

Innovative Business Models for On-farm Anaerobic Digestion

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WASTE TO WORTH 2017



Overview

Introduction to AgSTAR

Overview of U.S. Biogas Industry

Innovative Business Models

- Third-Party Owned and Operated Systems
- Eco-Markets for Coproducts
- Renewable Natural Gas to Vehicle Fuel



About Me - Nick Elger

Manage the AgSTAR Program and coordinate agricultural AD projects with the Global Methane Initiative

Grew up in southeastern Wisconsin

Got started in AD world studying small scale biogas systems in Nepal

Graduated from University of Minnesota – BS Environmental Sciences, Policy and Management

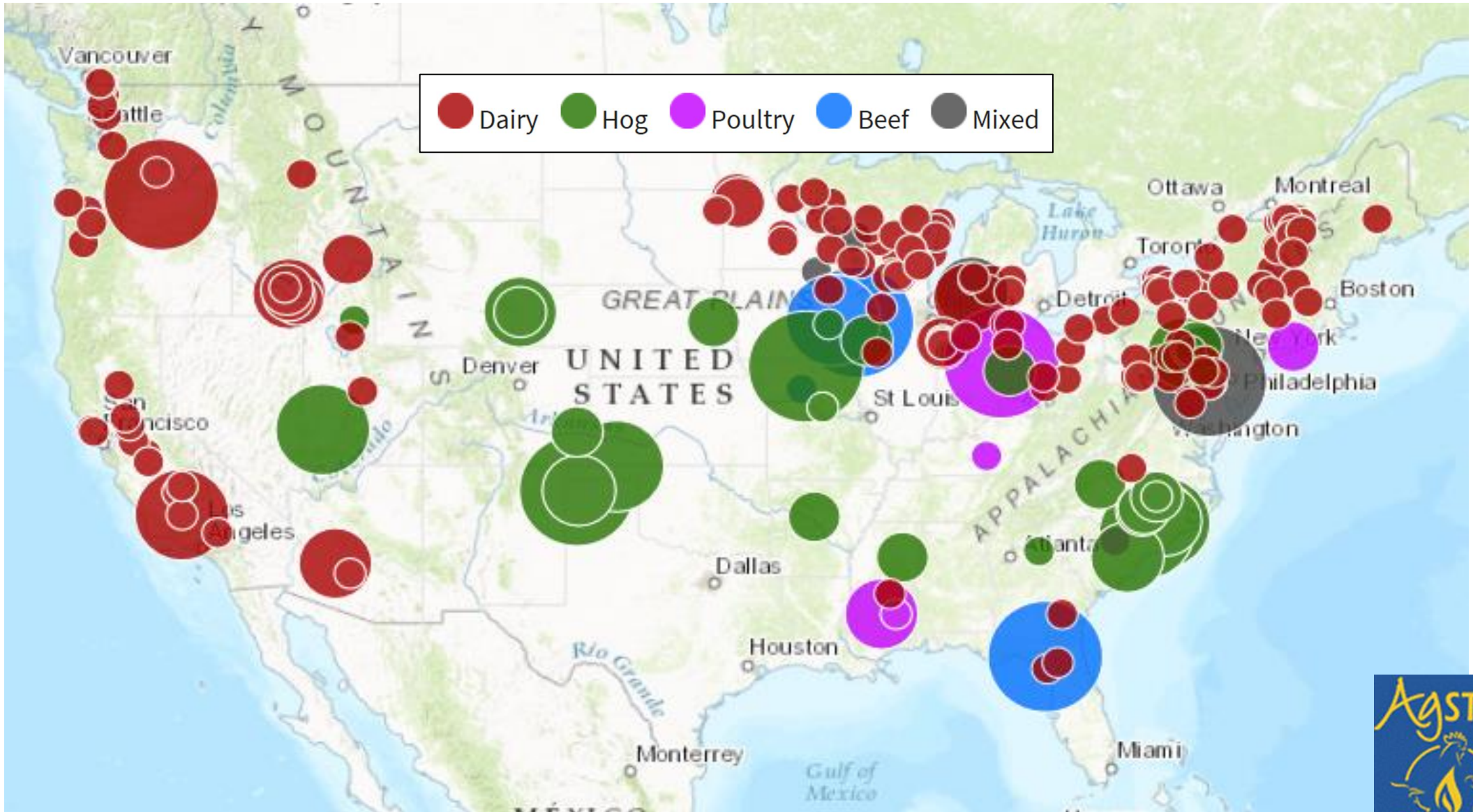


AgSTAR Program



- 20+ year collaborative voluntary program of USDA and EPA.
- Promotes the use of anaerobic digestion systems to advance economically and environmentally sound livestock manure management.
- Strong ties to industry, government, NGO and university stakeholders.
- Assist those who enable, purchase or implement anaerobic digesters by identifying project benefits, risks, options and opportunities.

Anaerobic Digester Projects in the U.S.



Livestock Anaerobic Digester Systems in the United States

There is potential for about

8,000

additional livestock anaerobic digester systems in the U.S.



If fully realized, these digesters could produce

257 billion

cubic feet per year of biogas

That's enough energy to power



1 million American homes

for one year, or provide natural gas to fuel

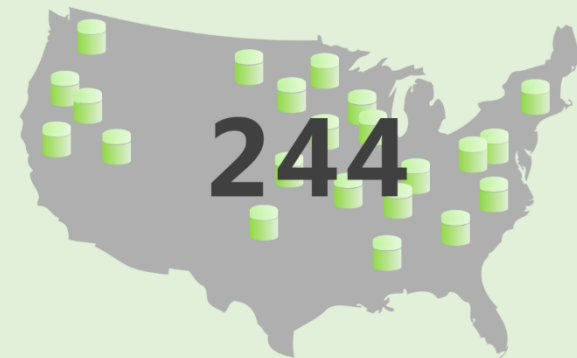


2 million passenger cars

for one year



There are currently



livestock anaerobic digester systems across the U.S.

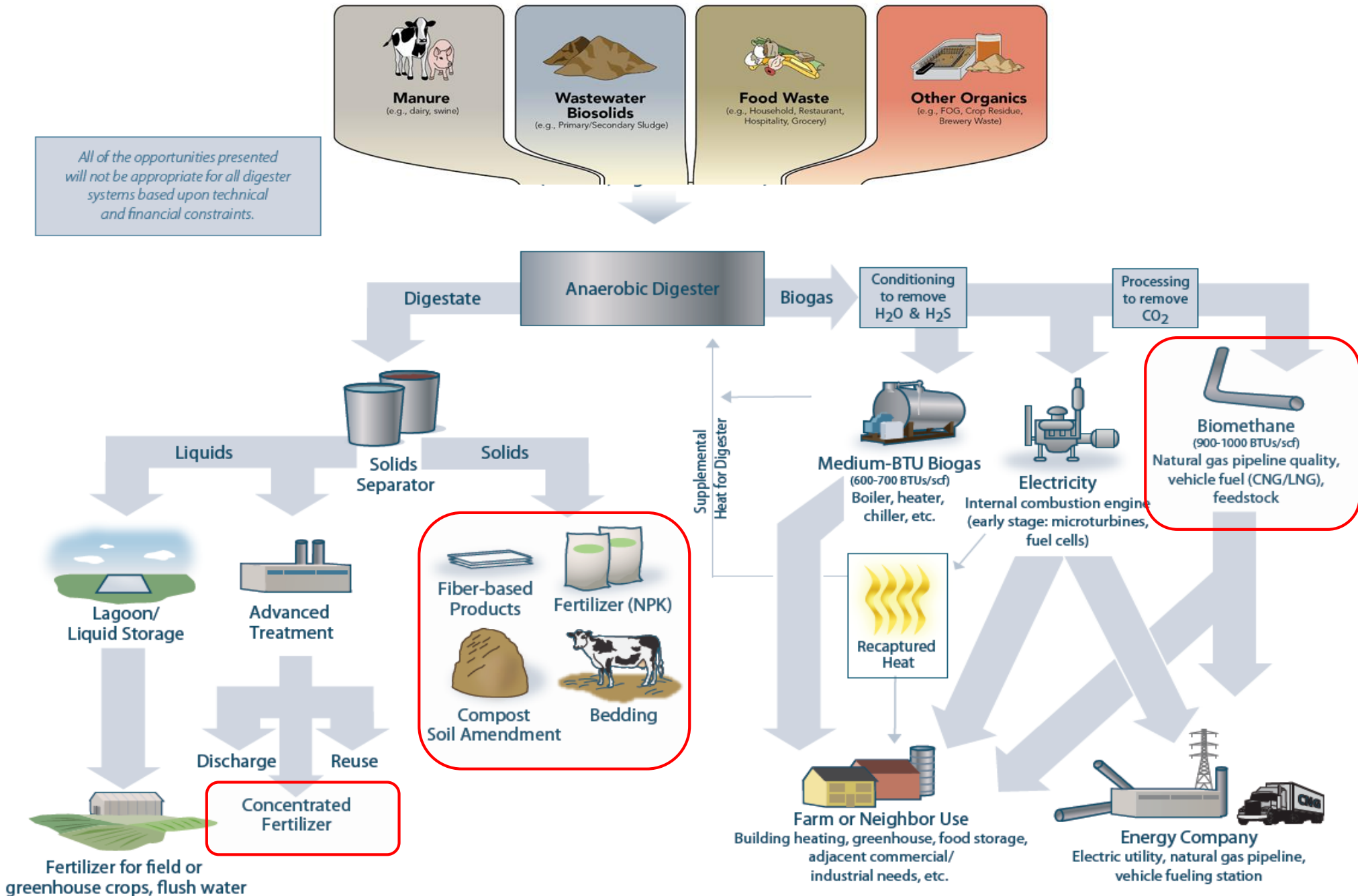
195 
on dairy farms

17 
on farms with poultry, beef, or a combination of animal types

32 
on swine farms



All of the opportunities presented will not be appropriate for all digester systems based upon technical and financial constraints.

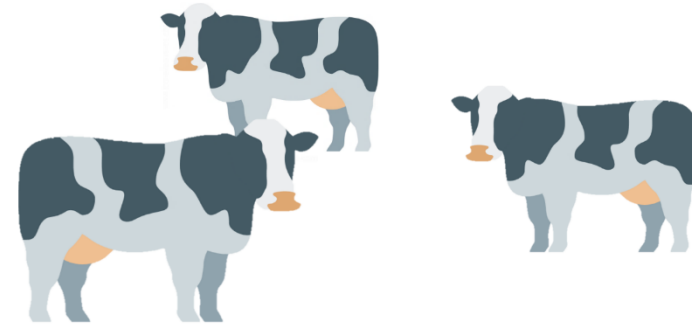


Nutrient Recovery Potential for U.S. Dairies

There is potential for about

2,450

additional dairy anaerobic digester systems in the U.S.



These systems could recover

330,000 tons of Nitrogen

and

110,000 tons of Phosphorus

over the course of one year

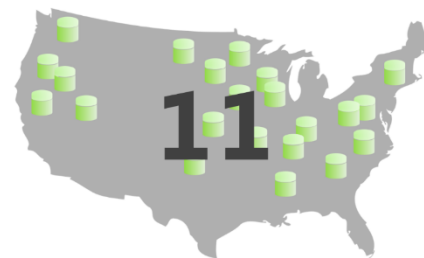
Valued at

\$467 Million

\$325 Million



Currently, only



nutrient recovery systems are used on U.S. dairy farms with digesters

From Informa Economics report on National Market Value of Anaerobic Digester Products



EPA Nutrient Recycling Challenge – Phase II



The Nutrient Recycling Challenge



U.S. Environmental Protection Agency



American Biogas Council



NMPF National Milk Producers Federation



Cooper Farms



Marquette University



Tyson Foods, Inc.



World Wildlife Fund



Dairy Farmers of America



Smithfield



U.S. Department of Agriculture



Innovation Center for U.S. Dairy



Water Environment & Reuse Foundation



Washington State University



Smithfield Foods



CowPots



Ben & Jerry's



National Pork Producers Council



Newtrient, LLC



Cabot Creamery Cooperative



American Society of Agricultural and Biological Engineers

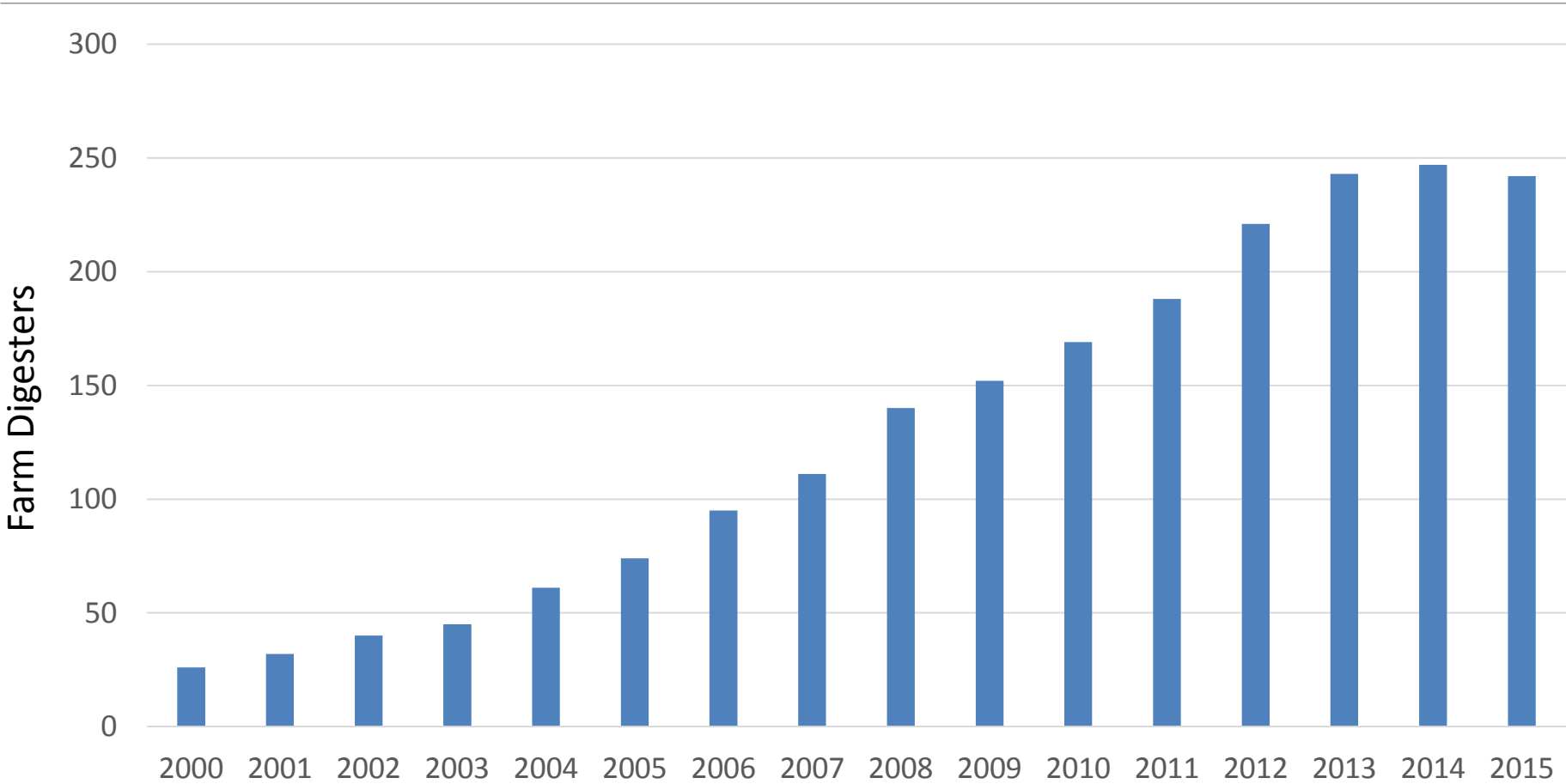


Iowa State University



What's Happening in the U.S. Market?

Growth in Farm Digester Market is Slowing



Why

Challenges Facing Digester Development

- Low energy prices
- Low milk prices
- Interconnection hurdles
- RFS Uncertainty



What can be done?





Innovative Business Models

New opportunities to diversify revenue and share risks and rewards

- Third-Party Owned and Operated Systems
- Eco-Markets for Coproducts
- Renewable Natural Gas to Vehicle Fuel

Third-Party Owned and Operated Models



Bar-way Farm - Deerfield, MA

- 600-acre dairy farm
- 250 cows milked daily

Digester Facts

- Construction 2016
- 660,000-gallon capacity

Future Annual Digester Input:

- 9,200 tons of manure
- 30,000 tons of food waste

Future Annual Digester Output:

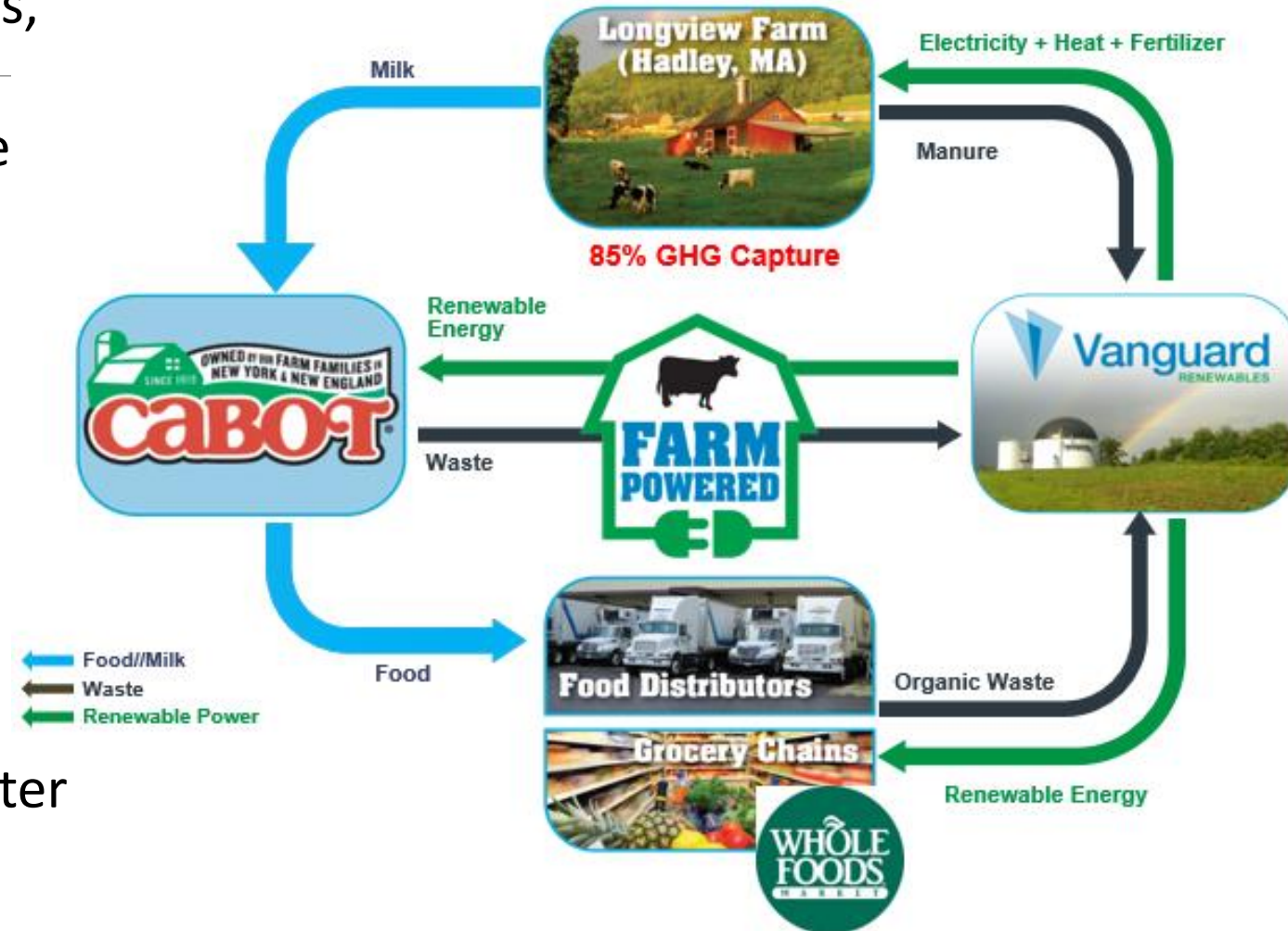
- Produces 7,700 MWh energy/year
- Offsets 5,500 lbs of CO₂ emissions daily



Shared Risks and Rewards



- **Vanguard Renewables** – develops, owns, operates and invests in digester. Coordinates with food producers, waste haulers, utilities, government, supermarkets and farmers to achieve common goals with universal benefits.
- **CH Four Biogas** – designs and installs digester
- **Farmer** - invests in project, provides manure feedstock, leases land for digester





Eco-Markets for Coproducts

Magic Dirt

- Potting soil produced from digested dairy manure fibers.
- Magic Dirt partners with 19 dairy farms across the country, utilizing separated manure fibers.
- Magic Dirt plans to be on the shelves at ½ of the Walmart stores in the U.S. in 2017.
- Manure soil product has more nutrients than competitors
- Each cubic yard of Magic Dirt used avoids about one ton CO₂e.



— Award Winning Packaging —

Eco-Markets for Coproducts

Freund Farm – East Canaan, CT

- Small family-owned farm
- Horizontal plug flow digester
- 300 dairy cows feeding digester

Cow Pots

- Biodegradable planter pots made from digested manure solids
- Displaces unsustainable peat moss and plastic planters



Renewable Natural Gas to Vehicle Fuel



Fair Oaks Dairy – Fair Oaks, IN

- 12 family-run dairies
- Attracts more than 500,000 visitors yearly to its agricultural science center

Digester Facts

- Operational since 2008
- 12,000 cows plus swine manure feeding digester

Energy Production

- Produces compressed natural gas (CNG) to fuel 42 tractor trailers that deliver milk daily to processing plants in 3 states
- Displaces about 2 million gallons of diesel fuel annually



Renewable Natural Gas to Vehicle Fuel



Hilarides Dairy – Lindsay, CA

- Family-run dairy
- 10,000 cows feeding digester

Digester Facts

- Operational since 2004
- Covered lagoon digester
- Produces 226,000 cubic feet of biogas per day

Energy Production

- Produces compressed natural gas (CNG) to fuel 2 milk trucks and 6 on-farm pickups.
- Displaces 230,000 gallons of diesel annually





Why is RNG such a big opportunity?

- RNG is carbon neutral and in some instances carbon *negative*
- RINs and Low Carbon Fuel Standard (LCFS) credits from California exist to help fund projects
- Producers can lock in long term fuel prices
- Natural gas burns much cleaner and quieter than diesel, making it more desirable for vehicle operators



Think Big

(aspirational examples – don't quote me 😊)



- All dairy and meat product hauling in the US will be done using bio-methane fueled trucks.
- 50% of fertilizer market will be manure-based organic products.
- Dairy fiber products will surpass peat moss use in the horticulture sector.
- 1,000 livestock farms will be energy independent based on AD-biogas based energy streams.
- 20M tons of wasted food will be managed in on-farm AD systems by 2030.



Take-Aways

Technology choices are important, but viable business model is critical

With low energy prices in most areas, must have a diversified revenue portfolio to drive project

Growing interest in broader eco-markets aspects of AD systems gaining traction

Learn More, Get Involved!



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Visit AgSTAR online www.epa.gov/agstar

✓ AD 101

✓ Fact sheets

✓ Tools

✓ Projects ... *and a lot more*

AgSTAR: Biogas Recovery in the Agriculture Sector

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Anaerobic Digestion at Work on Livestock Farms

Check out our [Stories from the Farm](#) for a first-hand account of project operations, lessons learned, benefits and challenges.



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- [Project Database](#)
- [How AgSTAR Works](#)
- [Market Data and Trends](#)
- [Codigestion Guidelines](#)
- [Frequent Questions](#)
- [Events](#)

AgSTAR promotes the use of biogas recovery systems to reduce methane emissions from livestock waste. In addition to producing biogas, anaerobic digestion systems can also help achieve other social, environmental, agricultural and economic benefits.



Learn about Biogas Recovery



Implement AD Projects



Connect through AgSTAR



For more information:

www.epa.gov/agstar

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Photo courtesy of Michigan State University