

The background of the slide is a nighttime photograph of a city skyline, likely Chicago, with the Willis Tower prominently visible. In the foreground, a modern building facade is shown, featuring a large, illuminated red oval sign with the white letters 'UIC'. The overall scene is lit with city lights and a deep blue twilight sky.

# US EPA Technical Education and Analysis for Community Hauling and Anaerobic Digesters (TEACH AD)

TEACH AD Webinar Series

June 16, 2021 - Diverting Food Waste from Landfills through  
US EPA's TEACH AD Program

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**I am the  
Moderator**



**Jane Epperson**

Associate Director

UIC Energy Resources Center



NEW WEBINAR - STAY IN THE KNOW



06.16.2021 | 10:30 am CST

## Diverting Food Waste from Landfills

US EPA's New Technical Education  
& Analysis for Community Hauling  
and Anaerobic Digesters

[erc.uic.edu](http://erc.uic.edu)



FEATURING:  
MARCELLO PIBIRI  
ENERGY RESOURCES CENTER (UIC)



JOE KRAMER  
ILLUME  
ADVISING



NICK  
MENNINGA



ENERGY RESOURCES  
CENTER

## Q&A



Submit your questions to the host using the Q&A box in the upper right-hand corner

## Survey



After the presentation you will receive a brief survey. We appreciate your feedback

## Presentations



A recording of today's webinar will be posted on the TEACH AD website and you will be emailed a link by early next week

## Technical Issues



Contact Sam Rinaldi at: [samr@uic.edu](mailto:samr@uic.edu) or 312-996-2554 for assistance

# Agenda



- Importance of diverting food from landfills
- Overview of anaerobic digesters
  - Use of Anaerobic Digestion at Livestock Operations
  - Anaerobic Digestion at Water Resource Recovery Facilities
- How to work with the University of Illinois Chicago on the newly awarded US EPA Grant: Technical Education and Analysis for Community Hauling and Anaerobic Digesters (TEACH AD)



# Diverting Food Waste from Landfills through US EPA's New Technical Education and Analysis for Community Hauling and Anaerobic Digesters (TEACH AD) Program

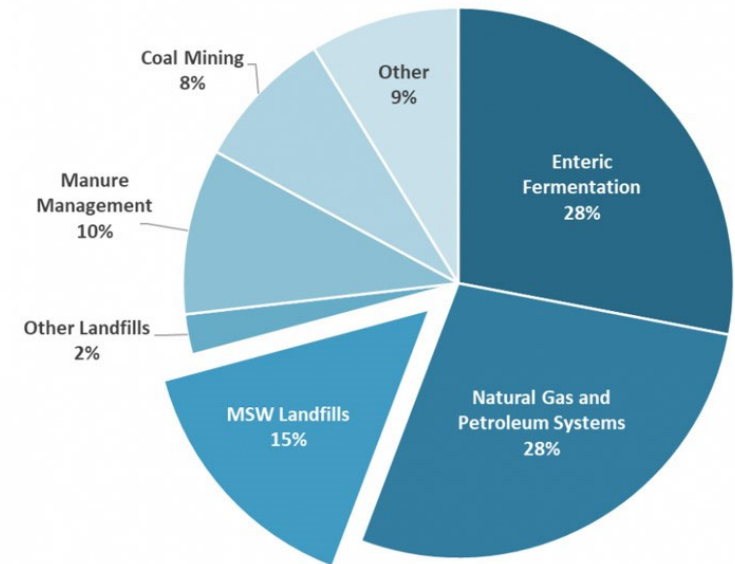
**Marcello Pibiri**

TEACH AD Webinar Series  
June 16, 2021

# Importance of diverting food waste from landfills

- Municipal solid waste (MSW) landfills are the third-largest source of human-related methane emissions in the United States
- By reducing the amount of food waste landfilled, we reduce methane emissions

2018 U.S. Methane Emissions, By Source

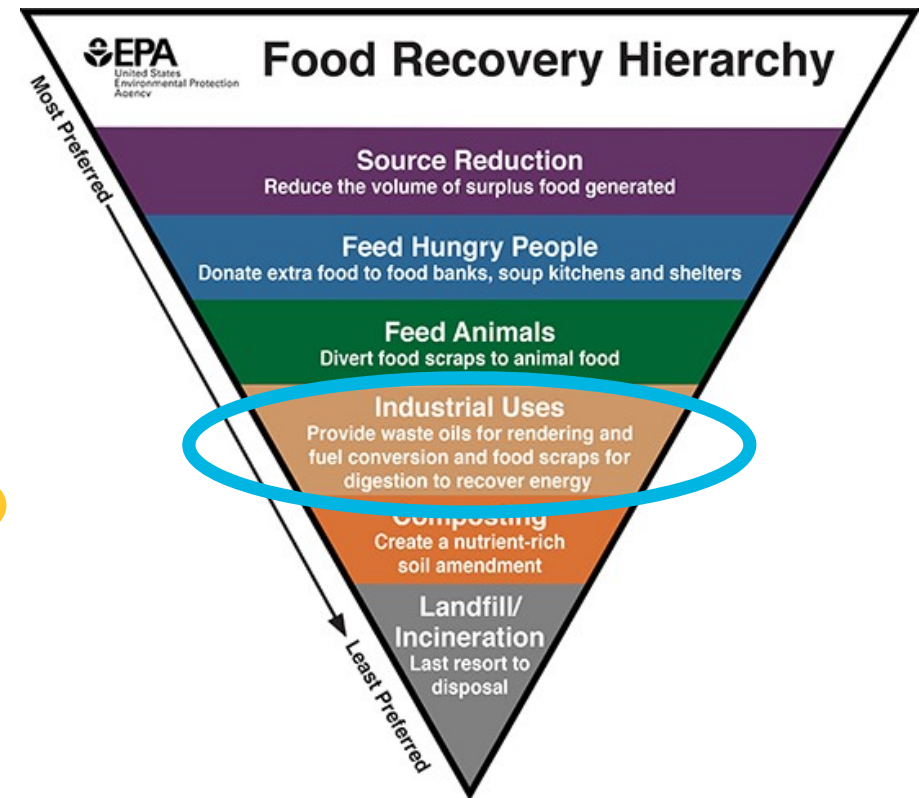


Note: All emission estimates from the *Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2018*. U.S. EPA. 2020.



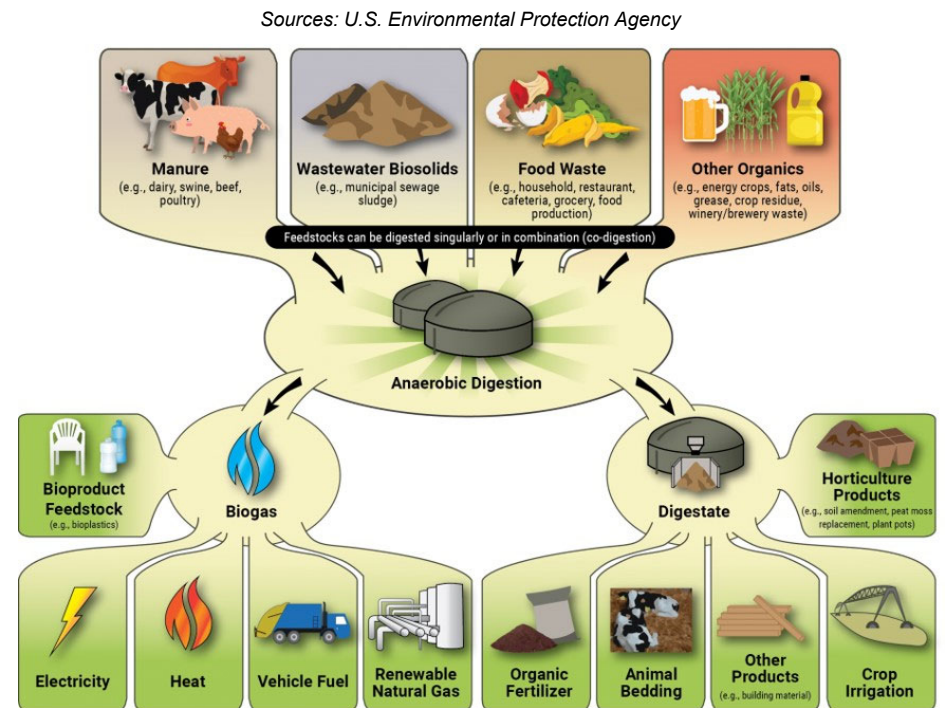
# Importance of diverting food waste from landfills

- One-third of all food produced for human consumption worldwide is lost or wasted
- Source Reduction
- Feed People, Not Landfills
- Industrial Uses
  - **Anaerobic digestion**



# Overview of anaerobic digesters

- Anaerobic digestion is the natural process in which microorganisms break down organic materials in the absence of oxygen.
- Two valuable outputs
  - Biogas
  - Digestate



# Overview of anaerobic digesters



- 
- Digesters at Water Resource Recovery Facilities
  - Stand-Alone Digesters
    - Community-based digester
    - Municipal Food Waste Digesters
    - Organics recycling businesses
    - Food processing digesters
  - On-Farm Digesters

# Use of Anaerobic Digestion at Livestock Operations

TEACH AD Webinar

June 16, 2021

Joe Kramer

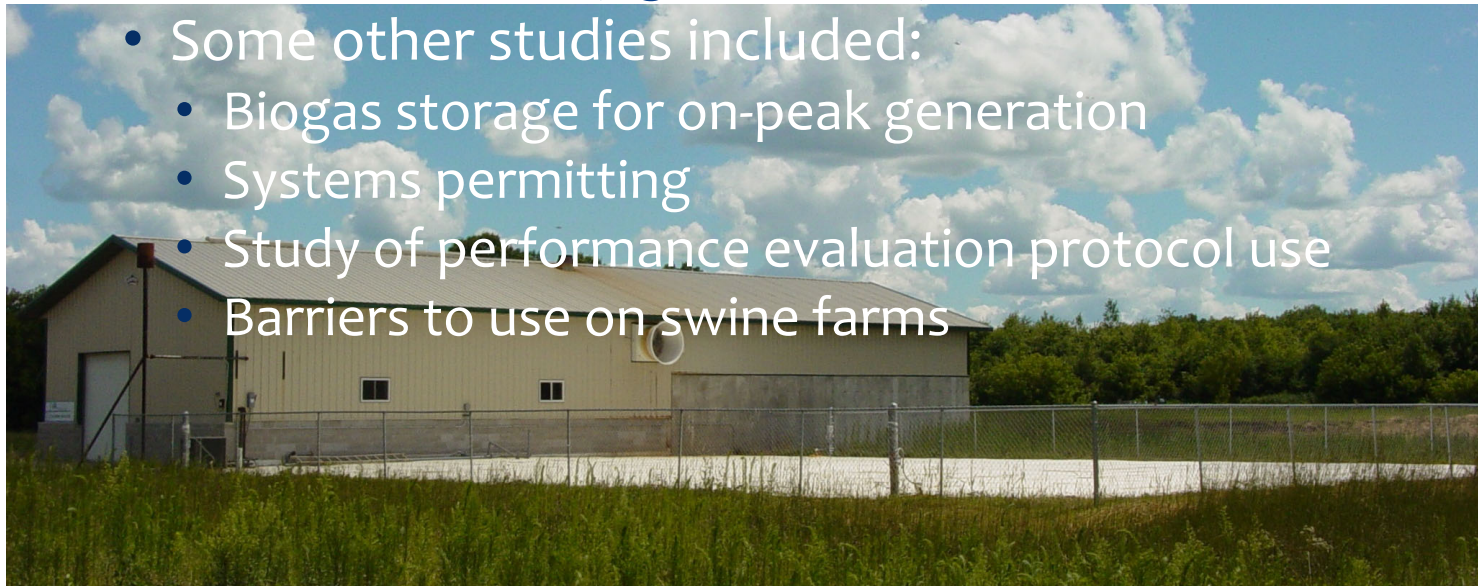
ILLUME Advising



# My Perspective

## Biogas research since 2001

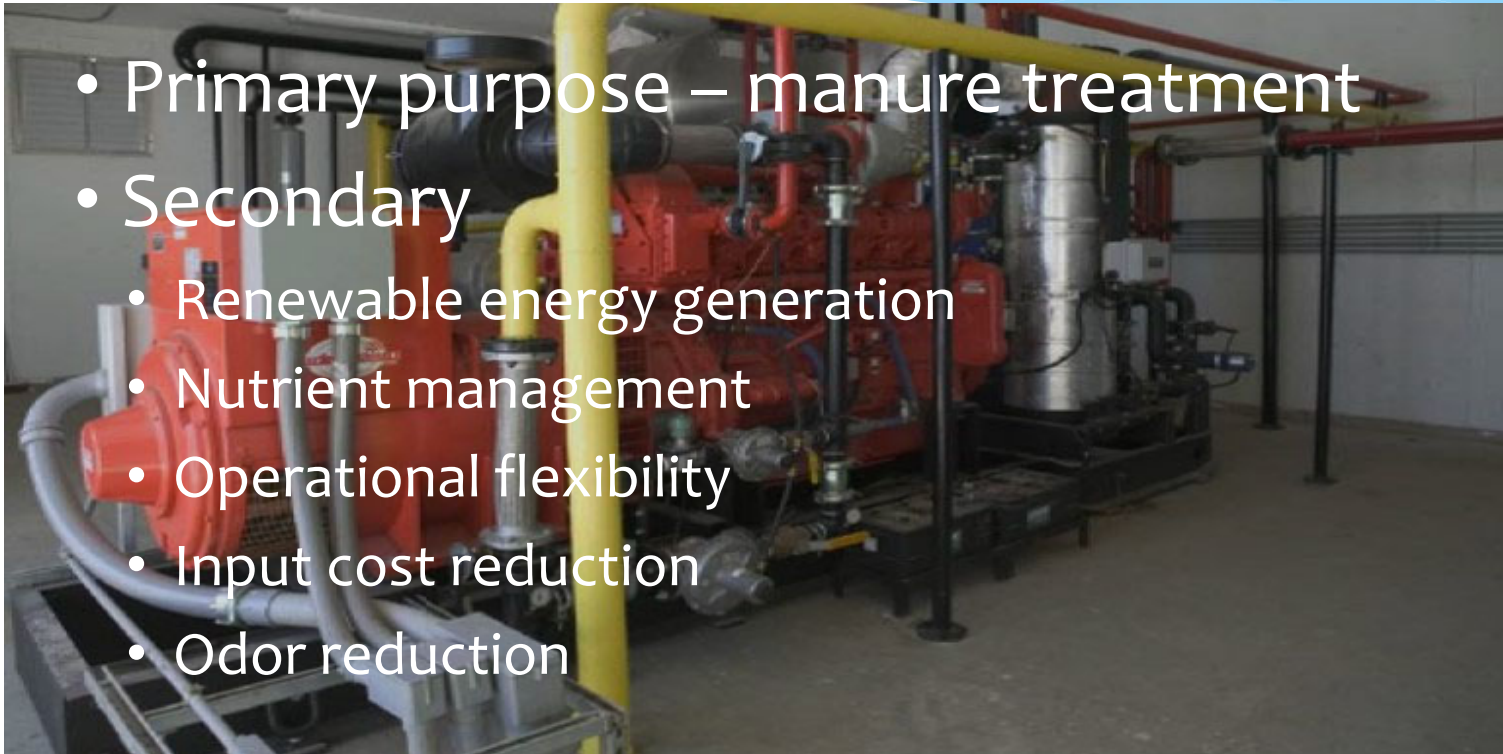
- 84 Case studies (ag and food)
- Some other studies included:
  - Biogas storage for on-peak generation
  - Systems permitting
  - Study of performance evaluation protocol use
  - Barriers to use on swine farms



Deere Ridge Dairy, WI. Photo courtesy of DVO, Inc.

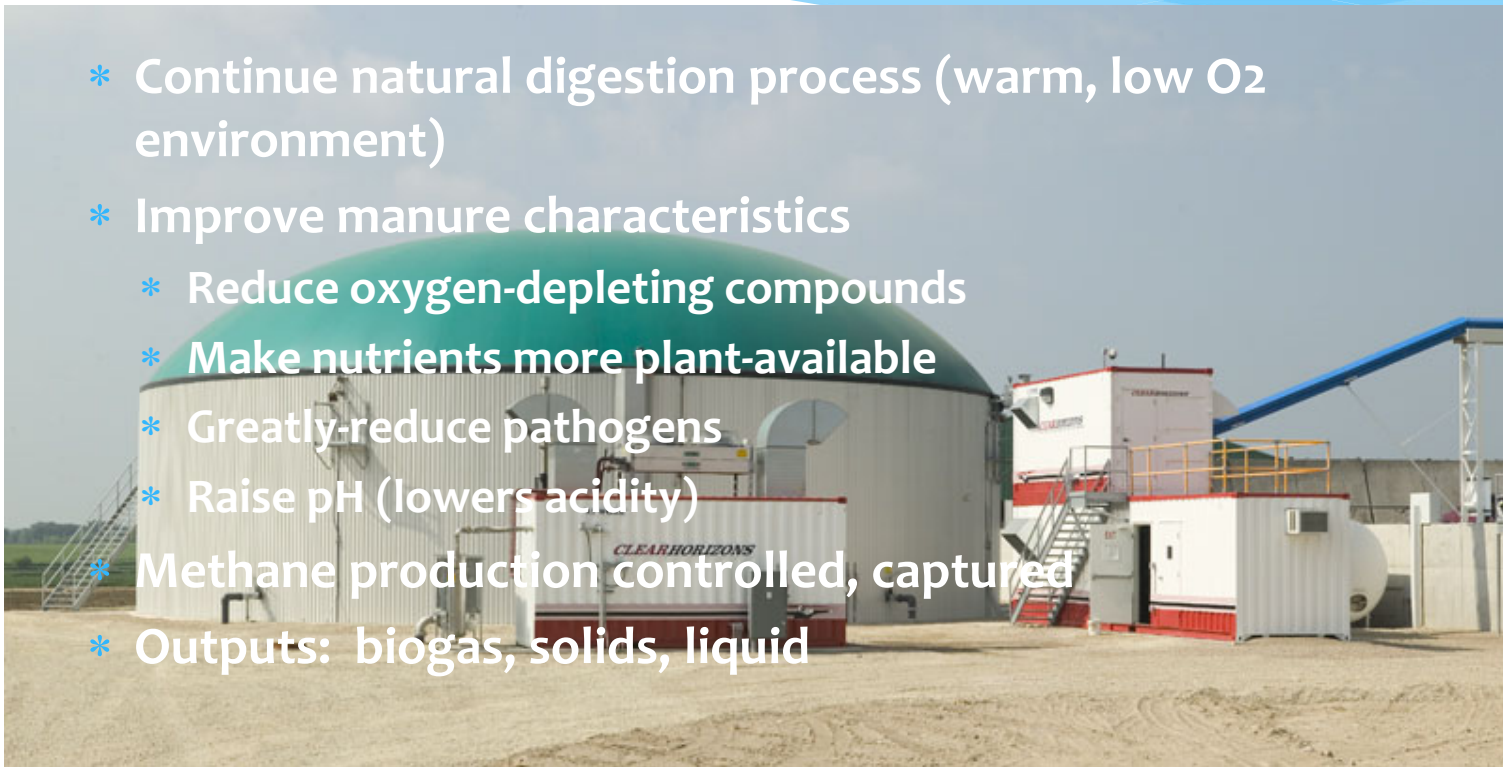
# Why do livestock farms install anaerobic digesters?

- Primary purpose – manure treatment
- Secondary
  - Renewable energy generation
  - Nutrient management
  - Operational flexibility
  - Input cost reduction
  - Odor reduction

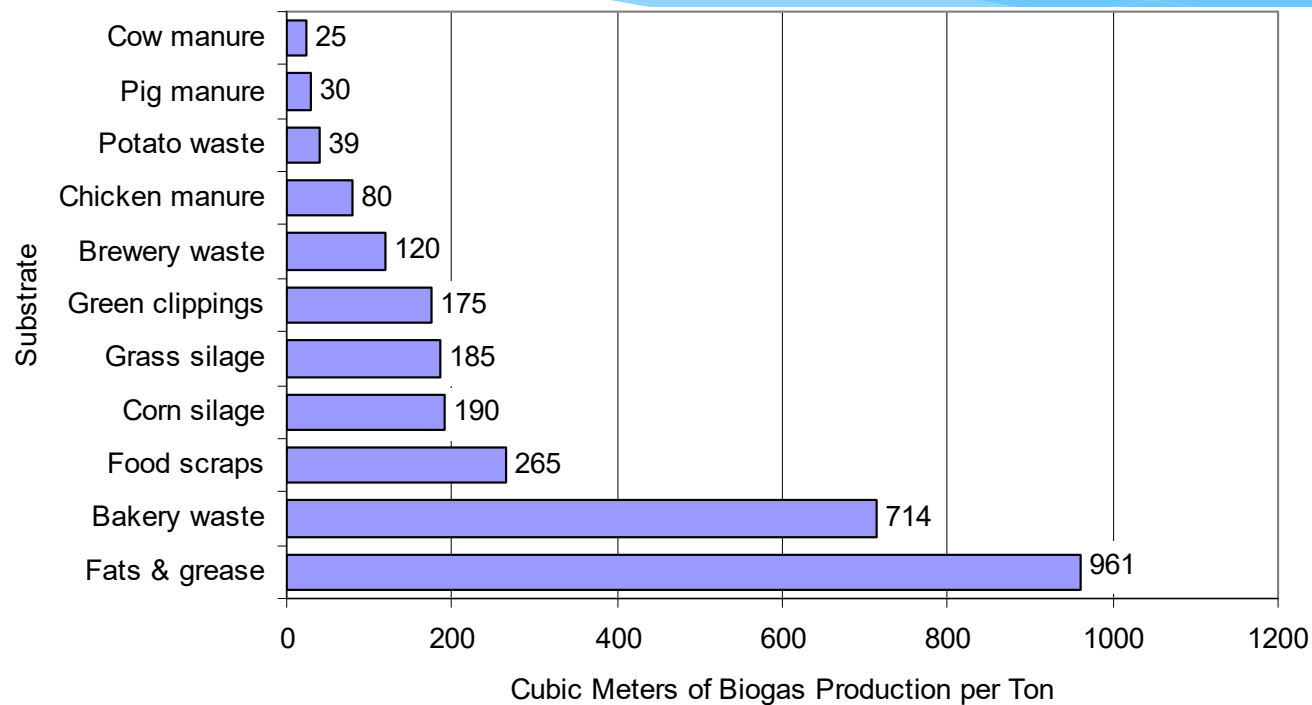


# What do digesters do?

- \* Continue natural digestion process (warm, low O<sub>2</sub> environment)
- \* Improve manure characteristics
  - \* Reduce oxygen-depleting compounds
  - \* Make nutrients more plant-available
  - \* Greatly-reduce pathogens
  - \* Raise pH (lowers acidity)
- \* Methane production controlled, captured
- \* Outputs: biogas, solids, liquid



# Why would farms process food wastes?



Source: Data derived from [www.biogas-energy.com](http://www.biogas-energy.com), © 2007 Biogas Energy, Inc., translated from: Basisdaten Biogas Deutschland, März 2005, Fachagentur Nachwachsende Rohstoffe e.V.



# Adding Food Waste

## Benefits

- \* Increases biogas production
- \* Tipping fees
- \* Helps local businesses with green disposal option

## Possible Issues

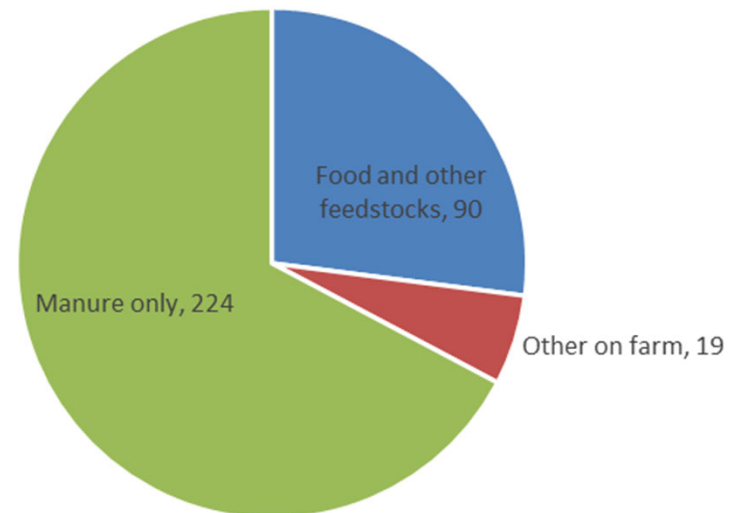
- \* Nutrient management
- \* Feedstock variability

Five Star Dairy, WI. Photo courtesy of Microgy, Inc.



# Farm Digesters and Food Waste

- \* 333 systems operating or under construction
- \* 224 processing only manure
- \* 19 process farm residues or process water
- \* 90 process other feedstocks including food



**AD system information from AgSTAR Projects Database:**

[Livestock Anaerobic Digester Database](#) | [AgSTAR: Biogas Recovery in the Agriculture Sector](#) | [US EPA](#)

# Dane County Digester, Waunakee

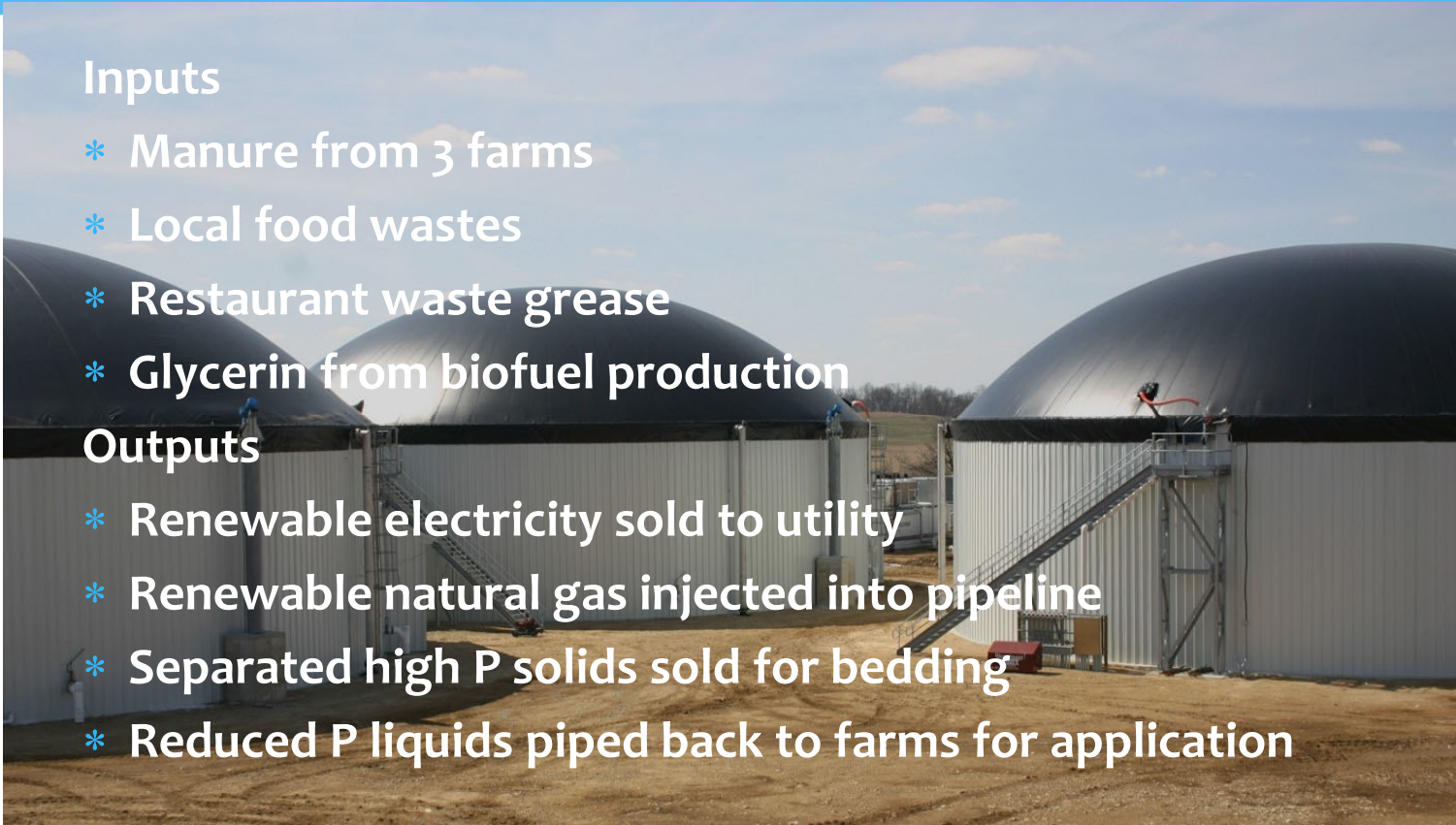
## Operating since 2011

### Inputs

- \* Manure from 3 farms
- \* Local food wastes
- \* Restaurant waste grease
- \* Glycerin from biofuel production

### Outputs

- \* Renewable electricity sold to utility
- \* Renewable natural gas injected into pipeline
- \* Separated high P solids sold for bedding
- \* Reduced P liquids piped back to farms for application



# Dane County Digester Benefits

- \* Help reduce P loading in watershed
- \* Greenhouse gas reduction
- \* Help farmers manage seasonal application restrictions
- \* Odor reduction in community



# Thank you

Contact Information:

Joe Kramer

[joe@illumeadvising.com](mailto:joe@illumeadvising.com)

608-335-9508



Flame cow courtesy of Kurt Hjort-Gregersen of AgroTech ([www.agrotech.dk](http://www.agrotech.dk)).



# Anaerobic Digestion at Water Resource Recovery Facilities

TEACH AD Webinar

June 16, 2021

Nick Menninga

Former General Manager at the Downers Grove Sanitary District

# Municipal Wastewater Treatment Plant (WWTP)...AKA

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- Water Resource Recovery Facility (**WRRF**)
- Water Reclamation Facility (**WRF**)
- Publicly Owned Treatment Works (**POTW**)
- Sewage Treatment Plant (**STP**)

# Ownership

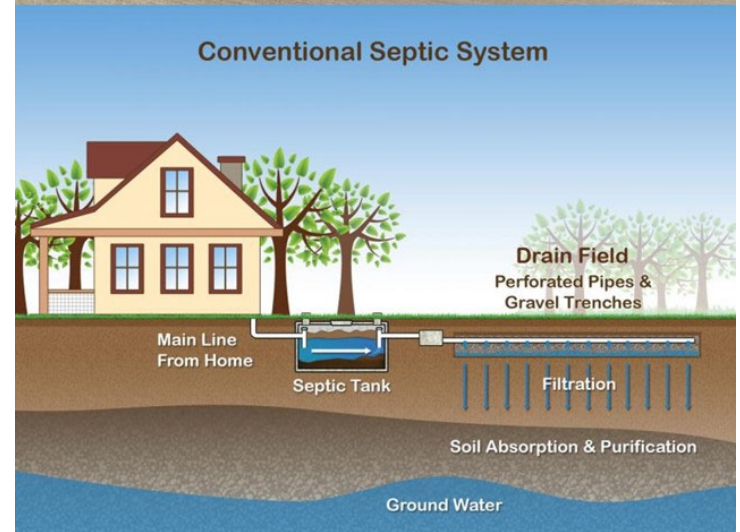


- 
- Municipalities
  - Special Districts
    - Sanitary Districts
    - Water Reclamation Districts
  - Utility Companies (Private)
  - Homeowners Associations



# Sizes / Technologies

- Smaller Facilities
  - Typically low-tech passive technologies
  - Lagoons
  - Septic tanks/seepage fields
  - Require significant investment to introduce digestion




# Sizes / Technologies

- Larger Facilities
  - Mechanical Infrastructure
  - Energy Intensive Operation
  - Purifying Wastewater for Discharge to Surface Water Body
  - Continuous Production of Sludge
  - Very Reliable Operation: Standby Power Available



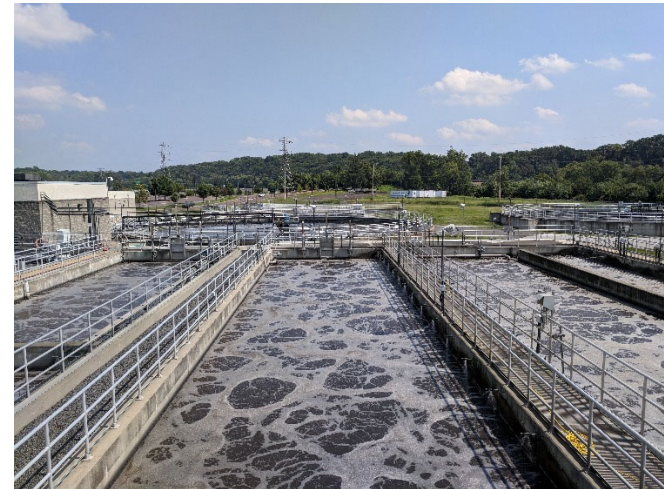
# Sludge



- 
- Nutrient-Rich
  - Low in Toxics - Source Control Enforced
  - Pathogenic
  - Vector Attraction
  - Makes Good Soil Supplement, but needs stabilization

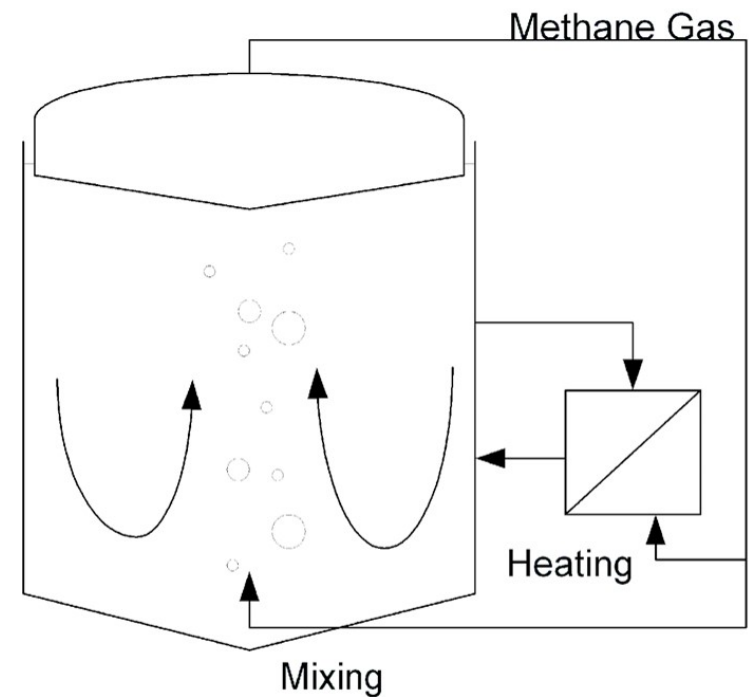
# Sludge Digestion Aerobic vs Anaerobic

- Aerobic - more common at mid-sized facilities
  - Lower capital cost - simple tankage
  - Energy intensive - aeration must be supplied
  - Odor source - typical operation generates periodic odors
- Anaerobic - typical at larger facilities - often conservatively sized
  - Higher capital cost - covered tanks
  - Energy efficient - generates more methane than needed to sustain process
  - More specialized operational control required



# Anaerobic Digestion Energy Considerations


- Raw sludge high in volatile carbon
- Anaerobic microbes convert volatile carbon to methane and carbon dioxide
- Raw digester gas is flammable, used in hot water boilers (70% efficiency typical)
- Some energy used for mixing, moving sludge
- Generally more gas than needed for heat - flared off



**ANAEROBIC DIGESTER**

# Alternative Uses for Methane



- 
- Co-generation of heat and power (CHP)
  - Renewable Natural Gas (RNG)
    - Vehicle fuel (R-CNG)
    - Pipeline gas
  - HVAC fuel (absorption chillers, dehumidification, building heat)

# Downers Grove Sanitary District

- Gas cleaning and engine genset to co-generate heat and power



# Downers Grove Sanitary District

- Co-digest Restaurant FOG





# Downers Grove Sanitary District

- Add second CHP Unit, net-zero energy across STP





Thank You

Nick Menninga

[nmenninga62@gmail.com](mailto:nmenninga62@gmail.com)



# Agenda



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# Technical Education and Analysis for Community Hauling and Anaerobic Digesters – TEACH AD


The goal of this program is to help communities and water resource recovery facilities in the Midwest region divert food waste from landfills by providing education and no-cost technical assistance to explore the increased adoption of anaerobic digestion and renewable energy biogas technologies.

- Educational Assistance
- Technical Assistance



# TEACH AD – Educational Assistance



- 
- In person workshops (2)
    - Onsite events
    - Tour of the site
  - Webinars (10)
    - Will cover different aspect of an anaerobic digestion project
  - Project profiles (8)
    - Will highlight successful AD projects

# TEACH AD – Technical Assistance

- Anaerobic Digestion Technical Assessments (20)
  - U.S. EPA's Co-Digestion Economic Analysis Tool (CoEAT)
  - Initial economic and physical feasibility assessment for (co)digestion of organic wastes
  - Standardized 2-4 page letter report



# TEACH AD - Contact



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Web: [erc.uic.edu/bioenergy/teachad/](http://erc.uic.edu/bioenergy/teachad/)

# Questions & Answers



**Jane Epperson**

UIC Energy Resources Center



**Joe Kramer**

Illume Advising



**Nick Menninga**

Downers Grove Sanitary District



**Marcello Pibiri**

UIC Energy Resources Center



# TEACH AD Webinar Series



Join us again on September for our second Webinar!

# Thank You



Please fill out our survey.

A recording of today's webinar will be posted, and you will be emailed a link by early next week.



Thank You