

MVP DAIRY – CELINA, OH

Sustainability Analysis

ON-FARM PRACTICES REPORT

2017

An Evaluation of Actual
Performance by



ECOPRACTICES®

Prepared for  **DANONE**
NORTH AMERICA



EcoPRACTICES®

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About EcoPractices

Sustainable Environmental Consultants, SEC, strives to inspire and engage companies to be leaders of sustainability by promoting the use of mindful practices and products that reduce environmental impacts. EcoPractices® was established in 2016 after seeing the need to help companies partner with agriculture, construction businesses and energy providers to preserve our ecosystems.

SEC's Risk Management Platform, EcoPractices, identifies, collects, verifies, documents and generates environmental impacts from sustainable practices. It allows interested organizations to help fund sustainability efforts while offering direct documentation and third-party proof. EcoTags® are the measurable, compliance-driven method for farmers, ranchers and organizations to work collectively for the common goal of preserving the environment.

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DANONE NORTH AMERICA - SOIL HEALTH PROGRAM

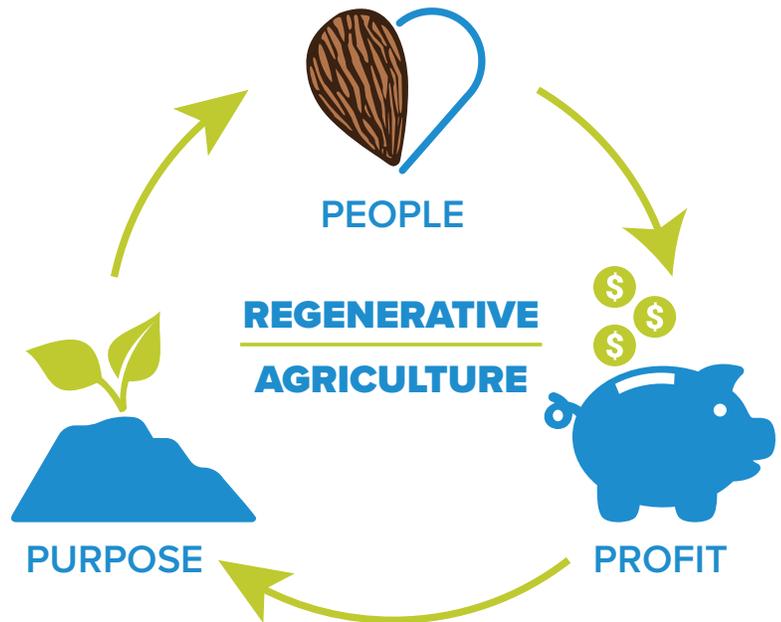
An Introductory Message from Danone North America

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

It is thanks to trustworthy long-term relationships that Danone North America with our farmer partners will be 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 continuous improvement plan for the next five years.

Thank you for making the planet better every day!



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

- › 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 farmer partners with Danone North America and support their Sustainable Agriculture Pledge. Although we focus on Soil Health, Water, Biodiversity, Carbon & Energy, Economy & Productivity and Animal Welfare in this report, our family, along with Danone North America, 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 MVP Dairy. 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
MVP Dairy



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



The VanTilburg Brothers (left to right) Kyle runs the excavation and piping business, Luke runs the farming operation and is the CFO, and Matt runs the Ag retail business.



MVP Dairy broke ground in 2017.

FARM SNAPSHOT



McCarty-VanTilburg Partnership

MVP Dairy is the product of more than a century of proud agrarian history.

Boyd VanTilburg began farming in 1902. Over the generations, the Ohio farming operation expanded to include custom fertilizer and chemical application, poultry litter, soil sampling, a commercial grain elevator, a crop insurance business, a trucking division and an excavation company. VanTilburg Farms, Inc. was incorporated in 1977. Today, Boyd VanTilburg's great-grandsons, Matt, Luke and Kyle manage various components of the business.

MVP Dairy, LLC was created when the VanTilburg's joined forces with the McCarty family, a leader in sustainable milk production and direct supplier of milk to Danone North America. Like the McCarty's Kansas farm with its innovative evaporative cooling milk processor, the northwestern Ohio site utilizes the latest technologies and production methods including cover crops to protect against soil erosion and improve soil health, and an emphasis on wildlife habitat to maintain the farm's eco-friendliness.

Key Information

Mission Statement: Under Development

Type of Ownership: Family owned partnership

Location: Celina, OH

Year Started Dairy Farming:

McCarty Family 1914 and VanTilburg Family 1902.

MVP Dairy 2018

MVP Dairy 2017, some silage being stored for when the dairy opens in 2018.

Cows in Production: Coming soon in 2018

Total Acres: 3,987 Acres included that form the conclusions of this report.

Employees: Expecting to hire over 30 new employees

MVP Goals:

- › Be a cost competitive direct supplier to Danone North America in a manner that is also conducive to public education as well as provide a place that can hold higher level meetings and gatherings.
- › Be good stewards of the environment.
- › Be community and employee oriented.
- › Provide the highest level of care to our cows to further reduce the stigma surrounding animal care in large dairies.
- › Provide the best quality milk possible to Danone North America.
- › Have a show place dairy that is CEO ready everyday.
- › Provide a farm that will mesh easily with fruit production and power generation.

Recognitions:

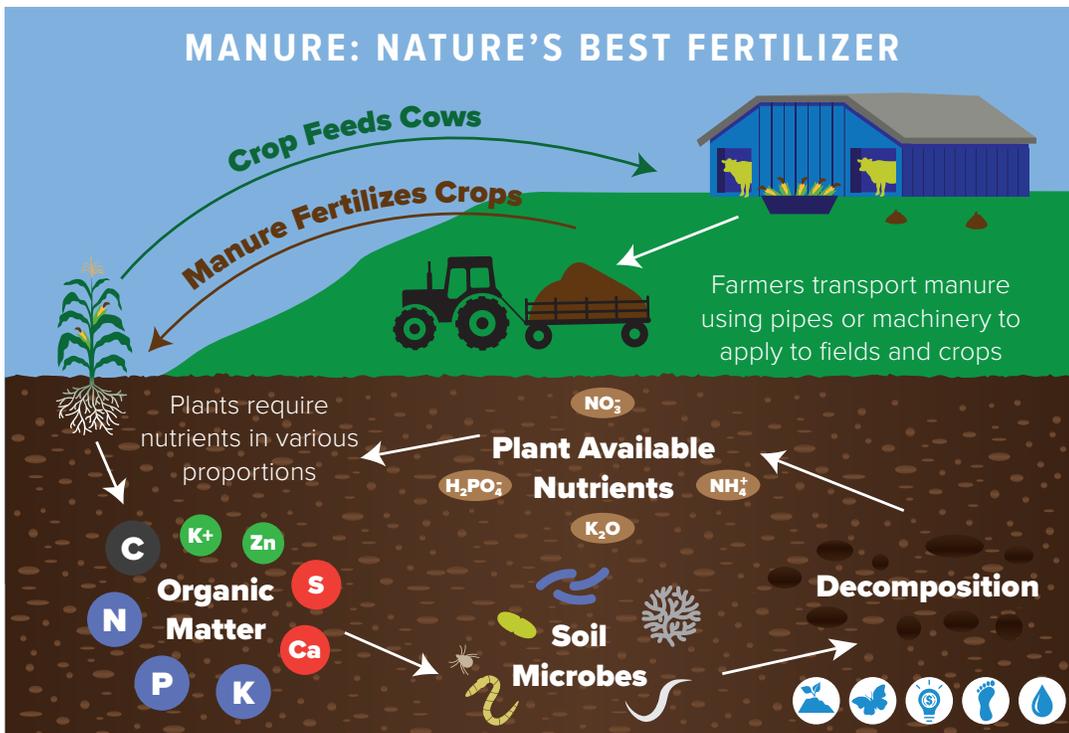
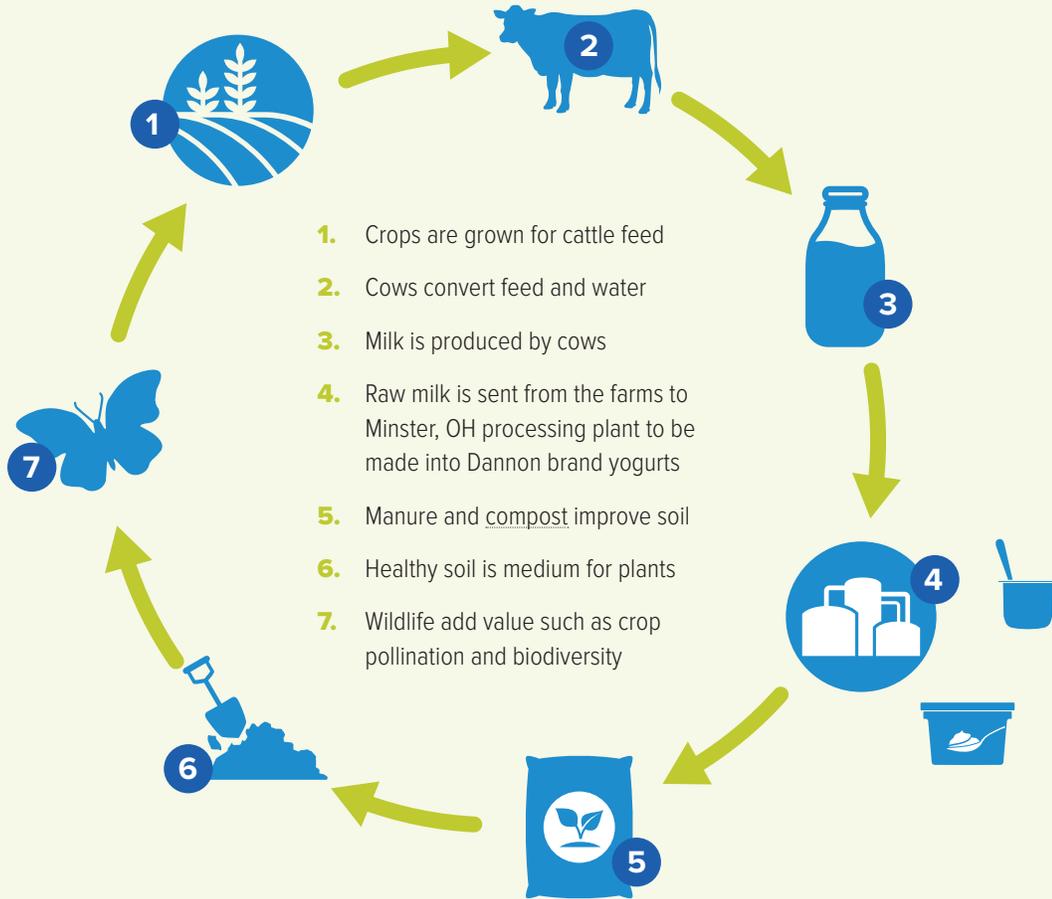
VanTilburg Farms

- › VanTilburg Farms received the No-Till Award in 2015 received the No-Till Award in 2015
- › VanTilburg Farms received the Ohio No-till business of the year award in 2012
- › Matt VanTilburg was awarded 2016 CCA of the year none
- › Ohio Master Farmer Award

McCarty Family Farms

- › 2013 Innovative Dairy Farmer of the Year by the International Dairy Foods Association and Dairy Today magazine
- › 2014 Innovation Center for U.S. Dairy's Outstanding Dairy Sustainability award
- › In 2007, the community of Bird City, Kansas requested the McCartys construct a dairy, recognizing the boost that a well-run and reputable dairy brings to their local economy, schools and more.

MVP Dairy EcoCyle



● 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.

SUSTAINABILITY BENEFITS

Quantifying the Impact of Actual Farm Practices

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. MVP Dairy Farm 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.

ENVIRONMENTAL BENEFITS FROM SOIL PRACTICES

*Because of the vigilant practices at MVP Dairy which was 93% no-till and 95% cover crop managed during 2017, significant estimated environmental benefits resulted from the 3,987 acres.**



3,191 tons reduction of carbon dioxide equivalent, which is the same as



620 average passenger cars off the road for a year



or **7.9** rail cars of coal (**1,596** tons) saved from being burned



or average yearly energy use by **313** American homes



669 tons of carbon sequestration, which is the same as



712 acres of US forest that sequesters carbon in a year



4,894 tons of soil saved instead of being lost to erosion,
which is the same as



306 dump trucks of soil



23 tons or (**45,952** pounds) of nitrogen fertilizer saved from runoff
into **waterways**

If the remaining 12.5% of the acres at MVP Dairy went to the no-till, cover crop management in future years, significant environmental benefits are estimated to result annually.*



369 tons reduction of carbon dioxide equivalent



43 tons of carbon sequestration



158 tons of soil saved instead of being lost to erosion



3.6 tons or **(7,227 pounds)** of nitrogen fertilizer saved from runoff into waterways

TOTAL ESTIMATED CONSERVATION PRACTICES

During 2017, MVP Dairy had Buffers, Waterways, and Wetlands in place for reducing sedimentation and water pollution.**



1,326 tons of soil saved instead of being lost to erosion, which is the same as



83 dump trucks of soil



5.2 tons or **(7,227 pounds)** of nitrogen fertilizer saved from runoff into waterways.



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

TOTAL ESTIMATED ENVIRONMENTAL BENEFITS

During 2017, all current practices at MVP Dairy resulted in the total estimated annual environmental benefits.



3,191 tons reduction of carbon dioxide equivalent, which is the same as



620 average passenger cars off the road for a year



669 tons of carbon sequestration, which is the same as



712 acres of US forest that sequesters carbon in a year



6,220 tons of soil saved instead of being lost to erosion, which is the same as



389 dump trucks of soil



28 tons or **(56,269 pounds)** of nitrogen fertilizer saved from runoff into waterways

SUSTAINABLE CONTINUOUS IMPROVEMENT PLAN

Soil Summary



PROGRESS

- › Utilizes a no-till system on 93% of the acres.
- › Utilizes a mixture of cover crop species implemented on 95% of acres for 2017.
- › Maintains a diverse crop rotation and leaves corn stalk residue standing in the fields.
- › Conducts grid soil testing every other year in the spring, meeting or exceeding the recommended every 2 to 3 years by Ohio State University.
- › Maintains readily available soil tests with all KPI nutrients tested.
- › Actively runs a no-till system on 95% of the fields.
- › Grower partner, VanTilburg, utilizes precision agriculture technology for tracking in-field management.

- › Standardize soil sampling protocols with Danone North America.

SHORT TERM GOALS

- › Implement cover crops on all acres for MVP Dairy.
- › Convert 100% of the fields to a no-till system for most seasons when work is not required for tile lines and other drainage water maintenance.

LONG TERM GOALS

- › Determine an optimum cover crop mixture for the area and continue to educate others on findings.

Water Summary



PROGRESS

- › Stores and recycles water runoff from fields.
- › Variety of conservation practices in place including wetlands, controlled drainage structures, saturated buffers and filter strips.
- › Utilizes three soil moisture probes for their 3 irrigation pivots.
- › Partners with NRCS on CRP, which offers compensation in exchange for growers removing environmentally sensitive land from agricultural production and planting species to improve environmental quality.

SHORT TERM GOALS

- › Establish method to track water use on the dairy.
- › Add flow meters to assist in capturing total water used on the dairy.
- › Construct 4 new pivots for effluent application when dairy opens.

LONG TERM GOALS

- › Maintain responsible water use on the dairy with periodic checks on total gallons utilized.
- › Explore adding additional buffer filter strips with new NRCS Conservation Contract.

Biodiversity Summary



PROGRESS

- › Utilizes organic fertilizer to benefit the biodiversity of life below the soil.
- › Maintains a crop rotation of corn and soybeans that incorporates biodiverse cover crop.
- › Maintains three wildlife boxes.

- › Utilize PZM report to work with local NRCS office to put conservation plan together.

LONG TERM GOALS

- › Add prairie species/flowers to thinning filter strips if occurring over time.
- › Add a pollinator habitat space to the dairy.

SHORT TERM GOALS

- › Expand cover crop usage to the remaining 5% of acres associated with the dairy.

Carbon & Energy Summary



PROGRESS

- › Considers the efficiency of energy use at all stages of building plans.

SHORT TERM GOALS

- › Installation of LED lighting during the dairy's construction.
- › Evaluate equipment used at the dairy for efficiencies, especially to monitor idle time.
- › Include energy use records into efficiency evaluations.

- › Installation of Variable Speed Drive (VSD) fans and sprinklers that adjust to temperature and humidity.
- › Corn grinder on location.

LONG TERM GOALS

- › Seek opportunities to use renewable energy.
- › Seek opportunities for efficiencies in product transportation supply chain to decrease emissions.

Economy & Productivity Summary



PROGRESS

- › Evaluates LED lighting for the new dairy construction to prove cost effectiveness.

SHORT TERM GOALS

- › Continue to monitor yield comparisons over time.
- › Evaluate the cost savings and efficiencies of installing a corn grinder on the dairy.

- › Implement sand recycling program to clean and recapture 95% of sand bedding, minimizing need to purchase new bedding.
- › Utilize PZM reports to increase ROI/acre.
- › Collect updated budget information for PZM reports.

LONG TERM GOALS

- › Monitor and increase the efficiency of inputs to outputs from the operation.



Case IH pulling manure spreader at MVP Dairy.

ENVIRONMENT

Overview

The McCarty-VanTilburg Partnership (MVP) Dairy will depend on thousands of acres in Ohio. In 2017, the VanTilburgs farmed and managed 66 fields on 3,987 acres that will encompass the bases for this report.

The fields associated with MVP Dairy have various crop rotations. Almost 70% of the acres have a standard corn grain-soybean rotation. Over 12% of the acres were soybean-corn silage rotation. Finally, about 18% of the total acres farmed and managed by the VanTilburgs is corn grain after corn grain.

The dairy is currently under construction and does not house or feed any cows at this time. The dairy is expected to house its occupants starting in the fall of 2018. The soybeans that were grown in 2017 were grown GMO and sold on the open market. About 40,000 bushels of non-GMO corn grain and 512 acres of corn silage was grown and held in storage on location to support the future dairy the following year. MVP Dairy has new innovative technology planned for their manure management system.



Harvest from 2017 was stored for feed for the upcoming herd moving into the new barns in the fall of 2018.



MVP Dairy ground breaking ceremony August 21, 2017.

Performance

KEY INDICATOR: SOIL

Cover Crops

The environmental benefits of cover crops include erosion control, improved water quality and soil health, reduced greenhouse gas emissions and restoration of wildlife habitat.

Matt VanTilburg, one of the MVP owners, has chosen to cover crop 95% of the acres with a mixture of grasses, legumes and brassicaceae. The benefits that come from multispecies cover crops include the additional benefits of a vast variety of rooting structures below the soil, which adds to the benefits listed above.

Tillage Practices

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.

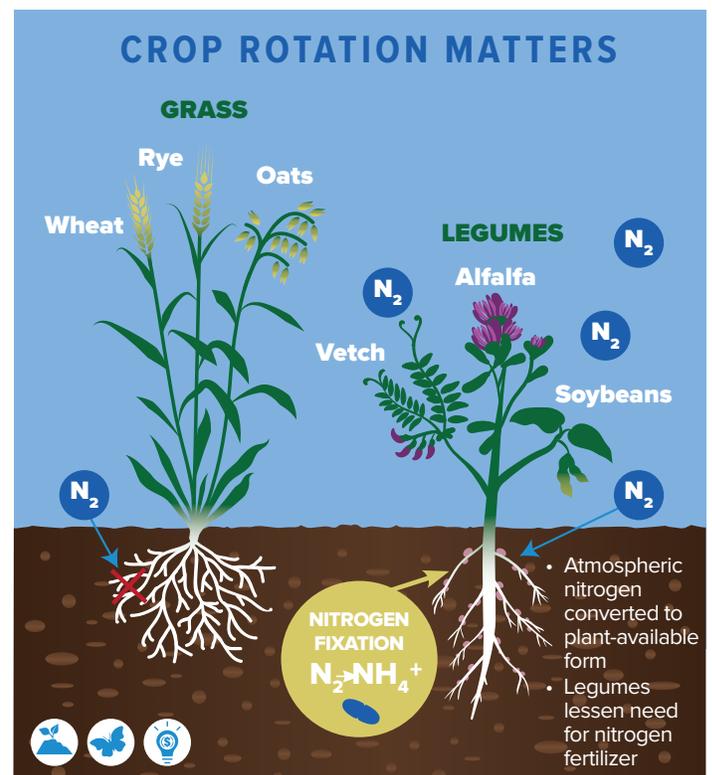
In 2017, the VanTilburgs had a no-till system in place on 93% of their acres and implemented a no-till system of field cultivating on the remainder of the acres. A portion of the acres needing tillage were to make easy access for underground tile replacement. Corn stalks are cut for harvest leaving over a foot of residue in fields to control erosion and add organic matter to fields.



Fall harvest drone image shots of grain corn near one of the wetland areas, *Courtesy of Pheasants Forever.*

Crop Rotation

Rotating crops has many benefits. In a corn-soybean rotation the total amount of commercial fertilizer being applied to the field is reduced compared to if corn was continuously monocropped for years. The soybean offers a legume nitrogen credit of 50 pounds, which means 50 less pounds of commercial fertilizer is needed to be applied for the succeeding corn to grow to its optimum point. A break between high nitrogen-demanding crops, such as corn, decreases environmental impact. Soybeans do not require synthetic nitrogen to grow to its optimum due to the ability to fix nitrogen from the atmosphere.



A diverse crop rotation including legumes significantly contributes to soil health. There are two major reasons. The differences in root structures reduce soil compaction to increase mobility of nutrients and water in the soil. Also, legumes have a symbiotic relationship with a group of bacteria known as diazotrophs or nitrogen-fixing bacteria. The symbiosis allows for plants to uptake this nutrient, unable to do so by itself, in exchange for a nutrient-rich home in its special rooting structures, called nodules. This relationship creates a free fertilizer because nitrogen remains in the fields by residual organic matter to supplement the next crop. This reduces the total commercial fertilizer need.

Soil Organic Matter and Soil Organic Carbon

According to Cornell University, productive agricultural soils have between 3% and 6% organic matter (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.

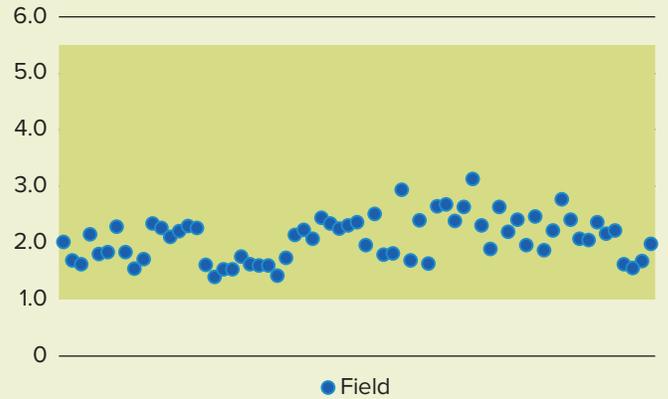
MVP's prominent soil type is an *Epiaqualf*, defined as a perched water table on a moderately-developed soil. The tested soils surrounding the dairy have a historic range of 1% to 5.5% OM according to the Web Soil Survey, a Natural Resources Conservation Service (NRCS) database, using an area around the new dairy of about 100,000 acres with the dairy as a central point. The fields of MVP tested at a range of 1.4% to 3.1% OM. Soil amendments such as manure are important for maintaining and increasing soil OM.

Soil Conditioning Index (SCI), a tool from the NRCS, predicts trends in soil OM in the top few inches of soil based on current management practices. If the calculated index is a negative value, the level of soil OM 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 2017, the MVP Dairy has a weighted average SCI value at 0.342 representing a positive trajectory predicted from current management, soil type, and climate for future years.



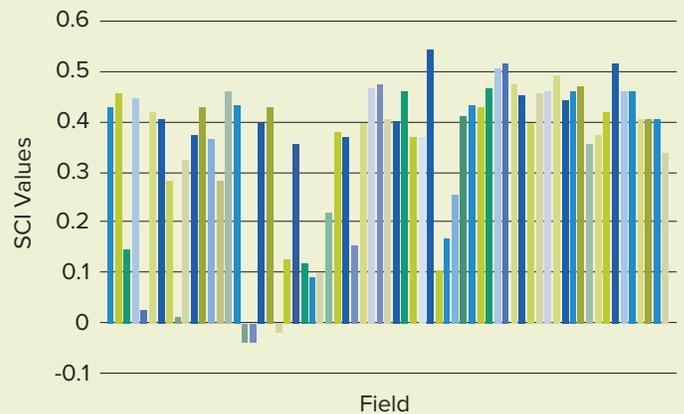
Conservation practices in place at MVP Dairy.

PERCENT ORGANIC MATTER BY FIELD COMPARED TO HISTORIC AVERAGE



MVP Dairy fields organic matter results compared to shaded historic organic matter range.

SCI BY FIELD AT MVP DAIRY



MVP Dairy fields' Soil Conditioning Index (SCI) predicts a trend in organic matter based on current management, weather and soils.

NRCS USDA PRACTICES AT MVP DAIRY

Soil:	Cover Crop (CRS Code 340) Residue and Tillage Management, Reduced Till (CRS Code 345) Residue and Tillage Management, No-Till (CRS Code 329)
Water:	Grassed Waterway (CRS Code 412) Constructed Wetland (CRS Code 656) Filter Strip (CRS Code 393) Waste Storage Facility (CRS Code 313)
Biodiversity:	Conservation Crop Rotation (CRS Code 328)

KEY INDICATOR: WATER

Ohio Watersheds

The Ohio EPA defines a watershed as an area of land that drains into a lake or stream but they can be small, like the area that drains into the creek behind a house or large when considering all the land, streams and rivers that drain into the Ohio River or Lake Erie. MVP Dairy is located in the St. Mary's River watershed. The St. Mary's River watershed is one of 8 subwatersheds within the Maumee River watershed and comprises 13% of that watershed. This river flows into the state of Indiana then continues northwest to join the St. Joseph River in Fort Wayne, Indiana where it forms the Maumee River which empties into Lake Erie. The St. Marys River watershed is defined as a total maximum daily load (TMDL) high priority watershed, meaning the total maximum daily loads of pollutants exceed standards set by the EPA. This watershed has a Watershed Management Plan (WMP) in collaboration with the Indiana Department of Environmental Management. According to a summary provided by the Indiana Department of Environmental Management, downstream from the dairy, this WMP focuses on issues with sedimentation, trash/debris, Atrazine, *E. coli*, as well as total phosphorus and nitrate. According to the Ohio EPA some potential recommendations for improvement include public awareness, managing livestock manure to reduce nutrient runoff, improving erosion and sediment control in all areas both rural and urban with stormwater management, as well as eliminating the pervasive bacteria problems. MVP Dairy utilizes filter strips, wetlands and retention ponds to control and improve water quality at the dairy near the fields. From over 25 years ago to

as recent as 10 years ago, restoration projects have been installed on four fields. The newer wetlands join three other wetland ponds and two retention ponds currently installed.

The interest in water protection has attracted the attention of the Ohio EPA and Pheasants Forever. The combination of the two groups and the VanTilburgs has resulted in a wetland project that focuses on water recycling. The field associated with the project has a retention pond filled from subsurface drainage tiles. The water is then pumped back on the field by center pivot irrigation during times of insufficient rain.

Currently, there is one field being farmed that sits between two streams. Prior to 2017, between the edge of the field and the streams was a 30-foot grass filter strip totaling two miles in length. The terrain was uneven near the streams and caused large areas within the filter strip to be useless for filtering water as the surface water flow was directed to only a select few locations. Funded by The Great Lakes Restoration Initiative, the VanTilburg operation converted the filter strips to a saturated buffer connected to the retention pond system. The construction occurred in 2016 and was fully functional in spring 2017. The filter strip had to be removed to make way for underground tiling and water control columns that create a saturated buffer. This system of tiling joins the field tiles together to release water under the grass buffer allowing the water to slowly move through the underground buffer of dense grass roots, which filters it before the water enters a water way.



"Miles of Algae Covering Lake Erie", New York Times October 3, 2017.



Restored wetland at edge of a field managed by the VanTilburgs.

Currently, the EPA and Pheasants Forever have partnered in a three-year study to observe nutrient runoff in the retention pond. The group responsible for testing is Wright State University. The preliminary research finds a 0.2 mg/L phosphorus concentration in the retention pond. Water bodies on the south side of the county have been tested and show phosphorus levels at 20 mg/L.

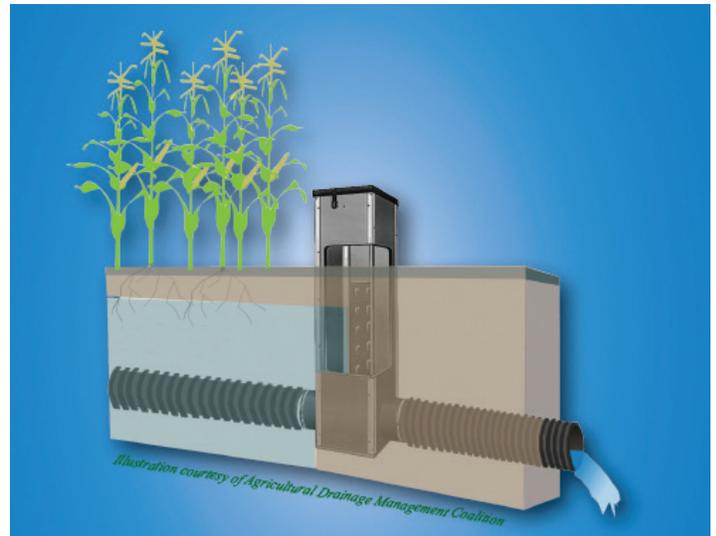
Soil Moisture Probes

The enterprise currently manages three separate irrigation pivots. Of the three, one pivot is strictly well-fed and one is strictly pumped from a retention pond. The final of the three is partially supplied by well water and partially supplied by a retention pond. The runoff from the VTF Sunrise LLC retail location goes to a retention pond to protect surface waters from potential fertilizer spills from the business. The remainder of the water needed for the pivot is provided by a well that is pumped directly into the retention pond.

The pivots are run only when necessary. If the crops are experiencing stress from limited water, then a soil probe will determine total water needed. All three pivots utilize AgSense Soil Moisture Probes. The device drops down to 48 inches taking measurements at 8, 12, 36 and 48 inch marks. The information gathered is sent directly to a computer or smart phone every few hours. The soil moisture probe allows for proper irrigation decisions and helps increase yields on fields that have pivots from other fields that do not.

Stop Logs

The VanTilburgs monitor three stop logs on their land. Stop logs are part of a controlled drainage structure system to allow for increased water use efficiency for the crops. The management of the stop logs involves placing them in the fall to build the water table up in the field, removing them in the spring to drain the field for planting and replacing again in the fall.



Stop logs are controlled within this control box to allow the rise and fall of the water table with the tile lines allowing plants to absorb more water. Image courtesy of USDA NRCS.

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.

“In today’s world environment, some suggest that this global model – which brings apparent simplicity and short-term efficiency – may become the source of a systemic risk for global food security, as not sufficiently taking into account long-term farmers’ autonomy and natural biodiversity, with uncertain long-term consequences on soil fertility and carbon, water usage and fossil energy efficiency.” –Danone’s Position on Biodiversity and GMO Use April 27, 2016

Cover Crop

Matt VanTilburg has taken extra steps in his cover crop plan to perfect a mixture of grasses, legumes and brassicaceae. The combination of the three plant families helps mitigate nitrogen loss during times when a cash crop, such as corn silage, is not on the field.

Grass species are very useful as a cover crop because of their ability to scavenge nitrogen with their fibrous root structure. If the grass species can survive the winter, then it can uptake nitrogen in the fall and in the spring. The downside to a non-winter kill grass species is that chemical intervention is necessary before planting a cash crop. If the grass species cannot survive winter, then it cannot capture spring leaching nitrogen.

Legumes are a great source for nitrogen fixation and add to the diversity of any system. A legume’s rooting structure is considered a tap root which is compatible with the rooting structure of a grass species.



Cover crop mixture with grass, legumes, and brassicaceae species.



The VanTilburgs fashioned a cover crop seed planter from a highboy sprayer.



The use of brassicaceae (cabbage family) as a cover crop is a newer idea. The plant family is an excellent nitrogen scavenger in the immediate growing area. The various species within the brassicaseae family establish rapidly. The negative to brassicaceae is that some species produce a pungent rotten egg-like smell during decomposition in the early spring.

About 95% of all acres associated with the dairy have a varying degree of grass, legume and brassicaceae cover crop mix. The plant families complement each other and add

to the biodiversity of each field. The following table shows the strengths and weaknesses of each species implemented by Matt VanTilburg.

Wildlife Boxes

The VanTilburgs have taken initiative for the wildlife on their acres and set up **three Wood Duck boxes** on their wetlands. They partner with Pheasants Forever on various projects ranging from water quality, habitat restoration, and recreation.

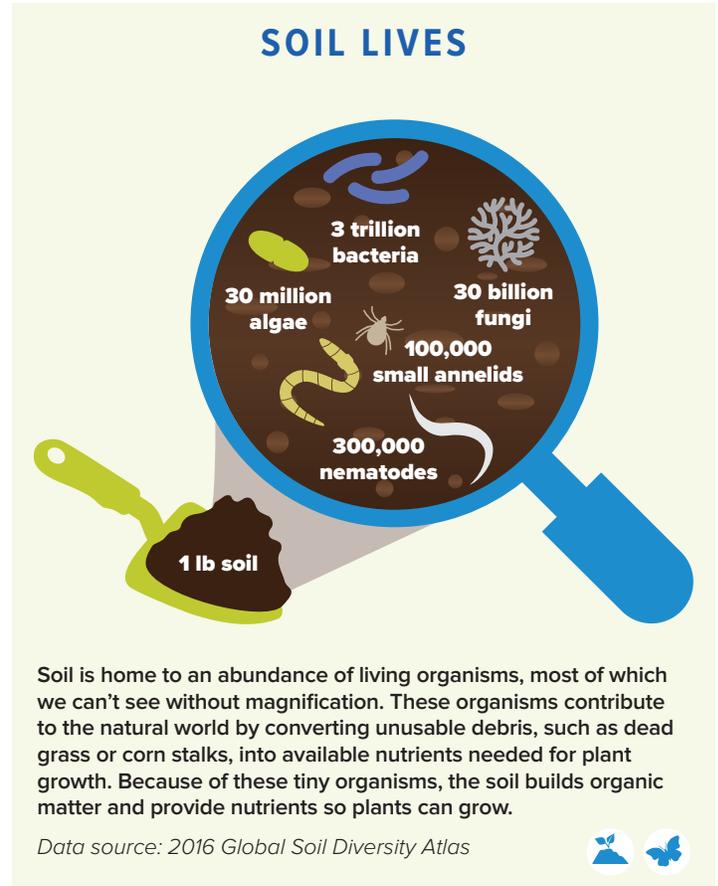
Species	Nitrogen source	Nitrogen scavenger	Soil builder	Subsoil loosener	Topsoil loosener	Erosion preventer	Lasting residue	Weed fighter
Cereal Rye	P	E	E	VG	E	E	E	E
Annual Rye Grass	P	E	E	E	E	E	G	G
Oats	P	VG	VG	P	VG	E	G	E
Hairy Vetch	E	F	VG	G	VG	G	F	VG
Red Clover	E	F	E	G	VG	VG	G	VG
Crimson Clover	E	F	E	G	VG	VG	G	G
Radish	P	E	VG	E	VG	F	F	VG
Canola Dwarf	P	VG	G	G	VG	F	G	G

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).



One of the Wood Duck boxes set up in an existing wetland.



KEY INDICATOR: CARBON & ENERGY

Manure Management System

An innovative and patented anaerobic treatment cell system on the farm will significantly reduce waste solids, consumption of water and waste odor, with a recycling system beneficial for animals, crop care and the environment. The planned system can be seen on the following page courtesy of MVP Dairy.

Fleet

Many of the machines used by the VanTilburgs have real-time kinematic (RTK) positioning. RTK means it is equipped for satellite navigation purposes. RTK assists with auto steer to exact positions of rows and can pinpoint the exact spots year after year. Two RoGator 1300s spray applicators have nozzle by nozzle control to turn off unneeded rows or when turning corners to avoid over application. A Terra-Gator is the dry spreader applicator and has row control to reduce over application. A Case Steiger 370 and Case Steiger 420 are used to pull implements such as the 1250 corn planter and the Case 500T air drill for beans, both of which are

RTK and have ability to turn off rows to not waste seed or overplant. Those same tractors are used to pull implements for tillage such as a chisel and field cultivator when needed. A Case 9230 is used to harvest with a 12-row folding corn head and a 40-foot bean head which has RTK and a yield monitor. Lately, the farm utilizes a Claas Jaguar 980 for silage chopping that is equipped with RTK and a yield monitor.

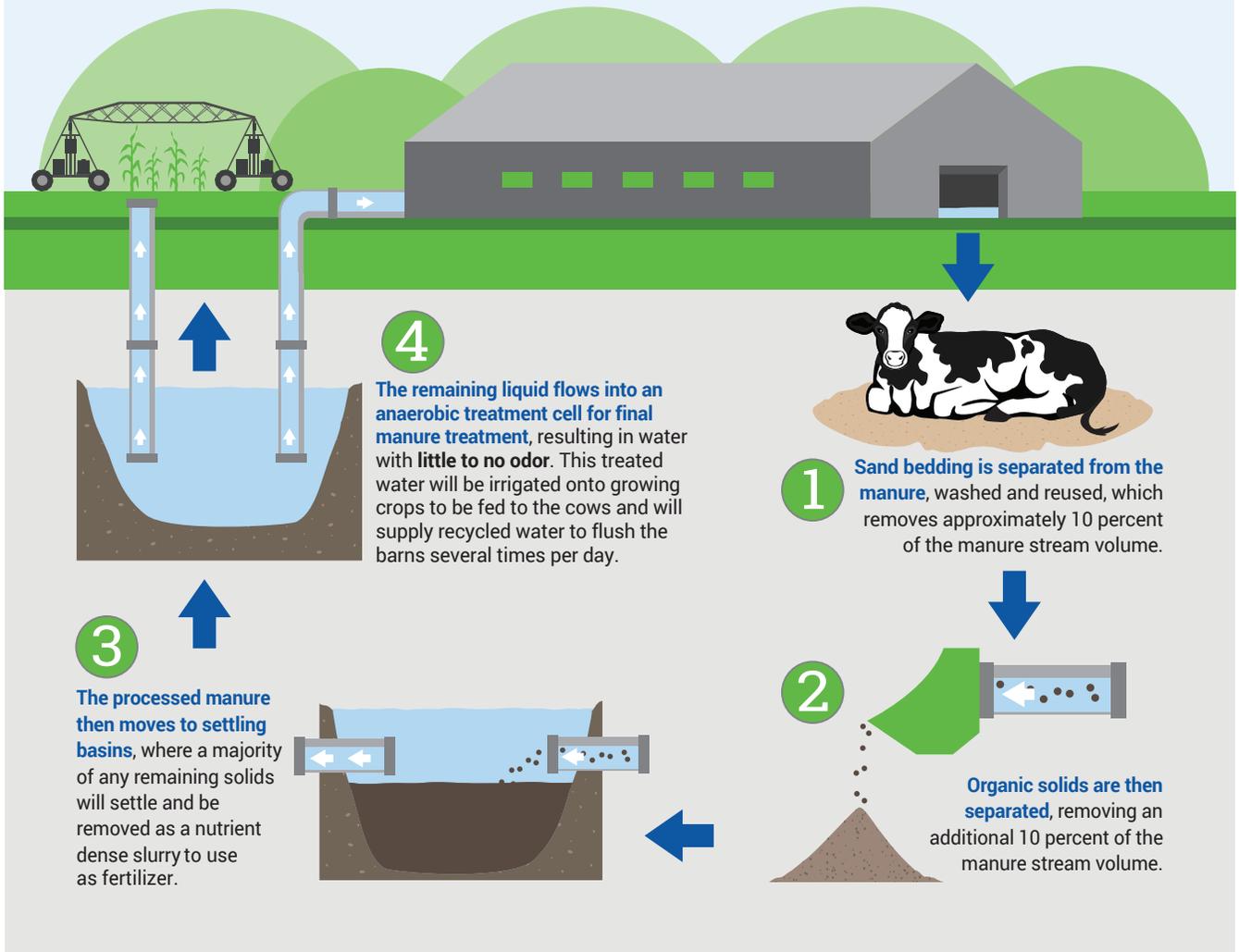


Case IH equipment in use for corn harvest.



The new MVP Dairy in Mercer County, Ohio will feature an innovative and patented anaerobic treatment cell system that will significantly reduce odor, and implement a recycling system which maximizes benefits for animal care, crop care and the environment. The system will reduce nutrients in the manure so that over 70 percent can be applied as valuable and virtually odor-free, low-nutrient irrigation water to grow feed for the cows.

After being flushed multiple times daily from the barns, manure will go through a 4-step process to separate solids and liquids before being used as organic fertilizer.



Note: The core of this system is a proven technology used by many municipalities throughout the United States, including eight Mercer County municipalities. The system relies upon the natural treatment of the manure after valuable components have been separated for beneficial uses.

Image courtesy of MVP Dairy.

KEY INDICATOR: ECONOMY & PRODUCTIVITY

Unfortunate Replant

A combination of snow and rain in late April caused several growers in the state of Ohio to replant. Excess cold and moisture reduces germination rates. If a field has a bad stand, then a grower has to replant. A grower must pay for each set of seeds during a replant. The VanTilburg family was subjected to the same weather patterns and replanted several of the acres that grow feed for the dairy.

Strip Trial

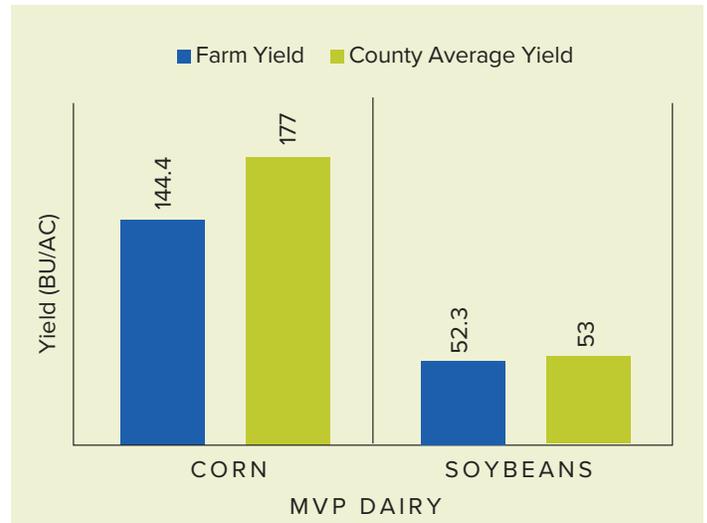
The VanTilburg Farm performs strip trials on their land to gauge the effectiveness of fungicide and split nitrogen application. These strip trials help improve their agronomic decisions for whole field applications. The total product used is less than if they would subject an entire field to a trial.

Utilizing Manure Fertilizer

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

Yield

Yield is important to MVP Dairy to supply the quantity and quality of feed for the dairy cows as well as the efficiency cost for the operation. The following graphs represent the crop grown in 2017 for MVP Dairy, compared to the county averages for that same crop from 2017.



Yield from crops grown at MVP Dairy in 2017 compared to county averages.



Case IH 320 tractor pulling a 24 row case 1250 planter.

KEY INDICATOR: ANIMAL WELFARE

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

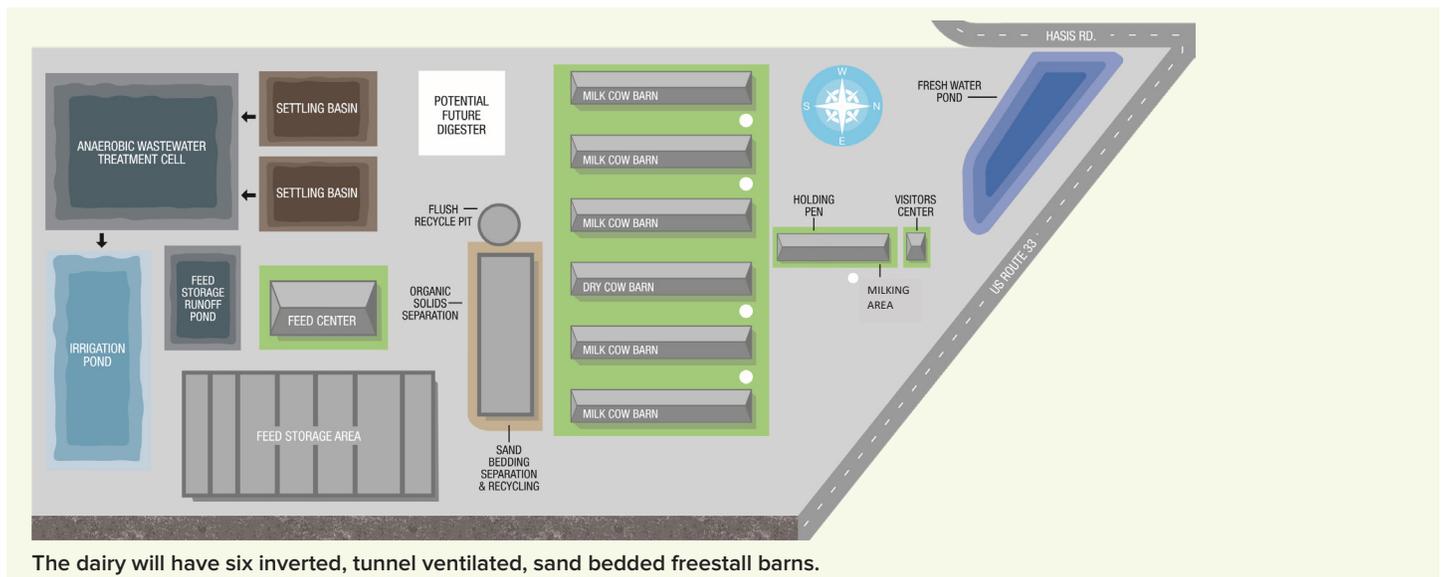
The dairy has taken steps to ensure five freedoms that must be provided to the cows by all workers:

- Freedom from hunger and thirst through ready access to fresh water and diet to maintain health and vigor.
- Freedom from discomfort by providing an appropriate environment, including shelter and a comfortable resting area.
- Freedom from pain, injury or disease by prevention or rapid diagnosis and treatment.

- Freedom to express normal behavior by providing sufficient space, proper facilities and company of the animal's own kind.
- Freedom from fear and distress by ensuring conditions and treatment which avoid mental suffering.

The combination of all five freedoms allows cows to be productive without limiting their physical, mental or social health.

MVP Dairy is designing and constructing a building meant for healthy cows. The buildings will have almost 400 variable rate setting fans that will automatically adjust based on the internal environment. The buildings will be broken into zones with automatic monitoring and response to temperature and humidity.



Cows will move into the new MVP state of the art dairy in fall 2018.

COMMUNITY ENRICHMENT

The McCarty and VanTilburg families came together as partners in this endeavor because of their shared vision of creating sustainable agriculture operations that have positive social, economic and environmental impacts on the communities in which they live and operate. Together, they're building an innovative, efficient and environmentally friendly operation the community will be proud to call their neighbor.

The VanTilburg family is motivated to be involved in their local Mercer County community. The willful giving of time and resources has created positive results. Luke VanTilburg is a guest in local schools when discussing seed science to provide his expertise and spread his knowledge on the subject. The VanTilburgs are also members of Pheasants Forever, No-Till Council and the local extension service advisory board.

The 4-H campground has benefited from this generosity by having their basketball courts rebuilt by VTF excavation. VTF excavation has also assisted in the demolition of older buildings to create a new library with a green reading space, participated with House of Hope projects and worked with St. Johns Builders. They donated the use of their equipment for setting up a local fair in the summer. The family has partnered with Pheasants Forever to host and provide a meal for a free Youth and Veteran Hunt event.

The family actively gives tours of their facility to Wright State University agricultural classes, Japanese Sister City Exchange, Lions Club, Rotary Club, Chamber of Commerce Business Round table, and Mercer Co SWCD Ag Breakfast Group. As the dairy finishes construction, they expect to provide over 30 jobs to the local community. The dairy also plans to give numerous tours and hold events open for the community.

MVP Dairy has a social media presence with their Facebook page, MVP Dairy, where they interact with their followers and have provided updates on the construction process.



VTF Excavation digging the basement for Men's House of Hope.

“Our success is dependent on these communities, and when they grow and prosper, so do we.”

—Clay McCarty



Farm Science Review event.



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 confidentially and non-disclosure 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 National Resource 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.

**EcoPractices estimates an additional environmental impact for edge of field practices utilizing the Iowa State Nutrient Reduction Strategy percent removal by conservation practice based on whole field impact scale.

By signing below the parties agree that the EcoPractices Process has been completed and summarized in this document titled *MVP Dairy Sustainability Analysis On-Farm Practices Report 2017*, and the data on which this EcoPractices report relies is accurate and has been presented correctly.

John Harsch
EcoPractices President

Luke VanTilburg
Member, MVP Dairy, LLC

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

Glossary and Abbreviations

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

Argiaquoll – 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 – is 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.

Carbon dioxide is 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) - Cations are positively charged ions such as calcium (Ca²⁺), magnesium (Mg²⁺), potassium (K⁺), sodium (Na⁺), hydrogen (H⁺), aluminum (Al³⁺), iron (Fe²⁺), manganese (Mn²⁺), zinc (Zn²⁺) and copper (Cu²⁺). The capacity of the soil to hold on to these cations is called the cation exchange capacity (CEC). These cations 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

CO₂e, or carbon dioxide equivalent, is 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) - is described as 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) - is described as 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

CRP – Conservation Reserve Program

Deep Rip Tillage – (CPS code 324) 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 https://www.nrcs.usda.gov/wps/portal/nrcs/detail/wi/home/?cid=nrcs144p2_027116

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.

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

Fertigation – Application of fertilizer materials via the irrigation system https://ag.purdue.edu/hla/fruitveg/Presentations/Saha_Fertigation_6up.pdf

Filter Strip –strip or area of herbaceous vegetation that removes contaminants from overland flow. 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>

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

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

KPI – Key Performance Indicator

Kilowatt Hour (kWh) – is a unit of energy used to describe the power in watts by the amount used over a period of time. 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 systems – 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; the high degree of stabilization reduces odors during land application; high nitrogen reduction minimizes the land area required for liquid effluent disposal, and long-term storage at a low cost. <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. The microbes perform nitrogen fixation in exchange for nutrients and housing known as root nodules. Agronomic systems utilizing this crop will reduce total fertilizers needed. <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.

NRCS – Natural Resources Conservation Service

Paddock – An enclosed field

Phosphorus (P) – an essential element for plant and animal growth. Unlike nitrogen and sulfur, phosphorus does not occur as a gas or disappear into the atmosphere. However, P can become strongly adsorbed to soil particles, and some plants may have trouble accessing it. Phosphorus is prone to loss on soil particles via erosion, and in some rare cases, via leaching. Cover crops can help prevent the loss of P by preventing erosion and leaching.

Residue and Tillage Management, Reduced Till (CPS Code 345) – is described as 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/wps/PA_NRCSConsumption/download?cid=nrcs143_025852&ext=pdf

RTK – Real-Time Kinematic

SOM/SOC Levels

Soil Organic Carbon (SOC) – Soil organic carbon (SOC) is 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> and http://soilquality.org/indicators/total_organic_carbon.html

Soil Organic Matter (SOM) – Soil organic matter is the fraction of the soil that consists of plant or animal tissue in various stages of breakdown (decomposition). According to the USDA, every 1% increase in organic matter results in as much as 25,000 gallons of available soil water per acre. According to Cornell University, most of our productive agricultural soils have between a 3 and 6% organic matter content level. <http://franklin.cce.cornell.edu/resources/soil-organic-matter-fact-sheet/>

Symbiotic – see symbiosis

Symbiosis – A long term interaction between two or more organism that will be mutually beneficial.

Therm (CCF) – is 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. Since natural gas meters measure volume and not energy content, a therm factor is used by natural gas companies to convert the volume of gas used to its heat equivalent, and thus calculate the actual energy use. 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

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>