Waxwing Consulting LLC

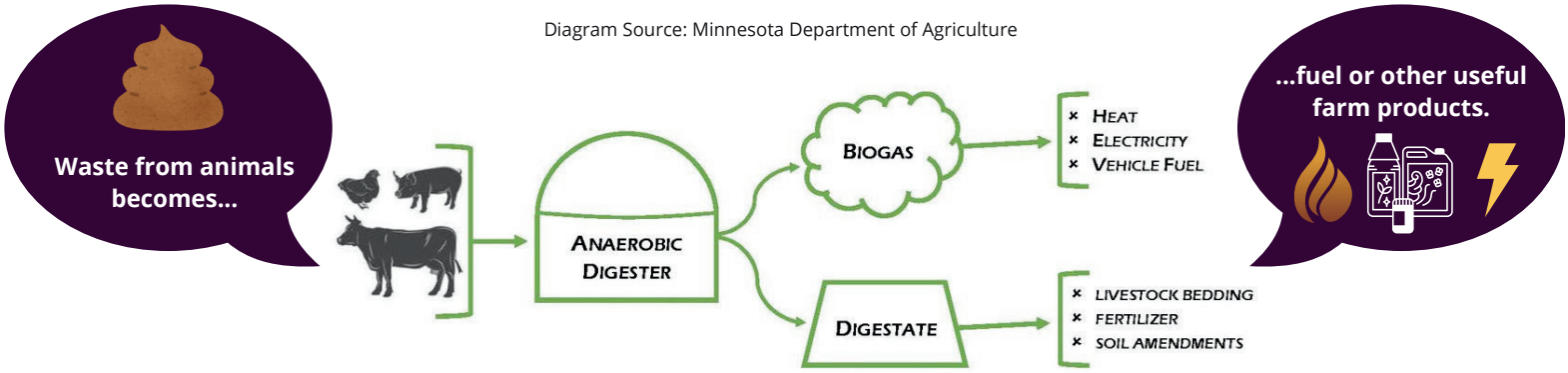
Anaerobic Digestion
What Communities Need to Know

Anaerobic Digestion (AD) attempts to reuse waste manure to produce a useful source of energy. If implemented, it should be done in tandem with other on-farm sustainability strategies. AD shouldn't be seen as the preferable energy source option. But, it can have net positive impacts **if** it is accessible to rural communities, and **if** it does two important things - 1) reduces methane emissions compared to more detrimental ways of dealing with manure, and 2) distributes the energy generated locally, reducing electricity costs.

What is Anaerobic Digestion?

Anaerobic digestion is the process of turning waste (usually cattle manure, though food waste is a growing part of the sector) into biogas (composed of methane and CO_2) that can be used for electricity, heating, vehicle fuel, or upgraded into renewable natural gas (RNG). This fact sheet mainly focuses on AD produced from animal waste.

Diagram Source: Minnesota Department of Agriculture



How we use the energy (aka biogas) produced by AD is important.

Biogas can be used several different ways...

- **Electricity Generation**: Biogas can be burned in local generators to make electricity. This option is community-focused and reduces transmission losses. It also boosts energy self-sufficiency. **However, it's not as clean as solar or wind energy. If not managed properly, it may pose health or environmental risks.**
- **Co-generation (CHP – Combined Heat and Power)**: A Combined Heat and Power system uses biogas to generate both electricity and heat simultaneously. It is more efficient than electricity by capturing heat that would normally be wasted for heating. **However, it still involves methane combustion and creates local air pollution.**
- **Compressed Natural Gas (CNG)**: Biogas can be cleaned and compressed for use as a transportation fuel, typically for fleets or farm equipment. **This reduces diesel reliance, but still emits methane when burned.**
- **Renewable Natural Gas (RNG):** Biogas can be purified and upgraded to pipeline-quality methane. While it is seen as a clean alternative to fossil gas, RNG is mainly methane, which is still a greenhouse gas. **This option comes with risks like leakage, combustion emissions, and high production costs. Also, RNG often travels through existing gas infrastructure, which can reduce its local origins and benefits.**

CAUTION

All of the options above still produce emissions and come with pollution risks...

...let's look deeper at some of the potential benefits and risks on the next page.

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Potential Benefits?

Income Source and Energy Generation

- AD is a way to generate electricity and could become a source of farm revenue.

Reduced Emissions?

- Though using biogas from AD produces emissions, in theory AD can still reduce emissions (compared to emissions from use of other fuels) by preventing harmful methods of managing liquid manure. **However, the reduction in emissions from using AD appears significant only when compared to the high emissions from manure management at Concentrated Animal Feeding Operation (CAFOs).**

A CAFO is a large-scale livestock operation where animals are kept in huge numbers in close proximity to one another. They are sometimes called factory farms and create concerns for pollution and animal well-being.

Many alternative manure management practices used by smaller, non-CAFO farms are already cleaner and less polluting than AD is.
(Yay, small scale farming!)

Should I run an Anaerobic Digestor at my farm?

A typical on-farm digester can cost close to **$1.2 million to build**. Farmers can apply for a Methane Digester Loan from the Minnesota Department of Agriculture to help finance the purchase of necessary equipment and the construction of a system that will use manure to produce electricity.

However, **AD is only viable for non-pastured based animal systems where cattle are concentrated in centralized barns** and manure is collected into a pit. When manure is handled as solid, it decomposes aerobically, producing no methane – meaning it can't generate biogas but it is environmental friendly.

Environmental Justice Considerations

AD might incentivize the overproduction of its sources (liquid manure, food waste, etc), making pollution and treatment of animals worse

Profit from digesters incentivizes farms to become CAFOs (concentrated animal feeding operations) and produce more liquid manure. This increases the potential for leaks and air pollution.

The goal should not be to create more liquid manure, but rather find a sustainable set of solutions for what to do with manure already being produced. We want to avoid a dystopian future where animals are further confined and turned into gas stations/power plants.

AD might take attention and funding away from alternative methods to manage manure that are both soil-healthy and more accessible

Every taxpayer dollar spent subsidizing digesters is a dollar that is not being spent on regenerative agriculture practices such as cover cropping, no-till, and managed rotational grazing. These methods need investment.

Scalability is attached to existing rural power hierarchies

Keeping small digesters operating smoothly requires maintenance and a steady stream of manure, which can be a lot of extra work for already-busy farmers.

Because of economies of scale, larger producers benefit more from the construction of digesters. If more of our public resources go to larger corporate digester companies and the largest CAFOs, then less will be available to small and medium-sized farmers.

Possible spills and explosions

Leaks and spills from AD, particularly when loading and unloading a digester, can cause pollution and/or explosions.

Explosions can also occur if air gets into the digester and mixes with the methane being produced, putting people at risk.

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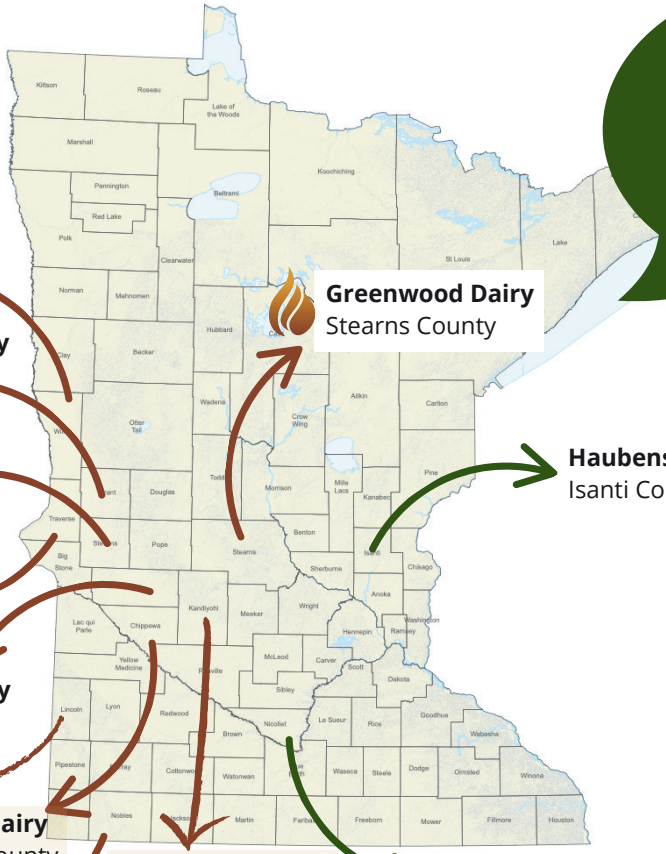
Minnesota has 17 manure digesters permitted across the state in various stages of development.

Most of them (14) produce renewable natural gas. Of these 14, 11 are operated by Riverview Dairy, a dairy farm conglomerate.

3 manure digesters in Minnesota generate electricity.



Campbell Dairy
Wilkin County

North Ottawa Dairy
Grant County

District 45 Dairy
West River Dairy
Riverview Dairy
Stevens County

Dollymount Dairy
Traverse County

Ash Grove Dairy
Lincoln County

Dublin Dairy
East Dublin Dairy
Swenoda Dairy
Swift County

Louriston Dairy
Chippewa County

Ached Dairy
Nobles County

Greenwood Dairy
Stearns County

Haubenschild Dairy Farm
Isanti County

Meadow Star Dairy
Kandiyohi County

Northern Plains Dairy Farm
High Island Dairy Farm
Nicollet County

Dairy farms in a yellow box are operated by Riverview Dairy.

"Renewable" Natural Gas (RNG) still produces emissions

Clean Energy Organizations say that **RNG pretends to be sustainable, but it will actually increase emissions and increase gas fuel costs if added to the energy mix**. Plus, its production boosts large liquid manure operations, and may slow our move to safer, healthier electrification. We're already seeing this play out in Minnesota – in practice, most of the energy from anaerobic digesters has been directed toward non-electrification uses such as RNG — rather than toward local clean electricity or community-centered energy solutions.

Influential Legislation

Big corporations like Nature Energy (a subsidiary of British oil giant Shell) and Xcel Energy, are pushing the scaling of AD in Minnesota. They try to benefit from the Natural Gas Innovation Act (NGIA), which facilitates AD implementation. The NGIA is a Minnesota law passed in 2021 that establishes a framework for natural gas companies to meet MN's greenhouse gas reduction goals. However, corporations' actions related to this law face criticism for falling short of needed greenhouse gas reductions.

This fact sheet was developed as part of the Emerging Climate Technologies in Greater Minnesota Pilot Project.
For more information, visit **waxwingllc.com/ruralejproject**

For a list of resources that contributed to this brief, scan this QR code: