries annually with affordable products.

### CLARIFIDE® Plus from Zoetis

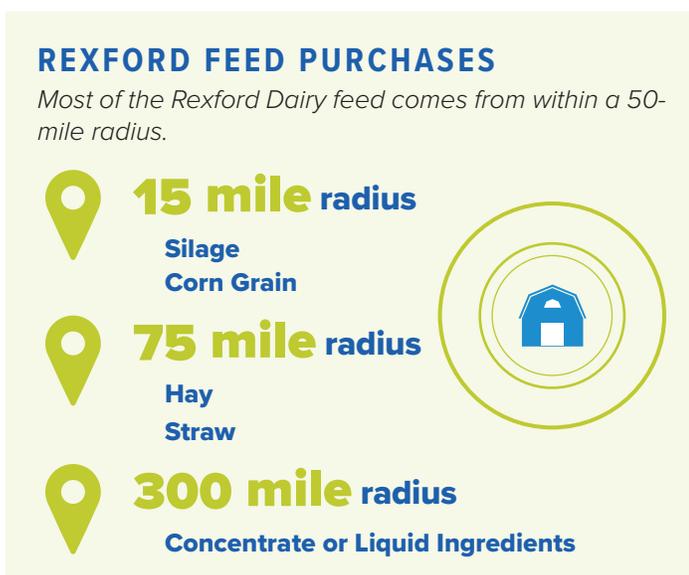
Zoetis, a leading animal health company, provides products and services that aid in animal welfare and strives toward productive and sustainable livestock operations. To promote healthy livestock, Zoetis focuses on optimizing feed efficiency through new products, mitigating methane emissions and improving genetic tools to select healthy animals. One of these products is CLARIFIDE® Plus which is utilized on McCarty Dairy for genetic testing, providing information on cow and calf wellness traits and Holstein and Jersey fertility traits. This type of genomic testing allows McCarty Dairy to efficiently manage herd health, production, profitability and sustainability. A study published in August 2022 from Zoetis shows the positive effect genetic selection can have on sustainability outcomes, with 25% of cows with superior genetics demonstrating 10% less enteric methane emissions, producing 35% more milk and generating an average of \$869 more profit lifetime per cow compared to the inferior cow group. ([Zoetis 2022](#))

# GREENING OF THE SUPPLY CHAIN

## Dairy Feed Components

The McCartys have various relationships with feed suppliers for other feed components besides their silage needs. The McCartys have been progressive in determining the original source of their dairy's feed to insure its quality and sustainability. In 2018, all **non-GMO molasses liquid** supplement for feed for McCarty Family Farms came from **U.S. based sources** originating from both Texas and Louisiana. Sugarcane grown in the U.S. reduces transportation but also **eliminates deforestation concerns** with production in overseas countries. Their **soybeans are not sourced from deforested acres and come from the U.S.** Energy booster, which is an additive, provides the dairy cow with an energy source that does not interfere with rumen fermentation and fiber digestion but aids in the energy density of the dry diet, reducing stress and supporting higher milk production. In 2019, the energy booster used was made from vegetable oil. In 2019, bypass fats, a supplement to aid in digestion, was not derived from palm oil sources and derived from all U.S. ingredients.

Most of the Rexford dairy feed comes from within a 50 mile radius. Rexford purchases **silage** and **corn grain** from approximately a **15 mile radius**, **hay** and **straw** from approximately a **75 mile radius** and purchases **other concentrate or liquid ingredients** from approximately a **300 mile radius**.



## Elanco & Royal DSM Partnership

Elanco Animal Health Incorporated and Royal DSM are working in conjunction to contribute to climate mitigation efforts by innovating new products that can reduce on farm methane emissions. McCarty Family Farms partners with Elanco and Royal DSM to utilize their new product, Bovaer®, a methane reducing product for beef and dairy cattle. This product has shown to consistently reduce enteric methane emissions by 30% for dairy cows. This methane reducing feed product could contribute to a large reduction in the environmental footprint of the dairy industry.

Elanco Animal Health Incorporated is a global leader in animal health working to improve products and services that prevent and treat disease in livestock. Founded in 1902, Royal DSM address global health challenges by applying science to improve health of animals, people and the planet.

## Milk Specialties Global Partnership

Milk Specialties Global (MSG), a dairy nutrition company founded in the 1940s, produces bypass fat supplements that can increase milk productivity, making dairy operations more efficient and shrinking the carbon footprint for one gallon of milk. The McCartys utilize these supplements for improved efficiency and increased milk production. MSG has reduced the amount of energy used per product by 26% and made saleable compliance improvements that prevented 1.7 million fewer pounds of product from going unused in 2021. MSG has also made strides in the industry for water conservation, investing in facilities that can clean and recycle water used.

## Diamond V Partnership

The McCartys have partnered with Diamond V to apply products that can improve feed efficiencies while reducing the amount of nutrients excreted. Since 1943, Diamond V has worked on microbial based fermentation research and technology innovation. Diamond V Original Yeast Culture™ can increase total tract digestibility which can result in improved feed utilization in dairy cows during lactation, providing an opportunity to reduce methane production and lower overall emissions.

## Sustainability a Shared Mission

McCarty vendor partnerships that have a shared mission for sustainability and commitment to environmental progress:

	Bypass Fats Vendor	<a href="#">Social Responsibility Report</a>
	On-Farm Equipment	<a href="#">Sustainability Report</a>
	On-Farm Equipment	<a href="#">Sustainability Report</a>
	Milk Hauler	<a href="#">Sustainability Efforts</a>
	Vet Med Vendor	<a href="#">CSR Report</a>
	Vet Med Vendor	<a href="#">ESG Report</a>

## Holstein Association USA

Holstein Association USA (HAUSA) is the world’s largest purebred dairy cattle breed organization, with information on over 24 million Registered Holstein cattle contained in the Association files. They have over 20,000 members. Their mission statement is “to provide leadership, information and services to help members and dairy producers worldwide be successful.”



The farm is able to use more efficient equipment by working with local dealers.

Holstein breeders participate in the programs and services offered by HAUSA, as the information provided back aids them in breeding a more profitable herd of cows. Knowledge is power, and the U.S. Registered Holstein population has as much information documented in terms of lineage, genetics and performance of any animal species in the world.

McCarty Family Farms have been HAUSA members since 2013. Since then, they have registered over 40,000 Holsteins into the official herdbook database, including over 6,100 calves in the past 12 months, making them one of the largest active Registered Holstein herds in the country.

The McCarty family is breeding a more quality herd of Holsteins with each generation that goes by. Over 20% of their animals rank within the top 10% of the Holstein population for genetic merit – meaning they have the genetics to produce more milk that is higher quality and live longer, healthier lives than the average Holstein cow. Because of this focus on breeding quality animals, McCarty Family Farms has been recognized as a Progressive Genetics Herd by Holstein Association USA for the past two years. That award is given to the top 500 Registered Holstein herds in the nation based on average genetic merit of their animals.

## On-Site Compost

Bird City has the land capacity that allows them to compost on site. The time to dedicate to successful composting is currently unavailable and because of time constraints, is contracted out to a third party company. A wind-row system has been implemented and is turned three times a year. The method ensures the piles are heated evenly to kill any pathogens and break down the materials with beneficial bacteria. The compost is created with the solid manure waste and straw bedding from the calves. The outside group that manages, markets and sells the finished compost adds conditioners to the mix. The group provide an analysis to those that receive the exported compost from the dairy for application management decisions.

# Data Collection & Verification

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The Sustainable Environmental Consultants data collection and verification process provides assurance that the data reflected in this report is accurate and reliable. Sustainable Environmental Consultants achieves the accuracy and reliability by employing data verification procedures with a multi-level verification process. All client data is collected and stored in Sustainable Environmental Consultants' safe and secure database, which is accompanied by chain of custody records. Sustainable Environmental Consultants enters into confidentially and nondisclosure agreements with all clients in order to ensure that client data is protected. Additionally, Sustainable Environmental Consultants enters into a Services Agreement with each client in order to define the release of any client information and acceptable reporting methods.

## Statements of Accuracy

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\*Sustainable Environmental Consultants, through its EcoPractices platform, estimates an environmental impact value for reducing greenhouse gas emissions, reducing soil erosion and reducing nutrient loss due to reduced leaching. These estimates adhere to processes that are documented by the NRCS Technical Guides and publications from the EPA. These values are tailored to a specific location and participant's operation. Models used are supported by USDA, NRCS, other government agencies and major universities. Modeled results include input data from public resources for weather, soils and historical crop rotation. Greenhouse gas simulations were produced from the Greenhouse Gas Inventory (GGIT) tool developed by Soil Metrics, LLC (2021) <https://soilmetrics.eco>. The GGIT tool implements the USDA-sanctioned greenhouse gas inventory methods described in Eve et al. (2014) 'Quantifying Greenhouse Gas Fluxes in Agriculture and Forestry: Methods for Entity-Scale Inventory'. The GGIT tool utilizes greenhouse gas modeling technology developed for the COMET-Farm tool, licensed by Colorado State University to Soil Metrics, LLC.

\*Sustainable Environmental Consultants estimates an additional environmental impact for edge of field practices utilizing the data referenced from the Iowa State Nutrient Reduction Strategy by conservation practice based on whole field impact scale.

By signing below the parties agree *McCarty Family Farms Sustainability Analysis On-Farm Practices Report 2022*, and the data on which this Sustainable Environmental Consultants report relies is accurate and has been presented correctly.

Sustainable Environmental Consultants, LLC

McCarty Family Farms

*This summary must not be edited or altered in any way without the involvement and consent of Sustainable Environmental Consultants, LLC.*

# Glossary & Abbreviations

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**4R Nutrient Stewardship** – an approach that utilizes best management practices (BMP) addressing use of the right fertilizer source, at the right rate, at the right time, with the right placement <https://nutrientstewardship.org/4rs/>

**American National Standards Institute (ANSI)** – ANSI certifies the process that the appropriate mix of industry, academia and public were consulted in developing the ANSI certification standard

**Animal Unit (AU)** – a basis to standardize and express stocking rates among different kinds and classes of livestock with similar dietary preferences. An AU is a measure of forage demand by a theoretical animal unit that can then be converted according to the relative demands of difference animal classes (based primary on metabolic bodyweight). <https://globalrangelands.org/inventorymonitoring/animalunits>

**Argiudoll** – a soil great group classified as an Udoll with an argillic horizon, under the soil order of Mollisols

**Agriaquoll** – a soil great group classified as an Aquoll with an argillic horizon, under the soil order of Mollisols

**Argiustolls** – a soil great group classified as an Ustoll with an argillic horizon, under the soil order of Mollisols

**Bioaccumulation** – the accumulation of a substance in an organism that occurs when an organism absorbs the substance at a rate faster than that at which the substance is lost

**CAFO** – Confined Animal Feeding Operation

**Carbon Dioxide** – a naturally occurring substance composed of one atom of carbon (C) and two atoms of oxygen (O<sub>2</sub>). Its chemical formula is CO<sub>2</sub>.

**Cation Exchange Capacity (CEC)** – the capacity of the soil to hold onto cations. Cations are positively charged ions that are held by the negatively charged clay and organic matter particles in the soil through electrostatic forces (negative soil particles attract the positive cations). The cations on the CEC of the soil particles are easily exchangeable with other cations and as a result, they are plant available. Thus, the CEC of a soil represents the total amount of exchangeable cations that the soil can adsorb. <http://nmsp.cals.cornell.edu/publications/factsheets/factsheet22.pdf>

**CFM** – Cubic Feet per Minute

**CO<sub>2</sub>e, Carbon Dioxide Equivalent** – a standard unit for measuring carbon footprints. The idea is to express the impact of each different greenhouse gas in terms of the amount of CO<sub>2</sub> that would create the same amount of warming.

**Commercial Fertilizer** – manufactured chemical mixture prepared for use as fertilizer meant to mimic natural substances such as animal manures

**Compost** – a mixture that consists largely of decayed organic matter and is used for fertilizing and conditioning land <https://www.merriam-webster.com/dictionary/compost>

**Conservation Crop Rotation (CPS Code 328)** – growing a planned sequence of various crops on the same piece of land for a variety of conservation purposes (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Conservation\\_Crop\\_Rotation\\_328\\_CPS.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Conservation_Crop_Rotation_328_CPS.pdf)

**Cover Crops (CPS Code 340)** – growing a crop of grass, small grain, or legumes primarily for seasonal protection and soil improvement (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Cover\\_Crop\\_340\\_CPS.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Cover_Crop_340_CPS.pdf)

**Constructed Wetland (CPS Code 656)** – an artificial wetland ecosystem with hydrophytic vegetation for biological treatment of water. Constructed wetlands are used to treat wastewater and contaminated runoff from agricultural processing, livestock and aquaculture facilities or for improving the quality of storm water or other water flows (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Constructed\\_Wetland\\_656\\_NHCP\\_CPS\\_2020.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Constructed_Wetland_656_NHCP_CPS_2020.pdf)

**Comprehensive Nutrient Management Plan (CNMP)** – a whole farm, progressive document. It contains records of the current activities on a livestock operation, an evaluation of the existing environmental risks and proposals to reduce the negative impacts to the environment. A Nutrient/Manure Management Plan is part of a CNMP. [https://www.nrcs.usda.gov/sites/default/files/2022-10/NRCS\\_CNMP\\_Template\\_1\\_25\\_21.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-10/NRCS_CNMP_Template_1_25_21.pdf)

**Critical Area Planting (CPS Code 342)** – is described as establishing permanent vegetation on sites that have, or are expected to have, high erosion rates and on sites that have conditions that prevent the establishment of vegetation with normal practices. (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Critical\\_Area\\_Planting\\_342\\_CPS.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Critical_Area_Planting_342_CPS.pdf)

**CRP** – Conservation Reserve Program

**Deep Rip Tillage** – performing tillage operations below normal tillage depth to modify the physical or chemical properties of a soil. It includes tillage operations commonly referred to as deep plowing, subsoiling, ripping, or tow-till, which are carried out on an as-needed basis

**Denitrification** – the nutrient Nitrogen (N) in a plant available form is converted by microbes to dinitrogen (N<sub>2</sub>) and leave the soil

**Diazotrophs** – microbes that convert N<sub>2</sub> gas into crop accessible forms of nitrogen

**Drag line** – a pump that send manure to a tractor though a flexible hose for application

**Drainage Water Management (CPS Code 554)** – the process of managing water discharges from surface and/or subsurface agricultural drainage systems with water-control structures (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Drainage\\_Water\\_Management\\_554\\_CPS\\_10\\_2020.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Drainage_Water_Management_554_CPS_10_2020.pdf)

**Effluent** – liquid portion of manure and waste water from a lagoon system that is used for irrigation

**Endoaquolls** – a soil great group classified as an Aquoll that does not fall under any other description, under the soil order of Mollisols

**Endoaquepts** – a soil great group classified as an Aquepts that does not fall under any other description, under the soil order of Inceptisols

**EPA** – Environmental Protection Agency

**ERS** – Energy Recovery System

**Epiaqualf** – a soil great group classified as an Aqualfs with that have episturation, under the soil order of Alfisols

**FDA** – Food and Drug Administration

**Fertigation** – application of fertilizer materials via the irrigation system <https://edis.ifas.ufl.edu/publication/HS1442>

**Field Border (CPS Code 386)** – strips of permanent vegetation (grasses, legumes, forbs and shrubs) established on one or more sides of a field (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Field\\_Border\\_386\\_CPS.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Field_Border_386_CPS.pdf)

**Filter Strip (CPS Code 393)** – strip or area of herbaceous vegetation that removes contaminants from overland flow (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Filter\\_Strip\\_393\\_CPS.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Filter_Strip_393_CPS.pdf)

**Flume Pipe** – water holding structures used to measure soil and other runoff from agricultural fields <https://ascelibrary.org/doi/abs/10.1061/%28ASCE%29IR.1943-4774.0000672>

**Grassed Waterway (CPS Code 412)** – a shaped or graded channel that is established with suitable vegetation to convey surface water at a non-erosive velocity using a broad and shallow cross section to a stable outlet (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Grassed\\_Waterway\\_412\\_CPS\\_9\\_2020.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Grassed_Waterway_412_CPS_9_2020.pdf)

**Hapludalfs** – a soil great group classified as an Udalfs that does not fall under any other description, under the soil order of Alfisols

**Integrated Pest Management (IPM) (CPS Code 595)** – a site-specific combination of pest prevention, pest avoidance, pest monitoring and pest suppression strategies (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Pest\\_Management\\_Conservation\\_System\\_595\\_CPS\\_10\\_2019.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Pest_Management_Conservation_System_595_CPS_10_2019.pdf)

**Irrigation Water Management (CPS Code 449)** – the process of determining and controlling the volume, frequency and application rate of irrigation water in a planned, efficient manner (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Irrigation\\_Water\\_Management\\_449\\_CPS\\_9\\_2020.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Irrigation_Water_Management_449_CPS_9_2020.pdf)

**KDHE** – Kansas Department of Health and Environment

**KPI** – Key Performance Indicator

**Kilowatt Hour (kWh)** – a unit of energy used to describe the power in watts by the amount used over a period. 1 kWh is equal to 3.6 megajoules, which is the amount of energy converted if work is done at an average rate of one thousand watts for one hour.

**Lagoon System** – a system to collect liquid portions of livestock manure. Lagoons are earthen structures that are designed to provide biological treatment and storage of animal waste. Manure can be handled here with water flushing systems, waste water lines, pumps and irrigation equipment. <https://extension.missouri.edu/publications/eq387>

**LED** – Light Emitting Diode

**Legume** – a group of plants that accumulate atmospheric nitrogen by having a symbiotic relationship with microorganism. <https://www.sciencedaily.com/terms/legume.htm>

**Mastitis** – inflammation of the mammary gland and udder tissue

**Microbiome** – a composition of microorganism interacting in and with the environment

**Monocrop** – planting and harvesting the same species for several years consecutively

**NPDES** – National Pollutant Discharge Elimination System

**NRCS** – Natural Resources Conservation Service

**Nutrient Management (CPS Code 590)** – managing the amount, placement and timing of plant nutrients to obtain optimum yields and minimize the risk of surface and ground water pollutions. (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Nutrient\\_Management\\_590\\_NHCP\\_PO\\_2018.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Nutrient_Management_590_NHCP_PO_2018.pdf)

**Nutrient Management Plan (NMP) / Manure Management Plan (MMP)** – conservation plans unique to livestock operations. This plan describes how manure generated at a feedlot will be used in upcoming cropping years. An NMP documents all crop nutrient needs, soil test results and application of all fertilizers, manure, soil amendments and by-products to the fields. An MMP focuses on manure.

**Ogallala Aquifer** – shallow water table aquifer surrounded by sand, silt, clay and gravel located beneath the Great Plains in the U.S. One of the world’s largest aquifers, it underlies an area of 174,000 square miles in portions of 8 states (South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico and Texas).

**OSHA** – Occupational Safety and Health Administration

**Paddock** – an enclosed field

**Phosphorus (P)** – an essential element for plant and animal growth. Phosphorus does not occur as a gas or volatilize into the atmosphere.

**Residue and Tillage Management, Reduced Till (CPS Code 345)** – managing the amount, orientation and distribution of crop and other plant residue on the soil surface year round while limiting the soil-disturbing activities used to grow and harvest crops in systems where the field surface is tilled prior to planting. (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Residue\\_And\\_Tillage\\_Management\\_Reduced\\_Till\\_345\\_CPS.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Residue_And_Tillage_Management_Reduced_Till_345_CPS.pdf)

**Residue and Tillage Management, No-Till (CPS Code 329)** – addressing the amount, orientation and distribution of crop and other plant residue on the soil surface year-round. Crops are planted and grown in narrow slots or tilled strips established in the untilled seedbed of the previous crop. [https://www.nrcs.usda.gov/sites/default/files/2022-09/Residue\\_And\\_Tillage\\_Management\\_No\\_Till\\_329\\_CPS\\_0.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Residue_And_Tillage_Management_No_Till_329_CPS_0.pdf)

**Restoration and Management of Rare or Declining Habitats (CPS Code 643)** – reestablishing and/or renovating a unique or diminishing native terrestrial and aquatic ecosystems. (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Restoration\\_Of\\_Rare\\_Or\\_Declining\\_Natural\\_Communities\\_643\\_CPS-3-17Final.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Restoration_Of_Rare_Or_Declining_Natural_Communities_643_CPS-3-17Final.pdf)

**Riparian Forest Buffer (CPS Code 391)** – area of predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Riparian\\_Forest\\_Buffer\\_391\\_CPS\\_10\\_2020.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Riparian_Forest_Buffer_391_CPS_10_2020.pdf)

**Roofs and Covers (CPS Code 367)** – a system that consists of a rigid, semirigid, or flexible manufactured membrane, composite material, or a roof structure placed over a waste management facility or an agrichemical handling facility (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-09/Roofs\\_And\\_Covers\\_367\\_CPS.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-09/Roofs_And_Covers_367_CPS.pdf)

**RTK** – Real - Time Kinematic

**Soil Health** – the condition of the soil and its potential to sustain biological functions, maintain environmental quality and promote plant and animal health <https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health>

**Soil Organic Carbon (SOC)** – one part in the much larger global carbon cycle that involves the cycling of carbon through the soil, vegetation, ocean and the atmosphere. It enters the soil through decomposition of plant and animal residues, root exudates, living and dead microorganism and soil biota. <https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health/manage-for-soil-carbon>

**Soil Organic Matter (SOM)** – the fraction of the soil that consists of plant or animal tissue in various stages of breakdown (decomposition) <https://www.nrcs.usda.gov/conservation-basics/natural-resource-concerns/soils/soil-health/role-of-organic-matter>

**Soil Quality** – the capacity of each soil to function, within its natural or managed ecosystems, to sustain productivity, enhance water and air quality, support human and animal health and habitation. This is not limited to agriculture, but most work and evaluation has occurred on agricultural lands.

**Solid/Liquid Waste Separation Facility (CPS Code 632)** – a filtration or screening device, settling tank, settling basin or settling channel used to separate a portion of solids from a liquid waste stream (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-10/Waste\\_Separation\\_Facility\\_632\\_NHCP\\_CPS\\_2019.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-10/Waste_Separation_Facility_632_NHCP_CPS_2019.pdf)

**Structures for Wildlife (CPS Code 649)** – structures installed to replace or modify a missing or deficient wildlife habitat component (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-10/Structures\\_for\\_Wildlife\\_649\\_CPS.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-10/Structures_for_Wildlife_649_CPS.pdf)

**Symbiotic** – see symbiosis

**Symbiosis** – a long term interaction between two or more organism that will be mutually beneficial

**Therm (CCF)** – a unit of heat energy equal to 100,000 British thermal units (BTUs). It is approximately the energy equivalent of burning 100 cubic feet (CCF) of natural gas. The therm factor is usually expressed in units of therms per CCF. One therm is also equivalent to about 105.5 megajoules, 25,200 kilocalories, or 29.3 kilowatt-hours.

**TMDL** – Total Maximum Daily Load

**Torrripsamments** – a soil great group classified as a Psamments that have aridic (or torric) soil moisture regime description, under soil order of Entisols

**Upland Wildlife Habitat Management (CPS Code 645)** – guidance on establishing and managing upland habitats and connectivity within the landscape for wildlife (USDA) <https://www.nrcs.usda.gov/sites/default/files/2022-11/645-NHCP-CPS-Upland-Wildlife-Habitat-Management-2022.pdf>

**USDA** – United States Department of Agriculture

**Ustorthents** – a soil great group classified as an Orthents that have an Ustic soil moisture regime, under soil order of Entisols

**VFD** – Variable Frequency Drive

**Volatilize** – nutrients converted to gaseous form and leaving the soil to the atmosphere

**Wind-Row Composting** – consists of placing the mixture of raw materials in long narrow piles called wind-rows that are agitated or turned on a regular basis <https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/windrow-composting>

**Waste Storage Facility (CPS Code 313)** – an agricultural waste storage impoundment or containment made by constructing an embankment, excavating a pit or dugout, or by fabricating a structure (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-10/Waste\\_Storage-Facility-313-CPS-May-2016.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-10/Waste_Storage-Facility-313-CPS-May-2016.pdf)

**Waste Treatment Lagoon (CPS Code 359)** – an impoundment made by constructing an embankment and/or excavating a pit or dugout (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-10/Waste\\_Treatment\\_Lagoon\\_359\\_CPS\\_Oct\\_2017.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-10/Waste_Treatment_Lagoon_359_CPS_Oct_2017.pdf)

**Waste Utilization (CPS Code 633)** – using agricultural wastes such as manure and wastewater or other organic residues (USDA) [https://www.nrcs.usda.gov/sites/default/files/2022-10/Waste\\_Recycling\\_633\\_CPS\\_Oct\\_2017b.pdf](https://www.nrcs.usda.gov/sites/default/files/2022-10/Waste_Recycling_633_CPS_Oct_2017b.pdf)