

OVERVIEW

A Project Selected for Funding from the Low-Income and Energy Efficiency Fund
Michigan Public Service Commission
June 30, 2005

Title: Advancing Energy Production in Agriculture by Increasing Efficiency and Use of Anaerobic Digestion and Other Advanced Manure Treatment and Biomass Conversion Technologies

Personnel: William Bickert, Dana Kirk and James Wallace, Biosystems and Agricultural Engineering, Michigan State University, East Lansing, MI

Location: Green Meadow Farms, Inc., Elsie, MI

The overall objective of this project is to demonstrate profitable energy production on a dairy farm in Michigan with implications to environmental protection, carbon sequestration and sustainability of agriculture. Anaerobic digestion of manure is the key to harvesting energy from manure. Furthermore, digestion is the cornerstone to further treatment of manure and the development of an integrated manure management system that encompasses manure stabilization, energy recovery, nutrient management, and reduction of odor and pathogens. Other sources of biomass including crop residues, crops produced specifically for biomass, food waste and forest products will be included. Moreover, production of hydrogen from biomass and fuel cell technology can be explored. The goal is to be able to develop the manure management system and related innovative enterprises on a dairy farm along the lines of another profit center.

The anaerobic digester will be the first newly constructed digester on a Michigan farm in more than 20 years and it will be operating on a dairy farm using sand for freestall bedding. The facility will serve as a place to test and demonstrate the next generation of manure treatment technologies. Already, Green Meadow Farms has sand-manure separation systems, a phosphorous removal system and a composting operation that will become integral components of the proposed manure management system.

This facility will be the only one of its kind in North America, a place for farmers to study cutting-edge technology in a commercial setting and to obtain hands-on experience with actual systems, a place for personnel to be trained in the operation and maintenance of a digester and associated systems, and a place for consulting engineers already schooled in the design, construction and operation of municipal and industrial wastewater treatment systems to extend their knowledge base to agriculture. Michigan dairy farmers will be the immediate beneficiaries through decreased costs of manure management on their own farms and realization of profits from integrated systems due to increased efficiency in energy production and sale of value-added products. Eventually, other technologies for converting biomass to energy, including hydrogen, will be available. Because the tenets of sustainability—social, environmental and economic—will guide the project, society will be the ultimate beneficiary. An integrated system has the potential to stabilize manure, capture energy from the manure stream, effectively manage nutrients, capture greenhouse gasses and reduce odors and pathogens. More effective and convenient use of manure nutrients will reduce use of fertilizers manufactured from fossil fuel energy. Furthermore, as other industries are encompassed, impacts on energy efficiency and the environment will go well beyond the farm.