

McCARTY FAMILY FARMS

Sustainability Analysis

ON-FARM PRACTICES REPORT

2019

An Evaluation of Actual
Performance by



EcoPRACTICES®

Prepared for  **DANONE**
NORTH AMERICA



EcoPRACTICES®

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About EcoPractices

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.

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DANONE NORTH AMERICA - SOIL HEALTH PROGRAM

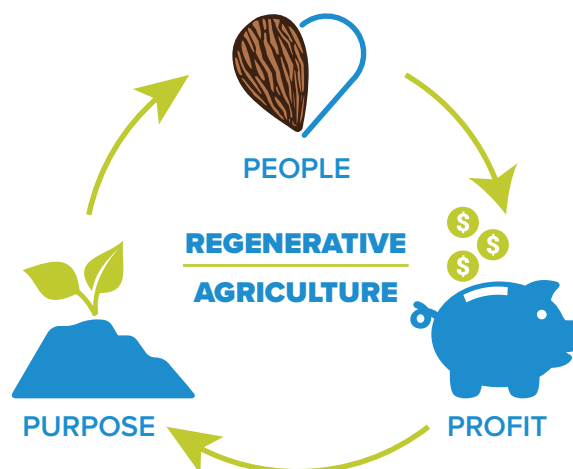
An Introductory Message from Danone North America

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 EcoPractice 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



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



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

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 four dairies comprising McCarty Family Farms, three in Kansas and one in Nebraska.

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

Location:

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

Year Started Dairy Farming: 1914

Cows in Production: 10,046

Total Cattle: 10,737

Total Acres: 13,007 acres included that form the conclusions of this report.

Employees: 110

Certifications:

Beef Quality Assurance

Non-GMO Project Verified

Validus

- › Certified Responsible Producer (first dairy in the US to achieve)
 - › Animal Welfare Review
 - › Environmental Review
 - › On-Farm Security Review
- › Worker Care Review
- › Traced, Segregated and Controlled Audit (processing plant)

Recognitions:

- › McCarty & Vantilburg Family named 2020 [Innovative Dairy Farmer of the Year](#)
- › 2019 Holstein Association USA Progressive Genetics Herd Award (also received in 2018: Rexford and 2017: Rexford, Bird City, & Scott City)
- › Featured in Forbes, [The Hardest Thing to Change is What Most Needs to Change: Expanding our Duty of Care](#) (May 2019)
- › Tom and Judy McCarty, [Kansas Master Farmer Award](#) Winners (February 2019)
- › Future of Agriculture Podcast interview, [Building a Family Dairy Business Through Commitment to Sustainability](#) (January 2019)
- › Featured in National Geographic (January 2019)
- › 2018 Bird City Cow winner of the Holstein Association Top 1,000 list
- › 2018 MVP & MFF showcased in a [Virtual Farm Tour](#) at the World Dairy Expo.
- › 2018 Danone Nature Award
- › 2018 Featured in American Dairymen (Sept)
- › 2018 Featured on [Market to Market](#), a show sponsored on Iowa Public Television, IPTV (Aug)
- › 2018 Danone Milk Cycle Days Excellence in Production Award, received at a Danone conference in Barcelona, Spain

GROWER SPOTLIGHT

FDK 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 and silage sorghum, wheat, alfalfa, soybeans, oats, sunflowers

Total Acres: 26,000

Acres sourcing McCartys: 2,238

Employees: 8 full-time, 6 seasonal



Milo Harvest 2013 at 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.

FDK
Partnership

GROWER SPOTLIGHT

WT 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, wheat and milo

Total Acres: 7,300

Acres Sourcing McCartys: 622

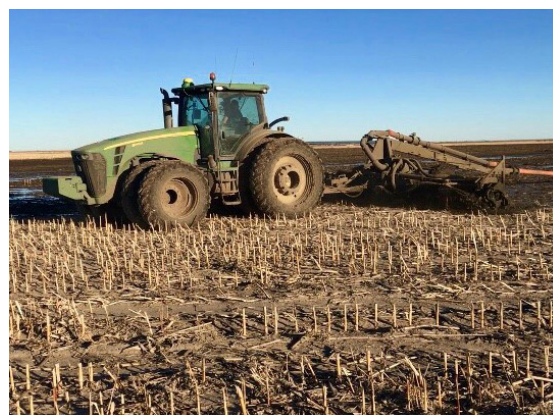
Employees: 1 full-time, 2 part-time



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, beans, milo, wheat and cover crops

Total Acres: 15,000

Acres Sourcing McCartys: 952

Employees: 5 full-time and 3 seasonal workers

Certifications: Commercial Applicator and Chemigation license

**CIRCLE C
FARMS
SCOTT CITY, KS.**



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 MILK PROCESSING INPUTS AND OUTPUTS

Daily Production Stats:



87,756 gallons of raw milk are processed from the four McCarty dairy farms daily.

Three approximate end products from processing:



18,870 gallons of **condensed skim milk** which are trucked to the Danone North America yogurt plants



6,785 gallons of **pasteurized heavy cream** which are trucked to a plant and made into butter



52,970 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 EcoPractices' 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 **13,007 acres** from **157 fields**

Bird City, Rexford, and Scott City Dairies

CROPLAND

Cultivated and non-cultivated crop production.**

9,757 acres
75%

3,250 acres
25%

FORAGE

Perennial pasture and hay production.**

ENVIRONMENTAL OUTCOMES

*From the management practices at McCarty Rexford, Bird, and Scott City locations, which was 37% no-till, 44% reduced tillage, and 55% cover crops during 2019, the following environmental impacts resulted.**

	CROPLAND	FORAGE	OVERALL FARM
CO₂e Emissions (tons per acre)	-1.3	-0.4	-1.0
Carbon Sequestered (tons per acre)	0.5	0.2	0.5
Soil Erosion (tons per acre)	0.4	0.4	0.4

Forage is expected to have lower CO₂e emissions, higher carbon sequestration, and lower soil erosion. CO₂e is comprised of greenhouse gas fluxes of carbon dioxide and nitrous oxide.

Kansas Cropland Average Erosion

5.0 T/ac

Kansas Forage Average Erosion

1.2 T/ac

National Average Erosion

4.6 T/ac

*** USDA, NRCS 2015 National Resource Inventory

*Beaver City feed acres are not included in the 2019 reporting

MANAGEMENT PRACTICE IMPACTS

Significant environmental benefits resulted from cropland acres compared to a conventional tillage, no cover crop scenario.*



8,474 tons reduction of CO₂e, which is the same as



1,646 average passenger cars off the road for a year



or average yearly energy use by **830** American homes



2,325 tons of carbon sequestered



18,879 tons of soil saved instead of being lost to erosion, which is the same as



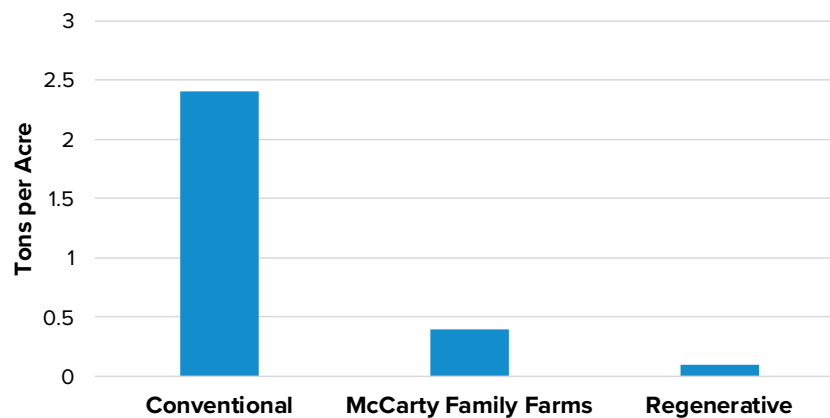
1,180 dump trucks of soil

CROPLAND CONTINUOUS IMPROVEMENT MOVING THE NEEDLE

■ Soil Loss
■ GHG



ANNUAL FARM-LEVEL COMPARISON SCENARIOS SOIL EROSION



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.
- 34% or 4,386 acres under a no-till system.
- Reduced tillage was implemented on 44% or 5,765 acres during 2019.
- 55% or 7,118 acres were in a cover crop.
- Soil tests readily available for all fields managed by MFF every fall with all KPIs.
- Added additional acres for row crop and hay that receive effluent and/or source feed to the dairy.
- *Alfalfa growers that source feed to the dairy were added to the program.

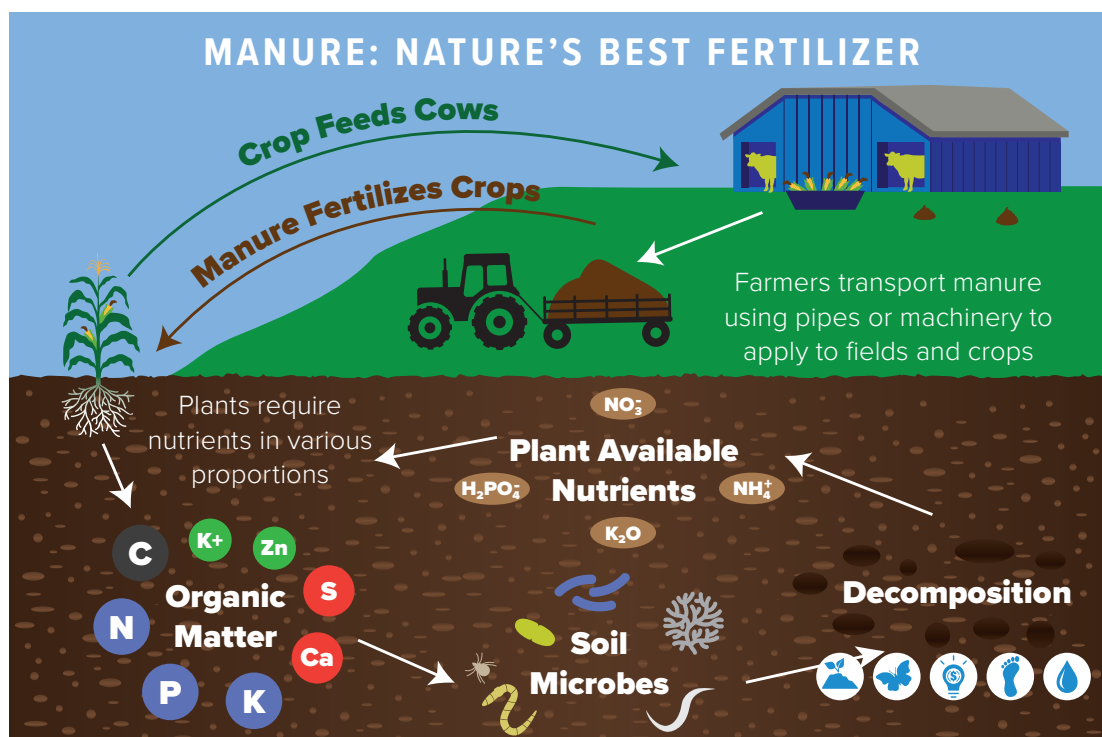
SHORT TERM GOALS

- Plan to purchase additional fields to source feed near the dairy.
- Increase total no-till to 50% of acres.
- Reduce number of tillage passes.
- Integrate soybean crop into the rotation after sufficient silage inventory established.

- Increase cover crop usage on fields that have stubble as cover crop rotation.
- Determine additional cover crops to increase the bioaccumulation level of phosphorus so more solid manure can be used as fertilizer.
- Implement gypsum protocol for fields with high salt areas.
- In conjunction with Danone, the dairy will update Nutrient Management Plan annually.

LONG TERM GOALS

- Seek options to increase crop residue and increase 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.
- Complete plan to implement an appropriate cover crop to all fields associated with the dairy.
- Utilize potential funding programs to improve farm sustainability and economics while exploring local, state and federal funding options.
- Standardize soil sampling protocols with Danone.



Primary Macronutrients

- N (nitrogen)
- P (potassium)
- K (phosphorus)

Secondary Macronutrients

- S (sulfur)
- Ca (calcium)
- Mg (magnesium)

Micronutrients

- Si (silicon)
- Cl (chlorine)
- Fe (iron)
- B (boron)
- Mn (manganese)
- Na (sodium)
- Zn (zinc)
- Cu (copper)
- Co (cobalt)
- Mo (molybdenum)
- Ni (nickel)

Structural Nutrients

- C (carbon)
- H (hydrogen)
- O (oxygen)

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

- 19.5 million gallons of water were reclaimed in 2019 from the evaporative cooling processor.
- Using effluent as crop irrigation water provides fertilizer benefits and reduced 201 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.
- Two additional center pivots were added to neighboring fields at Rexford to connect to the lagoon to utilize the effluent and recycled water resource in 2018.
- Pivots at Beaver City do not irrigate with fresh water; rather, utilize recycled water in lagoons for irrigation.
- Rexford is the only McCarty location to have a flow meter to monitor effluent.
- 13 AgSense units and 38 soil moisture probes installed for the 2019 growing season.
- Advanced cow comfort fans installed in parlor to save fresh water.
- Identified at Bird City a wetland, 10 acres, and a buffer strip, 1.6 acres 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. A filter system was also added to the pumps for more efficient pivot irrigation.

SHORT TERM GOALS

- Further improve manure management by reducing the need for inorganic fertilizer.
- Reduce fresh water irrigation by upgrading pivots and installing additional soil moisture probes to cover more acres.
- Add flow meters to assist in capturing total water used on the dairy.
- Add fans into pens and freestall barns to reduce water in cooling system.
- In conjunction with Danone, the dairy will complete a water risk assessment.
- Partner with NRCS on Irrigation Water Management Plan.
- Put into practice additional 4R Nutrient Stewardship steps (Right Source, Right Rate, Right Time and Right Place).
- *Add underground irrigation, sprinkler system, and moisture monitors at Rexford.

LONG TERM GOAL

- Upgrade older center pivots.
- Maintain responsible water use on the dairy with periodic checks on total gallons utilized.
- Actively work with all farmer partners that receive effluent to improve water use efficiency.

Biodiversity Summary



PROGRESS

- Utilizes manure as organic fertilizer benefiting the biodiversity of life below the soil.
- 10 acres at Rexford, 5 acres at Bird City, 5 acres at Beaver City, and 5 acres at Scott City are planted to pollinator habitat.
- An additional 21 wildlife boxes were added around the dairies, increasing the total count to 58 wildlife boxes.
- 55% of acres covered in the fall of 2018 for the 2019 growing season with wheat, radishes, turnips, brown mustard, and alfalfa.
- Identified 27 acres of forest on the Beaver City dairy providing wildlife habitat.

SHORT TERM GOALS

- Recognizing silage is a priority for feed, experiment with extending crop rotation to include soybeans.

- 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.
- Experiment with adding oats as a cover crop after corn silage on select fields with higher environmental risk fields.
- Partner with NRCS on Integrated Pest Management Plan
- *Identified 3 field corners to convert to Pheasants Forever habitat.

LONG TERM GOALS

- Continually improve and support native habitat.
- Introduce solitary bees to the farm as a pollinator.
- Convert unused cropping corners in two fields to native prairie vegetation.

Carbon & Energy Summary



PROGRESS

- Corn grinder installed in 2016.
- The dairies saved 1,659 gallons of fuel from the CAT fleet in 2019 compared to 2018 with improved fuel efficiency.
- Evaporative cooling processing reduces volume which reduces transportation emissions.
- The reductions in energy seen in 2019 included the processing plant at Rexford down by over 13,000 Kwh and 1,119 therms from 2018 as well as gas at Scott City down by 43 therms from 2018.
- 27% LED on the dairies and 80% on the plant have been installed.
- Continued to track and collect propane usage reports on the farm with 2019 as the third year.
- Installed advanced cow comfort system fans in freestall barns and parlor in 2017 to save more electricity.
- Now required to recycle cardboard by bringing it 4 miles to a facility drop off.
- A JD sprayer is utilized at FDK Farms.

- Grain is sourced within a 15-mile radius and hay is sourced within a 75-mile radius of the dairy.
- Aligns in missions with multiple vendor partners that have commitments to sustainability and environmental progress through efficiency.

SHORT TERM GOALS

- Continue to install LED lighting upgrades.
- Work with farm equipment partners to use machinery and fleets with advanced technology that result in positive sustainability outcomes.
- Include partner group managing compost production at Bird City.

LONG TERM GOALS

- Continue to find efficiencies in the product transportation supply chain which will further decrease greenhouse gas emissions.
- Implement efficiency techniques to reduce electricity and natural gas use.
- Assess opportunity for renewable energy from wind power at the dairy.

Economy & Productivity Summary



PROGRESS

- Perform 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.
- Manages pre-processing plant on-location.
- Harvests wheat for cover crop seed.
- Upgraded air compressor in 2018.
- McCarty Family Farms produce 17% above the national average at their four dairies.

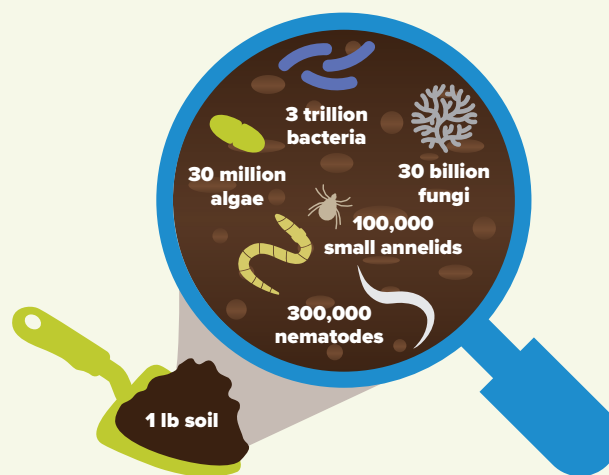
SHORT TERM GOALS

- Continue to monitor yield comparisons over time.
- Utilize the EcoPractices R3 ROI model to evaluate SCIP recommended sustainable practices.
- In conjunction with Danone, the dairy will complete an energy audit.

LONG TERM GOALS

- Track yield as non-GMO management/system continues.
- Calculate component efficiency.

SOIL LIVES



Soil is home to an abundance of living organisms, most of which we can't 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 tiny organisms, the soil builds organic matter and provides nutrients so plants can grow.

Data source: 2016 Global Soil Diversity Atlas



*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 8,786 lactating cows and 1,260 dry cows. Currently, 157 fields totaling 13,007 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, soybeans, and wheat. Non-GMO feed needed is grown by partners and neighbors, such as Circle C Farms, WT Partnership, FDK Partnership, & 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 2019, 4,263 acres received a total of over 201 million gallons of effluent and/or over 32,000 tons of solids from the dairy, which is a reduction of over 707 tons of commercial nitrogen fertilizer, 198 tons of phosphorus fertilizer, and 1,234 tons of potassium fertilizer. The manure applied has a value of \$42.78 per acre. See the Nature's Best Fertilizer infographic on page 11.

All McCarty dairies lay atop of the Ogallala Aquifer, which provides 30% of all US 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.



Wheat being baled for straw on corners of pivoted fields near Rexford dairy in August in 2019.

Performance

KEY INDICATOR: SOIL

Species	Nitrogen source	Nitrogen scavenger	Soil builder	Subsoil loosener	Topsoil loosener	Erosion preventer	Lasting residue	Weed fighter
Winter Wheat	P	VG	VG	G	G	E	E	VG
Radish	P	E	VG	E	VG	F	F	VG
Turnips	P	VG	F	P	VG	F	F	E
Mustard	P	VG	G	G	VG	VG	F	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 (CO₂) and reduce the total amount of greenhouse gases being lost to the atmosphere. The cover crop in the field can also be utilized as nesting material by local wildlife during the 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 2019 cropping season, 7,118 acres were planted with winter wheat or a winter wheat, radish, turnip, and brown mustard mix by the McCartys and associated growers. They had an additional 3,466 acres in perennial alfalfa that provided similar benefits as cover crops because the fields were covered throughout the winter. Last year, in the fall of 2017 prior to the 2018 cropping season, cover crops such as rye, oats, wheat, flax, turnips, and hay was planted on 4,908 acres. Acre expansion has been considered within the SCIP for implementation in 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 the 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 44% of acres and 34% 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.



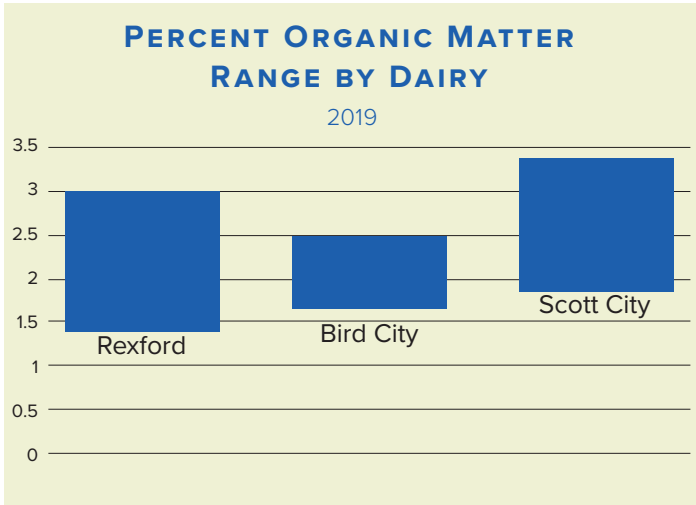
Corn now tasseled in July 2019.

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 dairies’ 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 McCarty’s acres tested at a range of **1.4% to 3.4%** for **organic matter**. Soil amendments such as manure are important for maintaining and increasing SOM.

SCI, Soil Conditioning Index, a tool from the NRCS, 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 value, the level is predicted to increase under the system. Values near zero (i.e., 0 ± 0.05) suggest that organic matter will be maintained near the current level. As of 2019, the **weighted average SCI value** is **positive**, predicted from current management, soil type, and climate for future years.



McCarty Family Farms’ organic matter results by dairy.

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 between farms. The McCartys soil sample almost annually so they can assess how much manure they are able to apply.

NRCS USDA PRACTICES AT MFF	
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)
Biodiversity	Irrigation Water Management (CPS Code 449)
	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)

The Natural Resources Conservation Service (NRCS) differentiates **soil quality** as the capacity of the **soil** to function within its ecosystem while **soil health** is the condition of that soil and its potential to sustain biological functions with maintaining environmental quality, both are essential to promote plant, animal, and human health.



Wheat harvested and baled at Rexford in July 2019; the field was then planted to peas.

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.

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.



Irrigation on crops grown for McCarty's Scott City location.

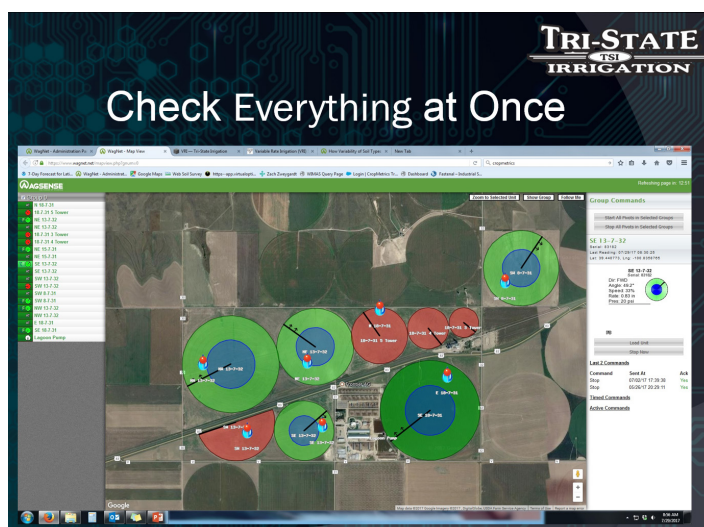
Water Quantity

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 land and 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.

Water quantity will be tracked based on historical water use and trend in current water use after soil moisture probes



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

have been installed. Report coming after more data points are established for the soil moisture probes in place in the coming years.

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 grey water 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.

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.



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



Pivot irrigation at Rexford.

Water Savings with In-House Processor

The evaporative cooling milk processor at the Rexford farm saves about 52,972 gallons of water a day by condensing the skim milk before it is transported. This equates to 19.3 million gallons of water a year. The processing facility is rare in the US, 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 Nos.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.



Reclaimed water is reused for purposes such as cleaning the cattle buildings.



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 US, 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 which often reduces 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.

Pollinators and Wildlife Areas

Animal pollinators are needed for the reproduction of 90% of flowering plants and one-third of human food



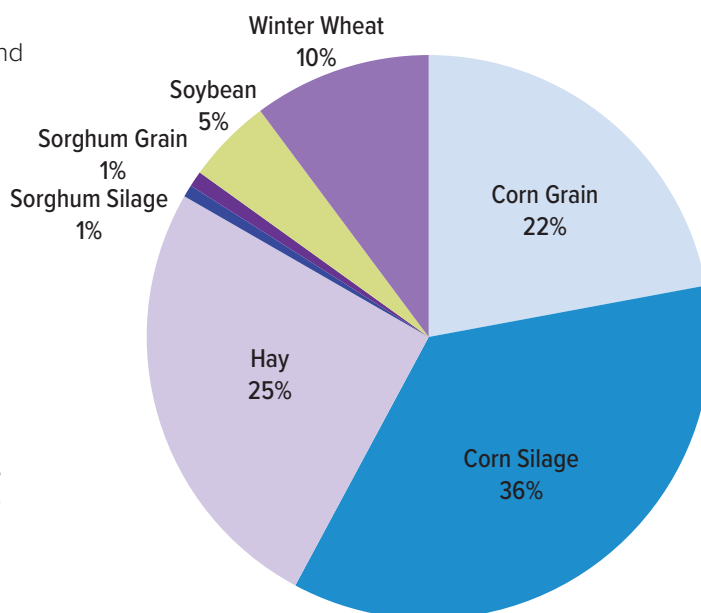
New insect and bird boxes deployed at all McCarty Dairies.

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.

In 2019 the dairies added an additional 21 wildlife boxes, increasing to a total of 58 to provide habitat for important species of birds, bats, and insects. Rexford has 1 bat box, 1 barn owl box, 1 screech owl box, 2 kestrel boxes, and the rest are bird or insect boxes.

10 acres at Rexford, 5 acres at Bird City, 5 acres at Beaver City, and 5 acres at Scott City are planted to pollinator habitat. They have plans to expand this acreage. They have identified 3 fields' corners to plant to habitat in partnership with Pheasants Forever.

CASH CROP DIVERSITY



The crops in this pie chart represent "cash crops" as they were taken for feed or to sell. This chart shows the percentage of acres each crop was grown in 2019.



New bat boxes for 2018 deployed at all four McCarty Dairies.

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.

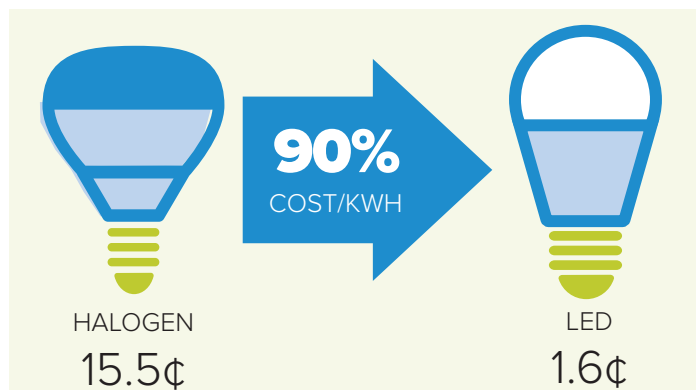
All dairies are monitored for energy usage. The energy reductions seen in 2019 included the processing plant at Rexford down by over 13,000 Kwh and 1,119 therms from 2018 as well as gas at Scott City down by 43 therms from 2018.

Lighting

Rexford has taken steps to reduce their carbon footprint and improve efficiency. LED lighting has been installed in 27% of the buildings at all four McCarty dairies and 80% 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.

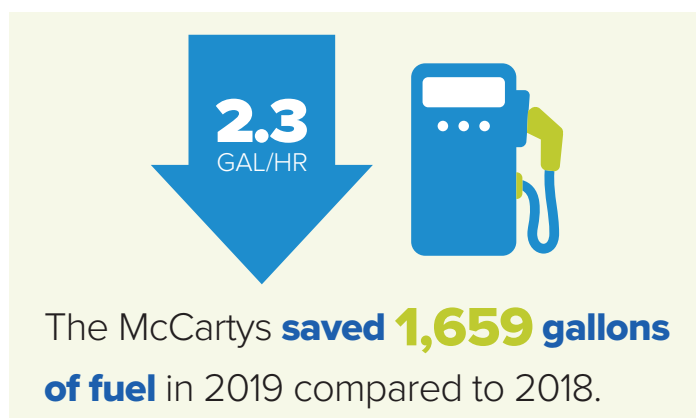


LED lighting installed at McCarty Family Farms.



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 **average haul** to its processing plant is **63 miles**.



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

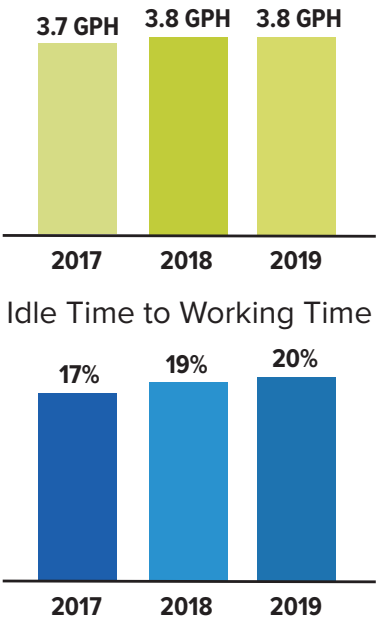
John Deere Partnership

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

"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

REXFORD MYJOHNDEERE 2019 DATA



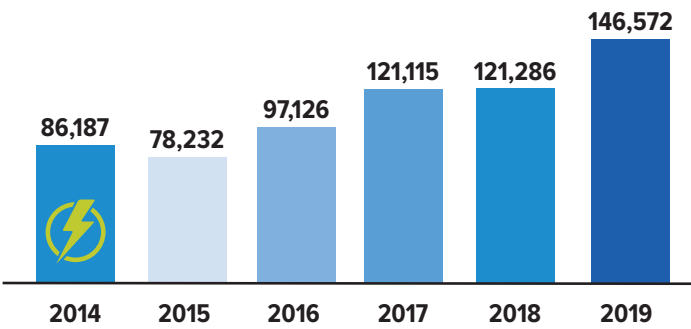
average fuel rate for the seven tractors at McCarty Family Farms is 3.9 gallons an hour accounting for idle, working, and transportation time. That has decreased by just .1 down from 4 gallons an hour from last year in 2018. Idle time is about 28% that of the working time which is 1% higher than last years idle time in 2018.

Ruan Partership

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 **7.4 mpg in 2019, up 0.34 mpg from 7.06 mpg in 2018** 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 7,232 gallons of diesel fuel equating to 71 tons of CO₂e 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 CO₂ emissions."
– Matt Fleming
Ruan, McCarty Family Farms Account Manager

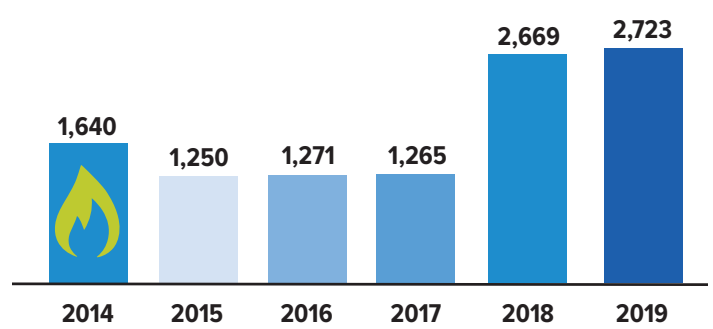
REXFORD AVERAGE ELECTRICITY USAGE 2014-2019*



MONTHLY AVERAGE KILOWATT HOUR (KWH) USAGE/YEAR

*Additional records provided in 2019.

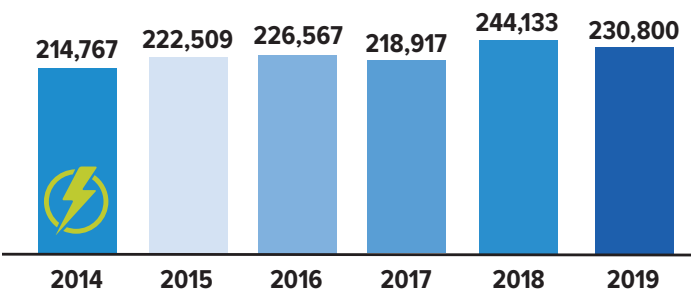
REXFORD AVERAGE NATURAL GAS USAGE 2014-2019*



MONTHLY AVERAGE THERM (CCF) USAGE/YEAR

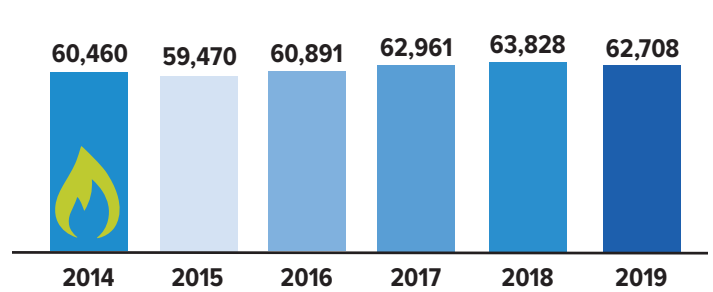
*Additional records provided in 2019.

PLANT ELECTRICITY USAGE FROM 2014-2019



MONTHLY AVERAGE KILOWATT HOUR (KWH) USAGE/YEAR

PLANT NATURAL GAS USAGE 2014-2019



MONTHLY AVERAGE THERM (CCF) USAGE/YEAR



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

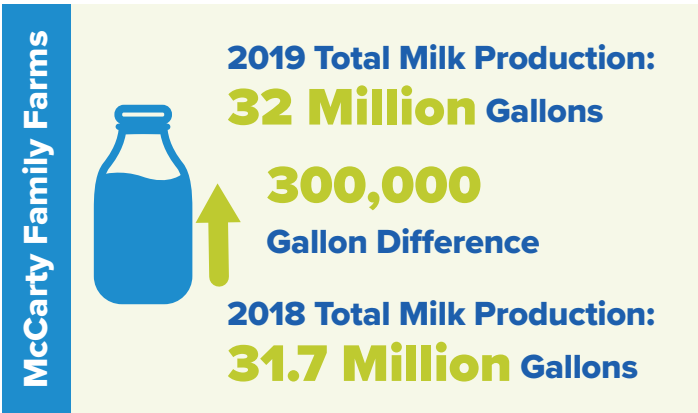
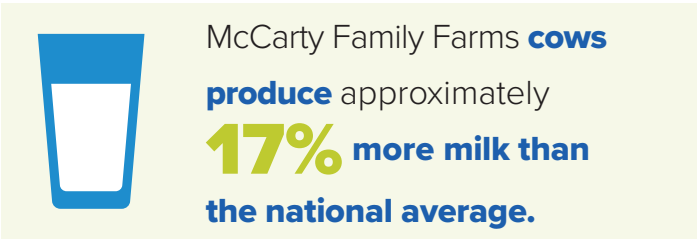
KEY INDICATOR: ECONOMY
& PRODUCTIVITY

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

McCarty Family Farms understands 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 MFF will produce 17% more milk than the national average (USDA: National Agricultural Statistics Service, 2018).



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 2019 growing season.

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.

CROP	YIELD
Corn Grain	191 bu/ac
Corn Silage	23.4 T/ac
Grass Hay	21.6 T/ac
Sorghum Grain	122 bu/ac
Sorghum Silage	10 T/ac
Soybean	48 bu/ac
Winter Wheat	84 bu/ac

Yield from crops grown for McCarty Family Farms in 2019.

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 McCartys 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 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



Dairy staff replace the well-loved cow brushes with new one from FutureCow.

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.



Content cows produce more milk and enhance efficiency on the dairy.

GREENING OF THE SUPPLY CHAIN

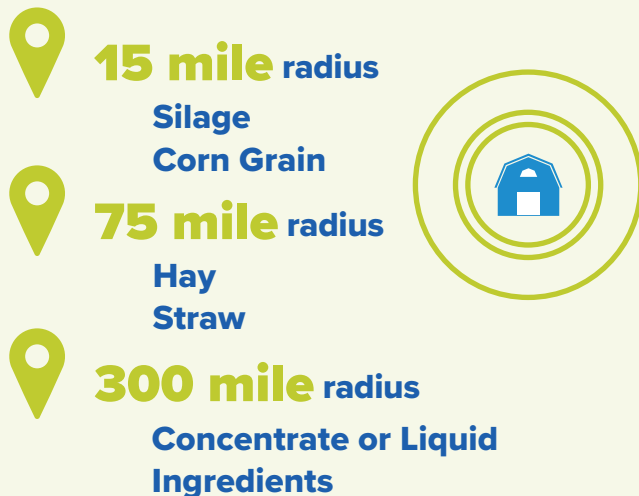
Dairy Feed Components

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 **US based sources** originating from both Texas and Louisiana. Sugarcane grown in the US reduces transportation but also **eliminates deforestation concerns** with production in overseas countries. Their **soybeans are not sourced from deforested acres and come from the US**. 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 US 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**.

Rexford Dairy Feed Purchases

Most of the Rexford Dairy feed comes from within a 50-mile radius.



Sustainability a Shared Mission

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

	Bypass Fats Vendor	CSR Report
	On-Farm Equipment	Sustainability Report
	On-Farm Equipment	Sustainability Report
	Milk Hauler	Environmental Equipment
	Vet Med Vendor	CSR Report
	Vet Med Vendor	CSR Report



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

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."

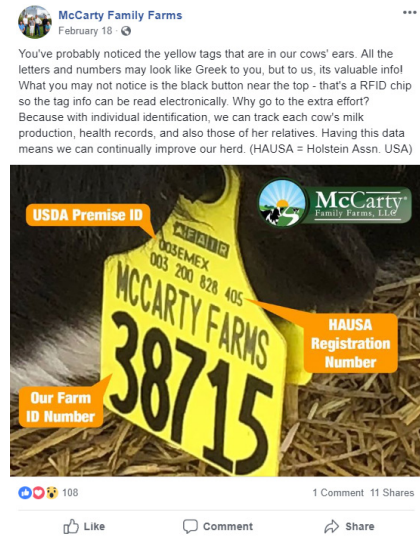
Holstein breeders participate in the programs and services offered by HAUSA, as the information provided back aids them in breeding a more profitable herd of cows. Knowledge is power, and the U.S. Registered Holstein population has as much information documented in terms of lineage, genetics and performance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



Rexford received the 2019 Progressive Genetics Herd Award.



Wind-row composting implement.

COMMUNITY ENRICHMENT

The McCarty Family Farms work with many organizations for the advancement of education in the dairy sciences. They have hosted interns at Rexford although the projects apply and work with all dairies. Typically, internships are focused on projects such as BVD testing, testing program development, Inspection Ready Every Day systems, Foreign Animal Disease Outbreak plans (particularly Foot and Mouth Disease), and TB risk assessments when transporting animals. The McCartys have worked with Cornell, Kansas State, Penn State, Michigan State, Colorado State and international students. McCarty Family Farms donated \$64,750 in 2019 between the 4 locations.

In addition to McCarty family members, the 4 farms have 110 employees. Kansas has become home for these families, most who have relocated to these small, rural communities. The improvements in school enrollments, quality of housing, availability of nearby goods and services and contributions to the local tax base have been considerable. More than 80 homes within the McCarty dairy communities have been purchased and renovated for employee homes. McCarty Family Farms provided the land to build Pine Village Apartments in Rexford, which and provided the land to build Century II Foundation in Bird City, which provides affordable housing to farm labor residents.

With Danone North America and the dairy checkoff group, the McCartys created the Yogurt for Youth program to donate yogurt to local schools, totaling **84,000 servings** in the 2018-2019 school year. This program is assisted by

Giving Back

The McCarty family **donated**
84,000 servings of
yogurt to local schools
through Youth for Yogurt for
the 2018-2019 school year.

Between the 4 locations,
McCarty Family Farms donated
\$64,750 in 2019.

partners such as Danone North America, Southwest Dairy Farmers, Ruan Trucking and local schools.

An average of two tours are conducted at the Rexford facility every week. Sustainability related topics are discussed in addition to other areas. Plus, a college-level internship is open to US or international students, broadening the thinking of both parties.

The McCarty Family Farms currently has a website and Facebook page to connect with their community and the general public on dairy life topics.



Data Collection and Verification

The EcoPractices data collection and verification process provides assurance that the data reflected in this report is accurate and reliable. EcoPractices achieves the accuracy and reliability by employing data verification procedures with a multi-level verification process. All client data is collected and stored in EcoPractices' safe and secure database, which is accompanied by chain of custody records. EcoPractices enters into confidentiality and nondisclosure agreements with all clients in order to ensure that client data is protected. Additionally, EcoPractices 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

*EcoPractices 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 Natural Resources Conservation Service Technical Guides and publications from the Environmental Protection Agency. These environmental impact values are tailored to a specific location and participant's operation or project. Models used are supported by USDA, NRCS, other government agencies, and major universities. Greenhouse Gas emissions and carbon sequestration potential were predicted using the COMET-Farm Application Program Interface 2019. The COMET-Farm tool was developed for the USDA Natural Resource Conservation Service by the Paustian Research Group, Natural Resource Ecology Laboratory at Colorado State University, available at www.comet-farm.com.

**EcoPractices 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 2019*, and the data on which this EcoPractices report relies is accurate and has been presented correctly.

EcoPractices President

Owner of McCarty Family Farms

This summary must not be edited or altered in any way without the involvement and consent of EcoPractices.

Glossary and Abbreviations

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 <http://www.nutrientstewardship.com/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 different animal classes (based primarily 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 (O₂). Its chemical formula is CO₂.

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://nmssp.cals.cornell.edu/publications/factsheets/factsheet22.pdf>

CFM – Cubic Feet per Minute

CO₂e, 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 CO₂ 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/Internet/FSE_DOCUMENTS/stelprdb1263479.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/Internet/FSE_DOCUMENTS/stelprdb1263481.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/Internet/FSE_DOCUMENTS/nrcs143_025770.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/Internet/FSE_DOCUMENTS/stelprdb1166381.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/Internet/FSE_DOCUMENTS/stelprdb1241316.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 (N₂) and leave the soil

Diazotrophs – microbes that convert N₂ 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/Internet/FSE_DOCUMENTS/nrcs143_026409.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://ag.purdue.edu/hla/fruitveg/Presentations/Saha_Fertigation_6up.pdf

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/Internet/FSE_DOCUMENTS/stelprdb1241318.pdf

Filter Strip (CPS Code 393) – strip or area of herbaceous vegetation that removes contaminants from overland flow (USDA)
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1241319.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/Internet/FSE_DOCUMENTS/stelprdb1263483.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/Internet/FSE_DOCUMENTS/stelprdb1255178.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/Internet/FSE_DOCUMENTS/stelprdb1263485.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. <http://articles.extension.org/pages/13276/liquid-manure-treatment-lagoons>

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/Internet/FSE_DOCUMENTS/stelprdb1255175.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/Internet/FSE_DOCUMENTS/stelprdb1251402.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/Internet/FSE_DOCUMENTS/stelprdb1249901.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/Internet/FSE_DOCUMENTS/stelprdb1255208.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)

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)

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/wps/portal/nrcs/detail/ks/newsroom/features/?cid=nrcs142p2_033494

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.

<http://www.fao.org/3/a-i6937e.pdf>

http://soilquality.org/indicators/total_organic_carbon.html.

Soil Organic Matter (SOM) – the fraction of the soil that consists of plant or animal tissue in various stages of breakdown (decomposition)

<http://franklin.cce.cornell.edu/resources/soil-organic-matter-fact-sheet/>

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.

https://www.nrcs.usda.gov/wps/portal/nrcs/detail/ks/newsroom/features/?cid=nrcs142p2_033494

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/Internet/FSE_DOCUMENTS/stelprdb1255200.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/Internet/FSE_DOCUMENTS/stelprdb1263418.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

Torripsamments – 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/Internet/FSE_DOCUMENTS/stelprdb1255212.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
<http://www.fao.org/docrep/007/y5104e/y5104e07.htm>

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)

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/Internet/FSE_DOCUMENTS/nrcs143_026002.pdf

Waste Utilization (CPS Code 633) – using agricultural wastes such as manure and wastewater or other organic residues (USDA)
https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_022114.pdf