

2013
Green Tier Annual Report
Crave Brothers Farms



February 2014

Executive Summary

Crave Brothers Farm, LLC (CBF) is the name of our dairy farm and we are located in south central Wisconsin. We house an average of 1400 cows as well as 1000 head of young stock. From the 1400+ cows we generate over 40 million pounds of milk in any given year. Eighty percent of our milk is piped, underground, to our adjacent cheese factory (Crave Brothers Farmstead Cheese, LLC.) where it is used to make a variety of premium cheeses. The remaining 20 percent is shipped via truck to other processors.

To keep the livestock fed and maintained, we farm 2000 plus acres of alfalfa, corn for silage and grain, soybeans, wheat and pasture. Our farm was founded in 1978 at a separate rented location with 43 head of cows. We have evolved to become a family owned operation where the management and ownership team consists of four Crave brothers. Sons and daughters of us four brothers are approaching and even excelling in their knowledge and ability to become part of the management. Our succession plan is to transition them to the ownership team in the near future. Our farm and adjacent cheese factory employ between 80 and 90 full time associates.

Environmental Performance

Over the years our farms commitment to the environment and sustainability has lead us to install a number of energy-efficient and renewable energy projects that benefit not only Wisconsin's air and water but the farm its employees, the community, our cows and our customers. If I condense our energy efficiency projects, programs and practices I come out with seven that are key to our operations and sustainability practices.

- The first and largest project was the installation of two state-of-the-art complete-mix anaerobic digesters.
- The second project born from the digesters was the comprehensive heat recovery system.
- The third was the installation of electrical efficiency projects throughout the farmstead.
- The fourth project was the installation of a programmable water system. This supplies water to the farm and cheese factory.
- The fifth practice is the recovery of gray water from the farmstead as well as the cheese factory.
- The sixth project was to install underground piping to transport our milk to the cheese factory and the cheese factory's permeate back to the farm's permeate silo.
- The seventh focus is utilizing minimal fossil fuels in the farm's agronomic practices.

Renewable and Energy Saving Program

Prior to the farmstead's 2006 redesign the management team evaluated our resources. We evaluated our current practices in the use of electricity, fossil fuels and water resources. With a sustainability focus in mind we utilized this redesign opportunity to design and implement the most sustainable practices and facilities available.

When we pin pointed the areas where it was possible to save we searched for programs practices and/or equipment. We searched at a national level and global level for other dairy farm practices. We researched other businesses with similar issues in pursuit of our goal of superior environmental performance. We also looked for input from educators and scientists on the practices, programs, and equipment we were discussing as options. Input was gathered from university researchers, Focus on Energy representatives, power company engineers, electricians, vendors, nutritionists, peers in the dairy industry and staff at the farm.

In discussions with industry professions we decided to forgo reaching for the top tier certifications (i.e. LEED). Our logic behind this was to focus on the projects we desired to achieve without getting bogged down with excessive engineering and financial obligations.

Roles and resources

- The Crave Family and employees acted as researchers, discovering and embracing our options. Discussions with both the private and public sectors, aided us in developing the most energy efficient systems.
- In a family operation commitment and communication between the four brothers was instrumental in allocating the large amount of time needed to produce the vision of a sustainable energy efficient design.
- Funding for these projects came primarily from Crave Brothers Farm. Some financial incentives were provided by Focus on Energy.

Collaboration-Other Planned benefits

Equipped with the latest research, advice from energy professionals and a functional EMS in place we continually strive for sustainability by implementing programs and practices that are environmentally friendly and energy saving. Out of all our programs we have seen the greatest sustainable environmental benefit from three specific ones:

- First, the installation of the dual 750,000 gallon complete-mix digesters. Our digesters are owned and operated by a third party. This allows the farm staff and management time to focus on the farms core operations. Operation of the digesters not only manages the manure on the farm but it also generates enough power to sustain the farm, cheese factory and 300+ additional homes. The excess heat produced by the generators engine is captured by a well-designed system for maximizing BTU recovery and distribution throughout the farmstead. In addition, the solid extracted in the digestion process is used to make organic bedding and potting mix which is affordably sold by the third party to dairy farms, including our farm. By installing the digesters we achieved our goals of energy independence, sustainability and renewable

features. In 2006 we partnered with Clear Horizons to build and install remotely controlled digesters. Since beginning operation of the two digesters we have been able to use the resulting heat, energy, liquids and solids. The application of the products to our fields produced to be an efficient foundation for our Nutrient Management Plan (NMP). Our NMP provides the details regarding the nutrients most beneficial to our farm's soil. The inputs into the digesters, such as our cheese factory's permeate, gray water and of course cow and heifer manure provide us with 90% of the nutrients required for our crops. It should be noted that a majority of permeate is used as a livestock feed. After the rations have been prepared, any remaining permeate is pumped into the digesters where it aids in producing an increased amount of biogas.

Our enclosed manure systems mentioned above allow for year round success in feeding the digesters, and year round operation of the digesters. Ag Star data has shown this digester system to be perhaps the most efficient in the country. It is estimated to have a 95% to 98% online rating and a BTU recovery of 68%.

- Second, the efficient use of gray water where well water is not specifically needed (Gray water is water containing organic matter, such as pipeline wash water and wash water from the cheese factory.) We utilize six extensive gray water sources on the farm. We have taken great measures to re-plumb one source, the milking parlor. The plumbing allows for the best utilization of potable, non-potable and gray water. This gray water eventually aids in manure handling before it feeds into the complete-mix digesters, therefore we are able to capture the nutrients in that gray water through the digester system.
- Third, the attention to detail in the cropping operations, leads to not only soil and water conservation, but energy efficiencies in this area as well.

Related Projects and Benefits

- Global positioning (GPS) planters and sprayers lead to efficiencies in not only planting, spraying and harvesting, but aid in record keeping. Tillage, manure handling and other crop operations are carefully evaluated for not only the fuel used, but for the effect on the environment as well.
- The heifer barns are built with outside feeding. The benefits are not only for the heifers well being but for manure and rainwater handling. We are one of a hand full of CAFO's designed as such. We were willing to pay more per heifer for these facilities as compared to a typical CAFO heifer structure and endure the permitting process for the uniqueness of design.

- We also have pasture for the heifers and dry cows. This allows for exercise and weight management.
- The value of conversations with our many visitors as it pertains to sustainability is enhanced by discussions pertaining to modern farming, the digesters and the usage of pastures.

Energy Project Metrics (Also See Metrics Report)

At the start of our energy efficiency programs we implement three primary projects and collaborated with Focus on Energy (FE) to measure the outcome. The figures for the following were taken from a FE report published about the farm in 2009.

- To capitalize on the byproduct heat of the digesters electrical generation system we have co-invested with Clear Horizons in a heat recovery system. The amount of heat captured is enough to heat the digester's facilities plus much of the farmstead. Our farm saves an average of 3,200 therms a year. This replaced an average 10,000 gallons of LP gas we used each year
- We installed 8 low-energy watering stations. We save 12,000kWh annually. The system also directs the non-contact cooling water for a second use as cow drinking and cooling water. That reduces water use for this source by 50%.
- Lastly, we installed energy-efficient lighting in our buildings. Although a 7-year return, we save an average of 24,000kWh annually.

Associated Projects

- The water system for both the farm and the cheese factory is controlled by a programmable logic controller (a PLC.) This system allows for efficient operation of the wells and distribution of potable and non-potable water. Engineers report the design is more comprehensive than 90% of the municipal water systems.
- An underground piping system transports our milk to the cheese factory. Another line transports the whey permeate back to the farmstead's feeding center where it is used as a feed. To truck 30 million pounds of milk and 25 million pounds of permeate would cost a quarter million dollars annually. Obvious financial savings are complimented by less chance of spillage and traffic concerns. Less wash water is used to clean the pipeline than would be used to clean one semi.

- Milking parlor improvements produced efficiencies in the following equipment and systems: compressors, heat recovery, chiller, water and glycol designed plate cooler, non-potable water recovery, boiler operation, VFD vacuum pump, automated soap dispensing and even the lighting and ventilation.
- Curtain sided free-stall barns have energy efficient lighting, supplemental ventilation and gravity flow manure handling.

Innovations in the shop and office design include: heat recovery, lighting, ventilation and infiltrative landscaping.

Social Benefits

Conservation/Environmental Stewardship

Environmentally, economically and socially speaking, implementation of a functional EMS is hard to measure in a quantifiable sense. If we were to look at the EMS in a qualitative sense one word comes to mind as a measurement; “value”. An EMS provides tangible values for our ongoing efforts to implement projects that we know are the right thing to do but have difficulty quantifying their benefits. An EMS charges us with taking a closer look at why we are implementing the projects and programs and what was the outcome, from an environmental, economic and social perspective, from implementation of these projects.

The following is a condensed list of projects and operations that were started prior to implementation of an EMS. This list will hopefully serve as to demonstrate two things. First, to convey our aspirations to continuously strive for superior environmental performance. Second, to illustrate why we here at CBF believe we have created an exceptional foundation of sustainability that can use the continual improvement foundation of the EMS.

- Even 24 years ago, back when our farm was in its infancy, we built our open air free stall barns with a slatted floor design. We built it with our current and future manure management in mind. The manure flows into collection pits by way of gravity without the use of skid loaders. The ease of cleanliness aids in our pest management and in keeping the odor to a minimum.
- We have installed potable, non-potable and gray water systems for the reuse of resources and keep our use of vital well water to a minimum. Saves water, saves energy.
- Two state of the art operational digesters were built on our farm. These are fed through our well designed underground manure transport systems and are large enough to handle all manure flushed into them.
- We are a permitted CAFO farm with a functional Nutrient Management Plan (NMP). By utilizing a digester with post digester solids separation system we are able to reduce the amount of land needed for our NMP by 400 acres. The nutrients stored in

the basin are easily agitated by the agitation barge prior to field application. Agitation creates an average of 10 percent variability within the nutrients resulting in a more accurate application.

- 10 concrete bunker silos allow for storage of 11,000 tons dry matter of feed. The leachate /rainwater collection from these bunkers can be used in the manure system. Nutrients found in the leachate/rainwater mix can enhance the performance of the digesters.
- Whey permeate produced from the production of cheese at the cheese factory is pumped back to the farm's permeate silo. On the farm it is used as vital feed or pumped to the digesters where its nutrients aid in the creation of methane.
- Lastly, outside the main farmstead our staff has developed and maintained several wildlife areas. Feed plots, forestry and nesting areas are planted annually to maintain the existence of beneficial Wisconsin wildlife.

Social-Communication

Many projects and programs cannot be completed alone nor do we wish to say that we implement our projects without help. We utilize agronomists, vendors, soil and water consultants and researchers to aid in our discussion on progressive steps to take. In molding our EMS with the relationships we have built we have a systematic way of sharing our experience with others. To us at CBF transparency is the key to social sustainability. Below is a list of the different avenues we take to achieve our goal of transparency and ultimately social sustainability.

- We take pride in and enjoy giving 1000 plus individuals, who visit our farm each year, a tour where we get to share our experiences and outcomes from the implementation of each project. In 2014 we are implementing a feedback process to establish two-way flow of information with our visitors.
- We have built a mutually beneficial relationship with UW-Madison so that we may learn and apply new techniques to our own farm while giving others a chance to educate themselves about them. We have also built beneficial relationships with contractors and consultants to stay in compliance and to obtain needed permits without delay.
- We have built mutually beneficial relationships amongst the staff and management team. EMS promotes communication and training so the employees know what their roles are and can do them safely. This sustains a culture of pride in the workplace and a feeling of personal ownership of responsibilities. Pride in the workplace brings us back to the economic and accumulated learning benefits of low staff turnover rates.

- The positive perception of CBF gained from our efforts to be transparent is what we believe makes CBF cheese such a success. The message of sustainable agriculture practices on our farm is shared with the cheese industry in a factual and transparent manner.
- We became a part of Green Tier to join with individual and outstanding companies who share our aspirations for sustainability and environmental awareness.
- We have hosted the National 4-H Dairy Conference for the last 10 years, a conference attended by the next generation of leaders in sustainable dairy farming.
- We have also hosted the American Society of Environmental Journalists. A group of individuals who we have received wonderful reviews from.
- We have the beginnings of a GIS in place. The GIS has allowed us as stewards of the environment to take a global look at our farm's overall impact on the environment.
- The digesters have greatly reduced manure odor on our farm. This leads to consistently positive compliments.

Those of us who have key EMS roles on the farm can bring similar processes to the committees and organizations that we participate with that are external to our farm.

Replication and Education

The lessons learned through the journey of implementing a functional EMS have been vast. A widespread lesson of our EMS is that we should continue to look at all the interconnections of our farm on a broad scope. By seeing the interconnections, we are able to find additional value in a specific project or see an issue which we can prevent, not temporarily fix.

The EMS has allowed us to take a structured approach at communication so that our message has a strong foundation and is not misunderstood. This enhanced communication has allowed us to become better business leaders and managers in the area of sustainability. We are now able to comprehensively build upon what is common knowledge in the industry and leap-frog learning to make achievements above and beyond that base of knowledge. This continual building approach provides future generations further "value" to build upon without having to re-fix problems or retrace steps.

Replication

We feel that an organized environmental approach can be adaptable and beneficial for any farm or agricultural operation to improve its bottom line. Improvement of a bottom line aids in planning, budgeting, managing compliance, squeezing more benefit out of its dollars, improving community perceptions, and building mutual respect with employees. Traditional EMS's are geared toward manufacturing. The EMS needs to

be adaptable to farms because of the renewable resources we need to sustain our operation. We have created a replicable EMS that works with our daily business practices. We do this because we strive to be good stewards of the environment. We want to be transparent for the dairy industry. If others in the dairy industry are looking to develop and implement an EMS ours can serve as a foundation for initiation of their own EMS.

WDNR Relationship

Crave Brothers Farm has worked with several divisions and departments within WDNR over the past two years. We believe that some departments embrace the green Tier program while others do not. The departments that do not are generally slow or nonresponsive to those issues where we need to cooperate to achieve superior environmental performance. We hope this can be changed within the Department.

On the other hand the collaboration and cooperation with the single point of contact and the management they report to has been excellent. In November 2013 we were able to meet with Tom Nowakowski and Christine Lilek at the farm to show them the work and efforts we have done to make continual improvement at our farm. Those experiences form a solid two-way communication to the farm and the Department that has positive ripple effects with other regulators and the community.

EMS audit report: In late October 2013 an external EMS auditor was retained to perform the one-year “functional equivalency” audit. A Letter of Conformance from our external auditor is attached to this report. It documents the process used and our current EMS status.

Please refer to the EMS metrics document to see measured improvements.

**WISCONSIN DNR GREEN TIER
SUSTAINABILITY METRICS**

Period Covered: 2013

Company Name:	Crave Brothers Farm
Facility Name:	Crave Brothers Farm
Address:	W11550 Torpy Road
City, State, Zip:	Waterloo Wisconsin
Environmental Coordinator:	Charles Crave
Coordinator Phone:	920-285-3812
Coordinator E-Mail:	ccrave@cravecheese.com

Metric	Not Collected/ Not Available	Quantity	Units	Period - if not Calendar Year
ENERGY				
Electricity		36,000	kWh	
			% reduction	
Natural Gas		3200	therms	
Renewable Energy		100	%	
WATER				
Total Water Used			gallons/year	
			% reduction	
Water Recycled/Reused		25000000+	lb/yr	
			% reduction	
Regulated Pollutants Discharged			lbs/ year	
			% reduction	
ADDITIONAL METRICS				
Please list all other certifications (for example: LEED, Energy Star, ISO 14001):			0,000,000 lbs of milk not transport	
			produced enough for farm + 300	
			1000+ visitors per year	

Produce 90% of fertilizer w/o fossil fuel
odor control compliments from most visitors