

CASE STUDY — FOOD WASTE AND THIRD-PARTY PARTNERSHIP

Dairy Power™

Overview

- *Jordan Dairy Farms, located in Rutland, Mass., partnered with local food processing companies to build an anaerobic digester that combines farm manure and food waste to create power.*
- *The digester system has been in operation since 2011 and uses approximately 25 percent manure and 75 percent food waste — provided by HP Hood & Sons, Cabot Creamery Cooperative, Kayem Foods and Cains Foods.*
- *The pairing of Jordan Dairy Farms with local food processors provides enough waste to assure profitability of the digester, while also reducing landfill use, greenhouse gas emissions, odors and chemical fertilizer application.*

Massachusetts dairy aids in solving food waste issues for the state

Sustainable and environmentally friendly practices are at the forefront of discussions across the country and in all facets of business. As a result, many states are beginning to require companies to follow sustainable practices. Beginning in 2014, Massachusetts will become the first state to require organic food waste be handled via a method other than landfill deposition. Alternative disposal methods include the use of composting facilities and anaerobic digesters.

Jordan Dairy Farms, located in Rutland, Mass., is the first dairy in the state to use anaerobic digester technology to blend farm manure, food scraps and food processing by-products to produce biogas that can be converted into power. The digester system at Jordan Dairy Farms, which is owned and operated by AGreen Energy, has been in operation since 2011 and uses approximately 25 percent manure and 75 percent organic food waste — provided by HP Hood & Sons, Cabot Creamery Cooperative, Kayem Foods and Cains Foods.

Food waste is delivered to the farm on a daily basis at no cost to the dairyman. The digester generates approximately \$200 per cow per year in revenue and cost savings for Jordan Dairy Farms from power, heat, fertilizer and bedding.

Although some large dairy farms have been utilizing digesters for several years, the expertise, time and financial requirements of a digester project can be burdensome for smaller farms. That's why Jordan Dairy Farms collaborated with food processing companies and AGreen Energy, a partnership of dairy farms, quasar energy group and New England Organics, to build and operate the digester.

The pairing of Jordan Dairy Farms with the local food processors provided enough waste to assure profitability of the digester while also reducing landfill use, greenhouse gas (GHG) emissions, odors and chemical fertilizer application. With fewer than 350 milking cows, Jordan Dairy Farms could not produce sufficient manure on its own to finance a digester project.

Five key components of a successful food waste and third-party business model:

- A long-term agreement for adequate supply of organic food waste from food processors
- An attractive power purchase arrangement (>10 plus cents per kWh) from/through the electrical utility and ownership of the Renewable Energy Certificates (REC)*
- An attractive price for the fertilizer obtained from the effluent coming from the digester
- Performance guarantees from the technology provider to ensure producer doesn't have to shoulder the burden of digester malfunctions, should they occur
- Professional management so the dairy producers can farm and another entity can tend to food processing companies, sell renewable power and ensure continuous operational excellence

Key benefits:

Power savings/Production — AGreen Energy owns and operates the qualified third-party generator system located on the Jordan Dairy Farms. The AGreen digester system supplies the total electricity needs of the farm. Excess power not used by the farm is delivered to the electric grid and AGreen Energy receives a credit as measured by an approved revenue meter. The credit is equal to the total electricity generated by the digester system minus the electricity used on the site (power to run the digester system and the rest of the dairy) times the retail rate of electricity sales. Because the entire farm's power is supplied by the digester, the farm no longer pays the utility for electricity. Instead, Jordan Dairy Farms pays AGreen Energy for electricity at a 20 percent fixed discount.

Because the AGreen digester produces more credits than Jordan Dairy Farms can use each month, excess credits are transferred to other AGreen Energy clients; for example, a large processing plant. The electricity credits are subtracted off that customer's electricity bill; the customer then pays AGreen a discounted rate for the credits, below the kWh rate charged by the utility company.

Environmental benefits — Food companies can reduce their environmental impact by providing the food waste to the digester instead of a landfill, and through the purchase of renewable energy. These initiatives can be important when working with customers that offer incentives for sustainability practices, or in communicating about their sustainability to consumers.

Environmental benefits — The dairy reduces GHG emissions, farm odors and phosphorus and nitrogen loads.

Economic benefits — The added revenue and cost reductions from the digester operation provide income to help sustain the dairy:

- Adding the food waste to the farm manure enhances gas production by 300 percent.
- Manure management costs are significantly reduced.
- The dairy saves on fertilizer, as it's produced by the digestion process and does not need to be purchased. The fertilizer generated by the digester is higher quality than most chemical fertilizers and manure alone. Jordan Dairy Farms was able to eliminate one application of chemical fertilizer on its corn crop and completely eliminated chemical fertilizer by applying effluent on hay.
- Combining manure and food waste allows farmers to produce excess electricity and reach a scale that allows them to sell Net Metering Credits under long-term contracts to creditworthy buyers such as large food processors or municipalities. Net Metering Credits in Massachusetts are calculated based on the excess power produced and are valued slightly less at the end of a billing period than the utility's full retail rate.
- Individual smaller farms, using manure only, would not have the amount of organic material necessary to achieve the returns necessary to be a worthwhile investment or produce the quantities of electricity necessary to supply large companies/municipalities and take advantage of Net Metering Credits. The AGreen digester at Jordan Dairy Farms receives approximately \$500,000 per year through the net metering contract with the utility.
- Jordan Dairy Farms pays AGreen Energy for electricity used on the farm at a 20 percent discounted rate.

Collaboration and third-party investment can deliver results despite challenges

Challenge areas

Uncertainty in the financial market — Lenders are concerned with financial stability when discussing these types of projects, as:

- This mix of organics (in quantity) and manure is new.
- The power contracts for smaller originators are new.
- It is difficult to get food companies to enter into contracts for a length that will satisfy lenders.
- The economic viability of dairy farming can be uncertain.

Joining a group of small farms, of which Jordan is the first of the group, seeks to provide lenders with scale and risk management not available to one farm alone. This is especially true now that the 1603 investment grant program ended Dec. 31, 2011. This is compounded also by the lack of a federal government loan guarantee program for building digesters at dairies. The replication of the digester operation at Jordan Dairy Farms is made more difficult by the current financial environment without the addition of outside equity and state aid, along with USDA EQIP programs.

Power rates – Abundant quantities of low-cost natural gas in the U.S. may have an impact on power rates where avoided-cost rate structures will be lowered in conjunction with power purchase contracts. This varies by state depending on the state of the infrastructure to deliver the gas to power plants. In Massachusetts, there is no infrastructure to handle fracked natural gas from Pennsylvania, for example, so power rates have remained stable.

Jordan Dairy Farms and food waste business model by the numbers

Farm type	Dairy
Herd size	350 milking head
Type of digester system	Complete mix
Digester capacity	65,000 gal./day
Manure collection methods	Scraped from slat barn into pit and pumped to digester
Biogas production	200,000 standard cubic feet/day
Installed electrical generation	One 300 kW engine, soon to 500KW
Ownership	AGreen Energy LLC (Jordan Dairy Farms location)
Digester designer	quasar energy
Date operational	2011
Net metering utility contract (\$/kwh)	\$0.12
Engine brand	Guascor (Martin Machinery)
Feedstock	Organic food waste and manure
Products/by-products	Electricity/fertilizer/bedding/compost
Utility	National grid

Financial information

Investment	\$3.4 million, including equipment and installation costs (site work, electrical, etc.), engine, development/management, legal, accounting, administrative fees
Annual operating and maintenance cost	\$100,00 to \$200,000
Revenue	\$500,000 annually
Payback period	7 to 9 years (with Investment Tax Credits)

The Dairy Power™/Biogas Capture and Transport™ project is focused on realizing the significant potential of anaerobic digester systems for U.S. dairy producers by helping put 1,300 methane digesters on dairy farms by 2020. Working with regional and national programs, the project addresses existing barriers, such as technology and financing.

Dairy Power/Biogas Capture and Transport is one of eight projects endorsed by the Innovation Center for U.S. Dairy® to help reduce greenhouse gas emissions and increase business value across the dairy industry. For more information about Dairy Power/Biogas Capture and Transport or to join our mailing list, email innovationcenter@usdairy.com.

The Innovation Center aligns the collective resources of the dairy industry to offer consumers nutritious dairy products and ingredients, and promote the health of people, communities, the planet and the industry.

*Renewable Energy Certificates (RECs) are generated when electricity is the primary product produced using biogas from an AD. Utilities purchase RECs from the digester operation to meet renewable portfolio standards or other state standards for renewable energy production. An REC price of \$1 per MWh is assumed for all states except California, which assumes an REC value to be \$8.50 per MWh. The average cow could produce 9.3 to 9.7 million RECs per year.