

Report Overview: National Market Value of Anaerobic Digester Products

A new business opportunity outlined in the *National Market Value of Anaerobic Digester Products* report shows that partnerships between dairy farms, food processors and retailers have the potential to solve current environmental concerns while creating a nearly \$3 billion bioeconomy for food and agriculture.

The report was commissioned by the Innovation Center for U.S. Dairy[®], which was established under the leadership of dairy farmers. It found that dairy farms with enhanced technology can combine farm and food waste to maximize renewable energy production and nutrient recovery, resulting in the ability to grow more food for human consumption.

Maximizing nutrient recovery

Cow manure contains high levels of nitrogen, phosphorous and potassium, which can be used as a natural crop fertilizer. But if it is not sufficiently disbursed over enough land to filter the contaminants, cow manure can have a negative impact on water resources.

Non-farm organic substrates such as food waste are typically disposed of in landfills, which causes greenhouse gas (GHG) emissions and also carries the disadvantage of permanently removing valuable nutrients from the ecosystem that could be used to grow more food.

In the anaerobic digestion process, methane gas contained in the manure and food waste is separated and used to generate electricity, heat or fuel. What is left is a mix of nutrient-rich liquid, which can be used to fertilize crops, and nutrient-rich fiber that can be used for bedding on the farm or as a substitute for peat moss.

Utilizing the anaerobic digestion process as an alternative to traditional disposal methods of cow manure and food waste can:

- Sequester GHG emissions
- Avoid the potential of contamination to water resources
- Save money on tipping fees
- Create renewable energy for homes and businesses
- Harvest otherwise wasted nutrients for the soil
- Repurpose waste to its highest value

An opportunity worth nearly \$3 billion

The AgSTAR project of the U.S. Environmental Protection Agency analyzed the possibility of installing anaerobic digesters in dairy operations of 500 cows or larger, which amounted to the potential for 2,647 dairy operations nationwide.

The Food and Agriculture Organization of the United Nations estimates that roughly one-third of all edible food produced for human consumption is wasted or otherwise lost from the food supply per year, or about 1.3 billion metric tonnes.

Input potential

- If 2,647 dairy digesters were operating on large dairy operations, they would have the combined capacity to dispose of more than 108 million tons of cow manure annually *plus* an estimated 19.8 million tons of food waste.
- Of the 19.8 million tons of food waste:
 - 15 million tons is commercial food waste that is diverted from landfills, which accounts for 70 percent of all commercial food waste that goes to landfills.
 - 4.8 million tons is food waste from food processors, which is not likely diverted from landfills.
- 19.8 million tons of food waste is comparable to 8 percent of annual U.S. landfill dumping.
- The diversion of food waste from landfills plus the addition of cow manure is estimated to avoid 13 million metric tons CO₂-equivalent from being emitted into the air.
- This is comparable to the annual carbon emissions of more than 3.2 million U.S. passenger cars.

Output and co-product potential

Products that can be produced from the anaerobic digestion of 108 million tons of dairy cow manure and 19.8 million tons of food waste annually include:

- Electricity — 11.7 million megawatt hours per year at an estimated current market value of \$894 million.
- Nitrogen — 331,163 tons per year at a current market value of \$467 million.
- Phosphorous — 108,782 tons per year at a current market value of \$324.6 million.
- Fiber — 30 million cubic yards per year at a likely market value of \$217 million if sold as a peat moss replacement and on-farm bedding material.
- Renewable Energy Credits (RECs) — 11.7 million RECs valued at \$34.4 million. RECs are only available for electricity, which could increase the value of electrical production produced by anaerobic digesters.

Sustaining the future

To feed the estimated 2 billion more people who will be on Earth in 2050, the food and agriculture industry needs to work now to create a more sustainable food system.

A sustainable food system is one that can:

- Satisfy human food, feed and fiber needs, and contribute to biofuel needs
- Enhance quality of life for farmers, farm workers and society as a whole
- Sustain economic viability of agriculture
- Enhance environmental quality and the resource base (nutrients such as nitrogen and phosphorus)

The ability to dispose of food waste in addition to cow manure is critical to the economic stability of digester operations. This business opportunity, identified by the report, outlines the potential to reduce current waste and ineffectiveness issues, manage for and adapt to natural resource constraints and advance farm technologies for optimized yields — all contributing to the development of a sustainable food system for the 21st century.

Visit USDairy.com/DairyPower to download the full report.