

Great Lakes Regional Biomass Energy Program Agricultural Biogas Casebook

Summary of Findings

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Presented to the Wisconsin Biogas Development
Group

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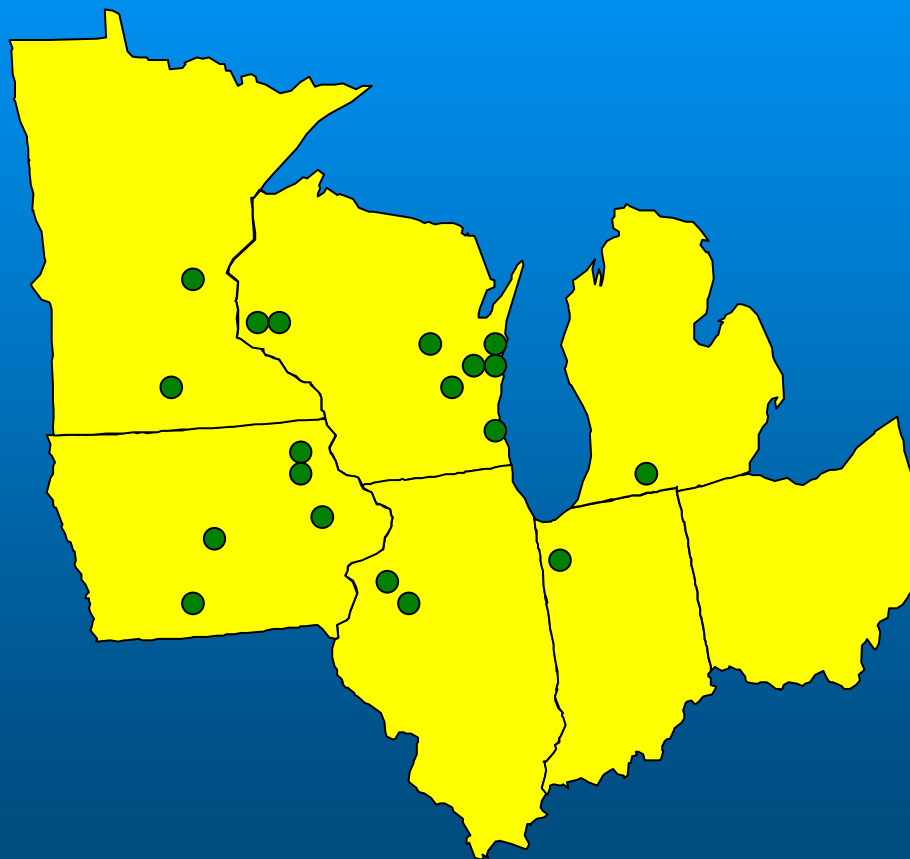
Funders

- Council of Great Lakes Governors,
Great Lakes Regional Biomass
Energy Program
- Alliant Energy, Inc.

Project Objectives

- **Picture of current applications**
- **Gather available performance data**
- **Highlight experiences**
- **Funding sources**
- **Service providers**

Farms by State



Farms w/ Digesters

IA	5
IL	2
IN	1
MI	1
MN	2
OH	0
WI	8

Digester Development Status

Status	Farms	Definition
construction	3	not yet complete
startup	8	biogas production not yet stabilized
operational	8	stabilized biogas production

Farm and Digester Types

Farm Type

Digesters

- 15 dairy

15 plug flow

2 covered lagoons

1 TPAD

- 3 swine

2 complete mix

1 ASBR

- 1 duck

1 complete mix

Digester Subtypes - Mesophilic Combined Phase

- **plug-flow (15 on 12 farms)**
 - straight, flexible cover (5)**
 - straight, fixed cover (3)**
 - straight, fixed cover, gas mixing (2)**
 - loop, fixed cover, gas mixing (5)**
- **complete mix**
 - mixed, covered lagoon (1)**
 - mixed tank (2)**

Bedding Types

Operational Dairies

plug-flow (2)

plug-flow (1)

covered lagoon

covered lagoon

Duck Farm

complete mix

Bedding

digested solids

newspapers

sand

wood shavings

pine shavings

Biogas Production

<u>Type</u>	<u>Ft³/Head/Day</u>
dairy plug-flow	86/cow
dairy plug-flow	90/cow
swine, complete mix	8/hog
duck, complete mix	0.13/duck

Note: Production numbers are from stabilized systems only, as of the survey date. Periods of demonstrated performances vary. See casebook for relevant operation details.

Energy Generation

Technology	Farms
engine/generator	14
boiler	3
microturbine	1
flare	2

Electricity Production

Installed Capacity

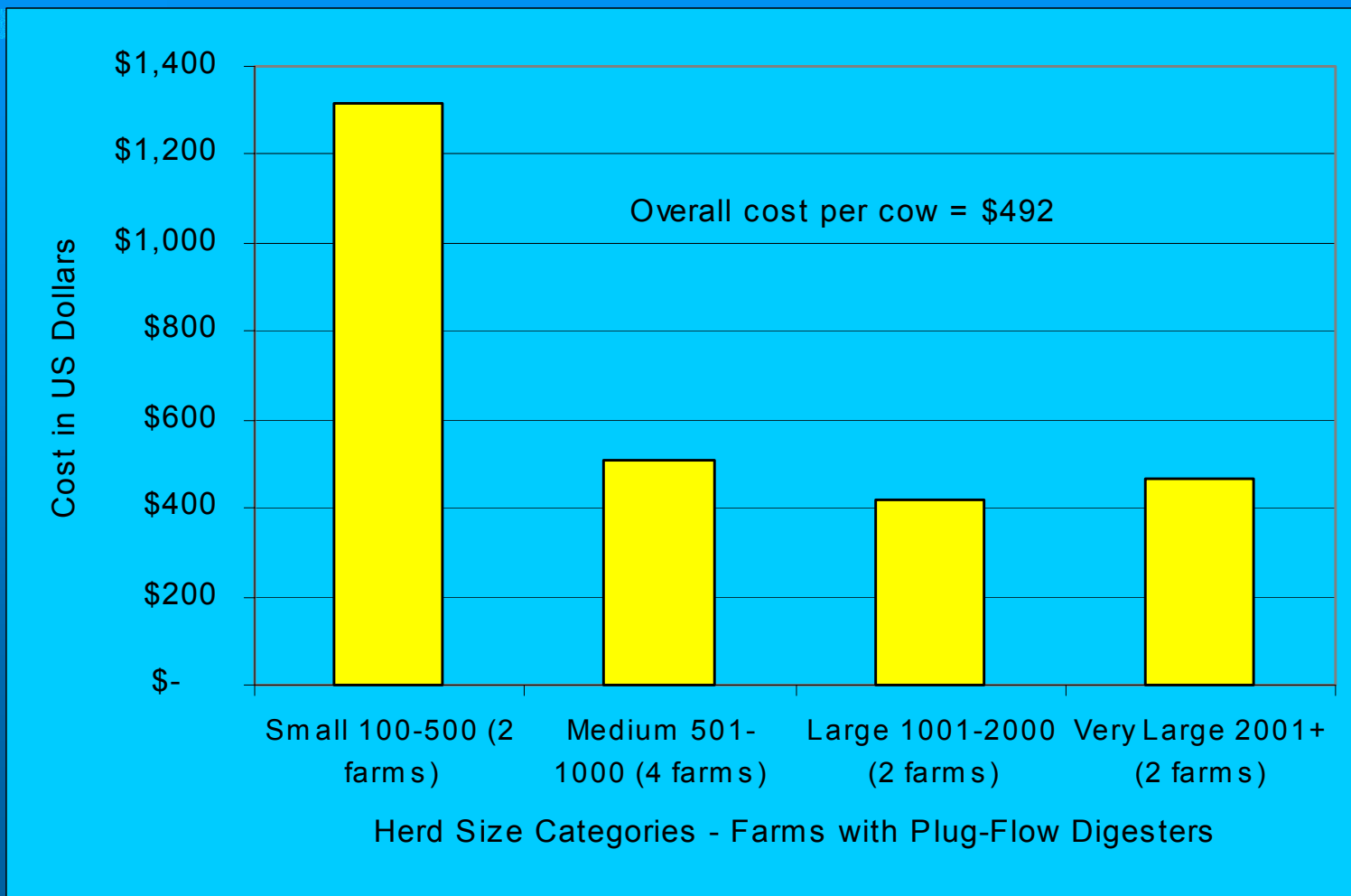
operational (5 farms)	0.6 MW
startup (7 farms)	1.9 MW
construction (3 farms)	1.2 MW
total (15 farms)	3.7 MW

Heat Applications

15 farms with electricity generation - all used heat

Application	Farms
heat digester	15
heat facilities	9
heat water	7
assist solids drying	2
absorption refrigeration (planned)	2

System Costs - Plug Flow



Owner Comments

Negatives

- requires operational adjustments
- longer startup & higher costs
- solids separation / treatment
- equipment malfunctions

Owner Comments

Positives

- odor reduction / neighbor relations
- adds value to agricultural byproduct
- steady income / cost offsets
- fly reduction

Closing Comments

- **Negatives mostly from startups**
- **Positives mostly from operational systems**
- **Outputs and performance defy summarization and generalization**
- **Keep in mind primary purpose - manure treatment system**