



Biogas Recovery in the Agriculture Sector

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WHAT WE'LL SEE TODAY

- 1. Overview of national strategic efforts and AgSTAR Program**
- 2. Opportunities for project implementation**
- 3. Current anaerobic digester landscape and opportunities**
- 4. Questions and answers**

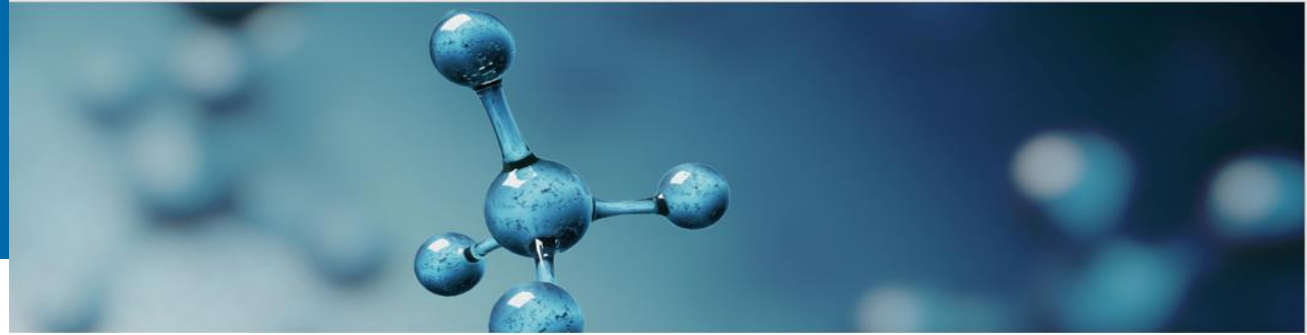
National Framework for Methane Mitigation

- **Overarching Strategies**

- [U.S. Methane Action Plan](#)
 - [USDA Climate Smart Ag and Forestry Strategy](#)
 - [Inflation Reduction Act](#)
 - [Bipartisan Infrastructure Law](#)
 - [Farm Bill](#)
-
- These national strategies discuss opportunities for supporting anaerobic digester systems on farms



Why methane?

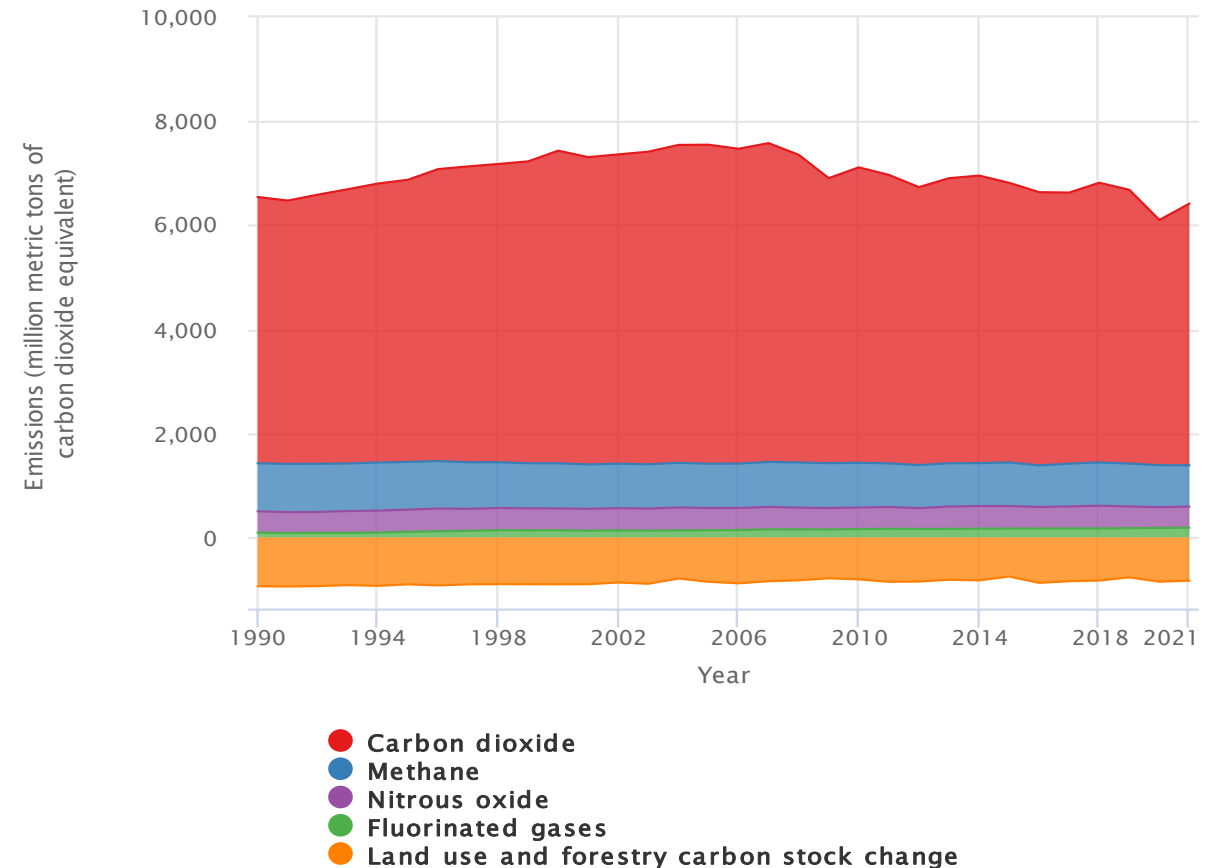


- Methane is the 2nd largest emitted GHG in the United States
- CH₄ has a warming potential 28 times higher than CO₂
- Methane emissions also contribute to ground-level ozone, a health and ecological risk

The Good News:

- Reducing methane emissions today can produce visible results within our lifetimes
- Methane is a valuable energy source
- Methane capture systems have many co-benefits for local communities

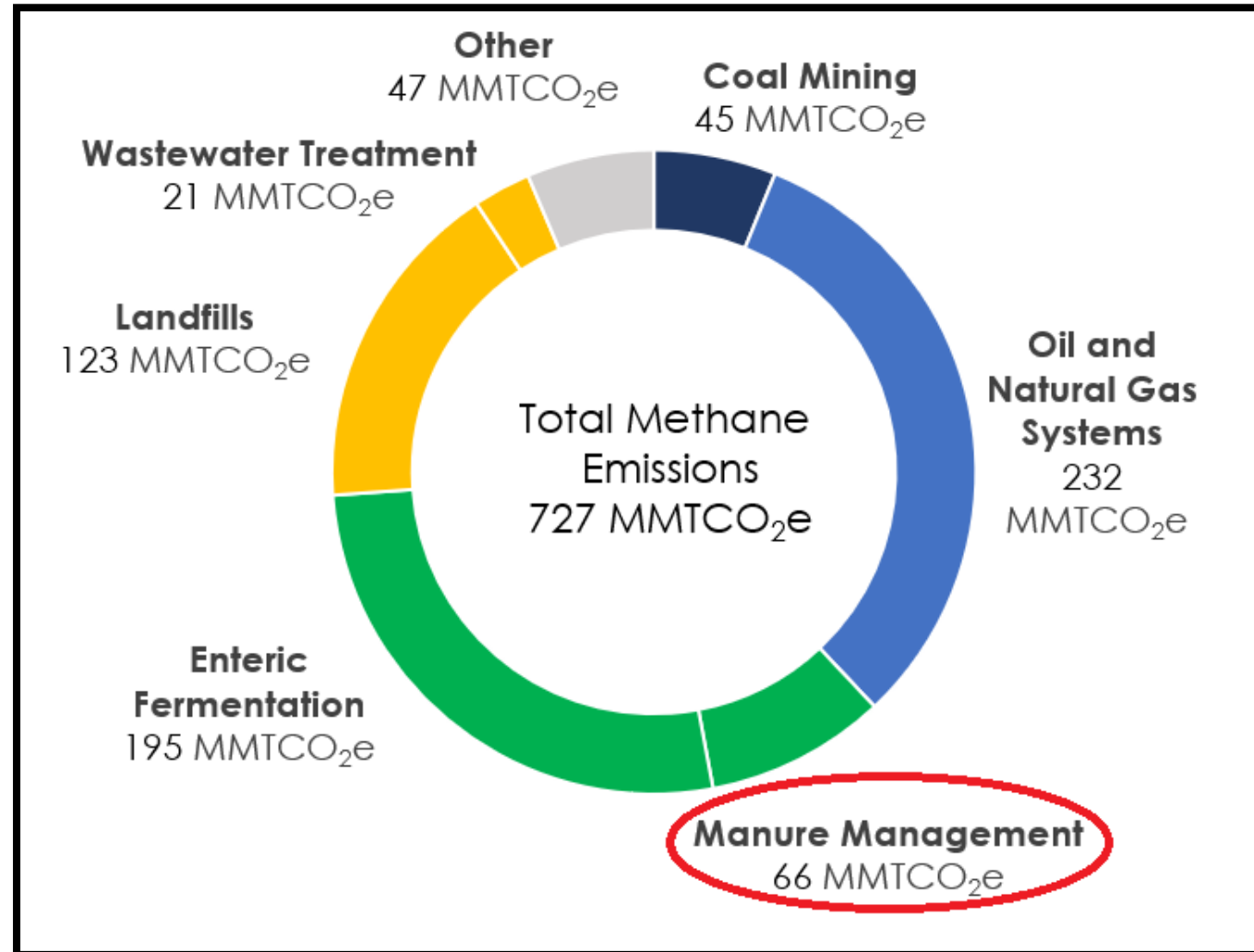
U.S. Greenhouse Gas Emissions by Gas, 1990–2021



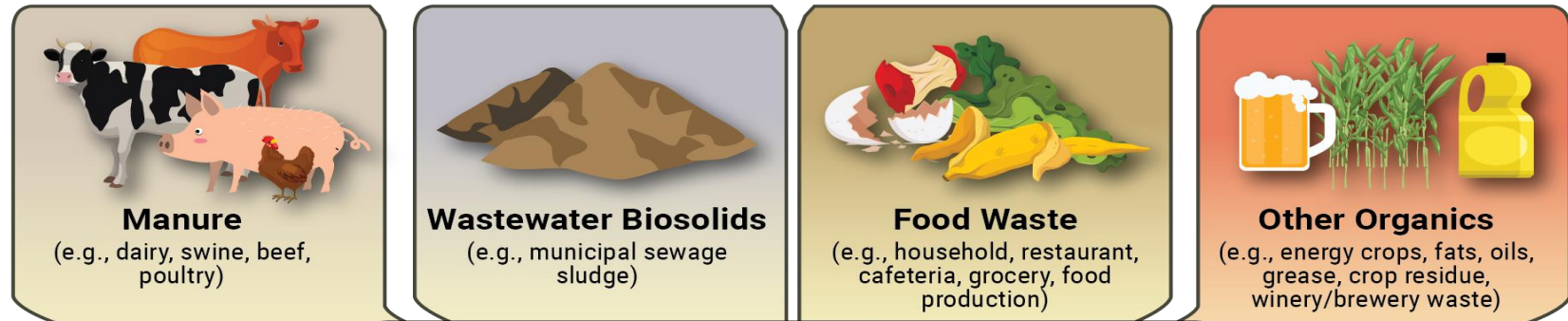
Source: U.S. EPA's Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990–2021.
<https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks>

Methane Emissions in the U.S. by Sector (in 2021)

- Livestock (dairy, beef, swine, poultry) manure contributes ~9% of US methane emissions, or 66 MMTCO₂e
 - ≈14.7 million cars/yr
 - ≈ 12.8 million homes' electricity/year
- US methane emissions from livestock manure increased 71% between 1990 to 2020



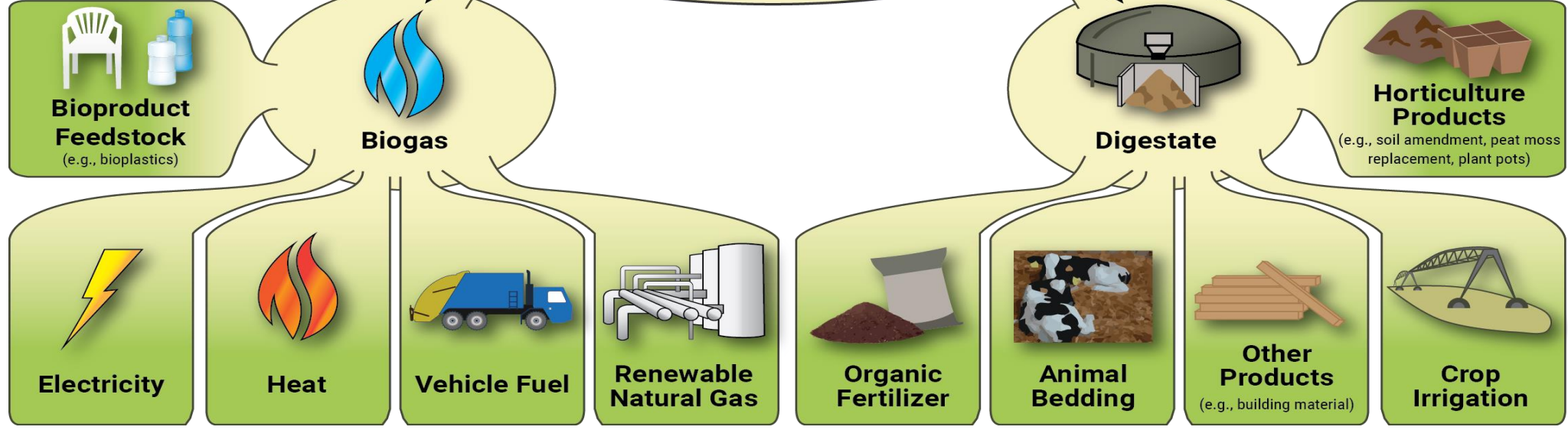
How does anaerobic digestion work?



Feedstocks can be digested singularly or in combination (co-digestion)



- Just add:
1. Organic Feedstock
 2. Heat
 3. Bacterial consortium
 4. Time
- And eliminate oxygen



Funding opportunities for anaerobic digester projects

- **Funding from the Inflation Reduction Act:**
 - **EPA Programs:**
 - [Climate Pollution Reduction Grants](#)
 - [Greenhouse Gas Reduction Fund](#)
 - **USDA Programs:**
 - [Rural Energy for America Program](#)
 - [NRCS Environmental Quality Incentives Program](#)
- **Resource: [Database of State Incentives for Renewables and Efficiency \(DSIRE\)](#)**



How AgSTAR Works



PARTNERSHIP PROGRAM

Collaborative program sponsored by EPA
and USDA.

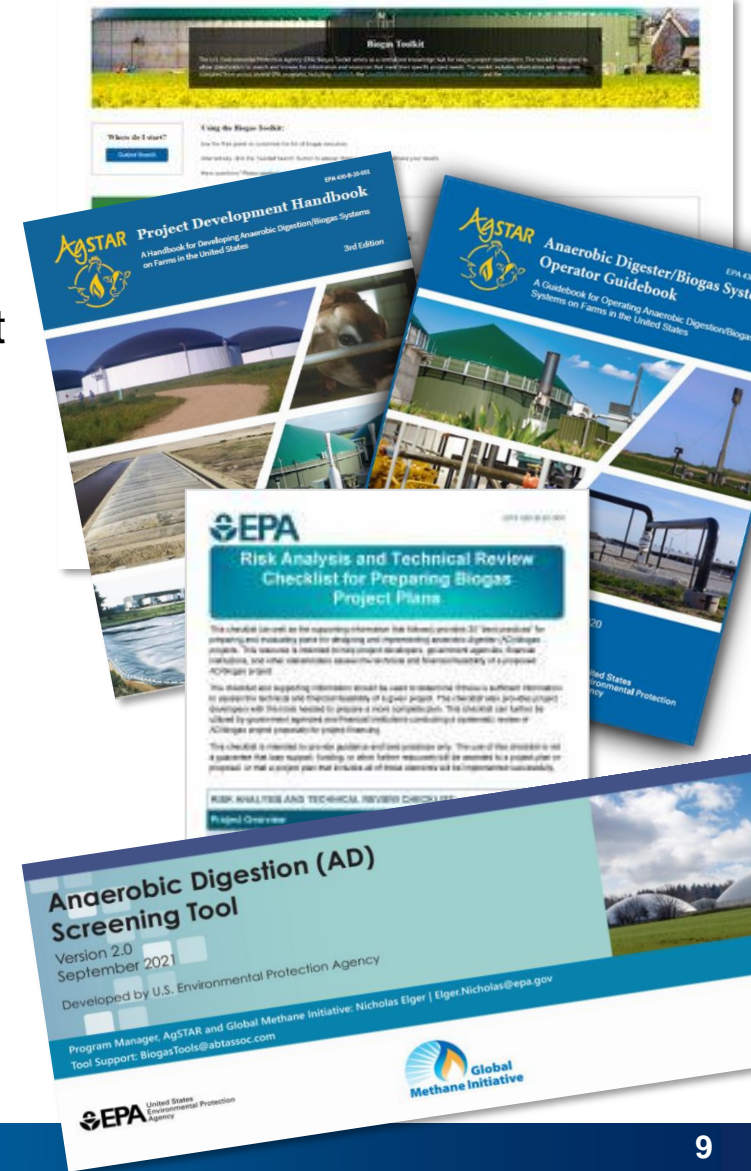
- 1 Promote Anaerobic Digestion**
Advancing economically and environmentally sound livestock manure management.

- 2 Strong Ties**
Working with industry, government, NGOs and university stakeholders.

- 3 Helping Hand**
Assisting those who enable, purchase, or implement farm anaerobic digestion projects.

Resources for Anaerobic Digester / Biogas Systems

- **Biogas Toolkit:**
 - A web-based toolkit with 38 tools and resources to facilitate biogas project development.
- **Project Development Handbook (3rd Edition):**
 - A comprehensive compilation of the latest knowledge in the industry on best practices for anaerobic digestion (AD)/ biogas systems.
- **Operator Guidebook (1st Edition):**
 - A guide for AD/ biogas systems operators to ensure safe and efficient operations of the systems they manage.
- **AD Risk Analysis Checklist:**
 - A checklist of best practices to help users determine technical & financial feasibility of AD/ biogas projects.
- **AD Screening Tool:**
 - A Microsoft Excel-based screening tool to assess the potential feasibility of AD projects in the U.S. and globally.



Practices to Reduce Methane from Manure Management

Manure Management Practice	Relative Methane Reductions*
Anaerobic Digestion	🍃 🍃 🍃 🍃 🍃
Daily Spread	🍃 🍃 🍃 🍃 🍃
Pasture-Based Management	🍃 🍃 🍃 🍃 🍃
Composting	🍃 🍃 🍃 🍃 🍃
Solid Storage	🍃 🍃 🍃 🍃 🍃
Manure Drying Practices	🍃 🍃 🍃 🍃 🍃
Semi-Permeable Covers, Natural or Induced Crusts	🍃 🍃 🍃 🍃
Decreased Manure Storage Time	🍃 🍃 🍃 🍃
Compost Bedded Pack Barns	🍃 🍃 🍃
Solid Separation of Manure Solids Prior to Entry into a Wet/Anaerobic Environment	🍃 🍃



(Scale based on 1/2 leaf = 10% methane reduction)

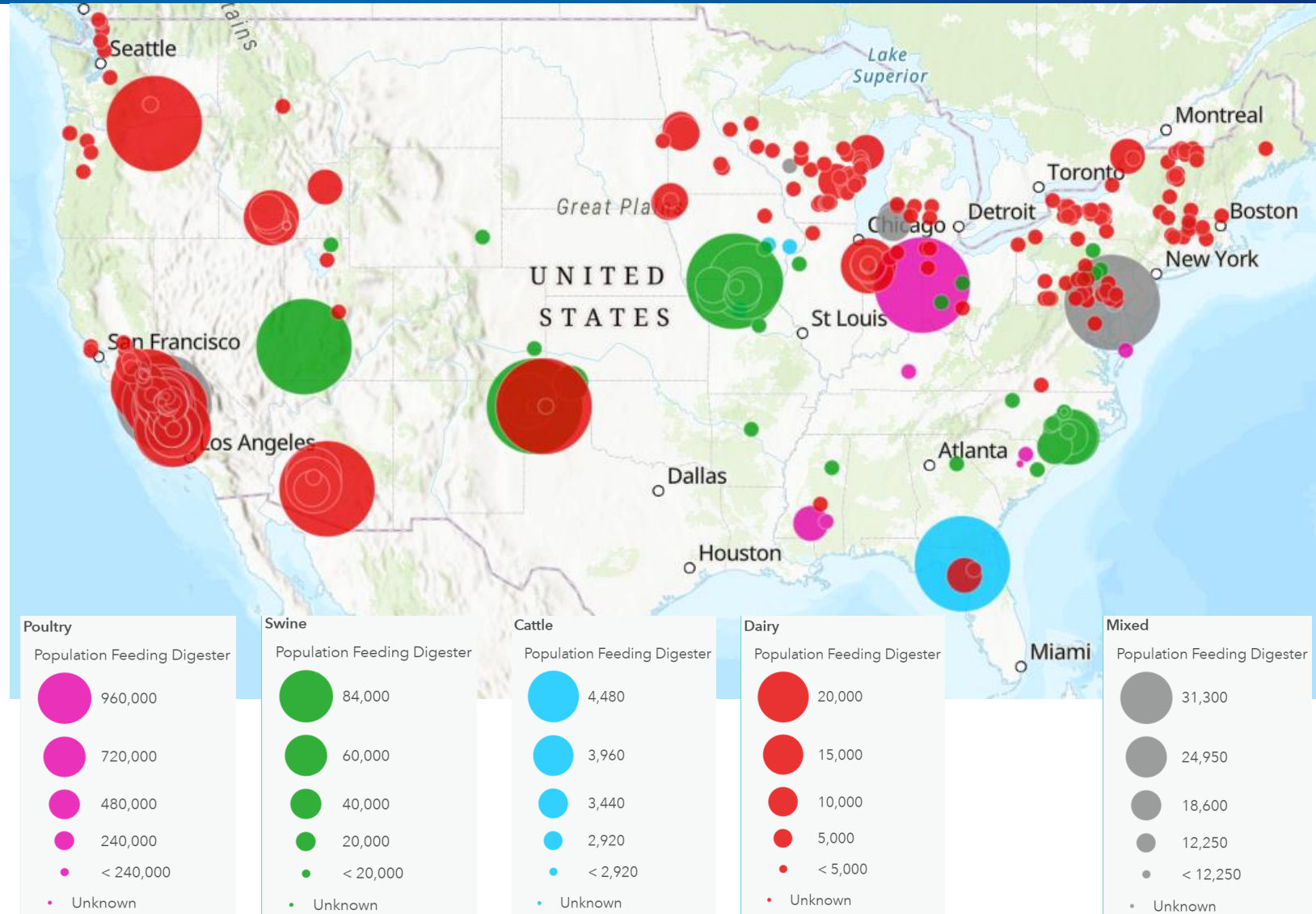


Where are digesters found on farms?

- **343 active digesters in the U.S. (as of Jan. 2023)**
 - 290 Dairy
 - 46 Hog
 - 8 Poultry
 - 9 Beef

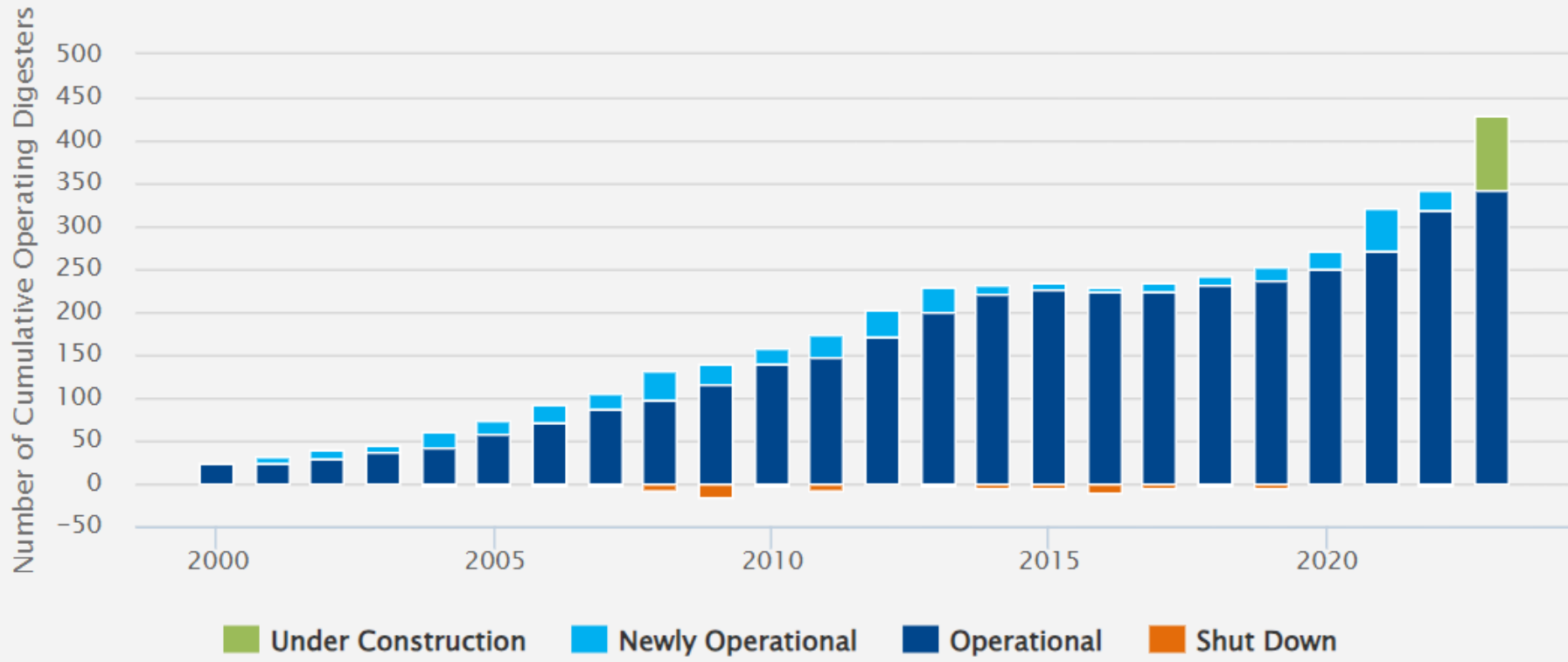
Note: Total exceeds 343 because some systems accept manure from more than one animal type.

- **104 (~30%) digesters combine manure with other feedstocks such as:**
 - **Brewery/distillery spent grain**
 - **Dairy processing wastes (e.g., whey)**
 - **Food waste**
 - **Agricultural residues**



Farm Digester Market Growth

Manure-based Anaerobic Digesters Operating in the U.S.
(Updated through January 2023)



343  **Current Digesters**

27 new AD systems came online in 2023

72 AD systems currently under construction



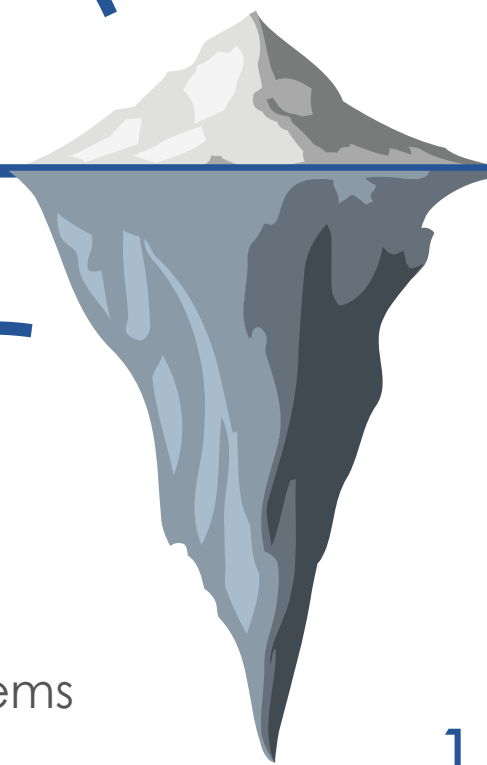
Source: AgSTAR Digester Database

~343

Existing biogas systems

~8,100

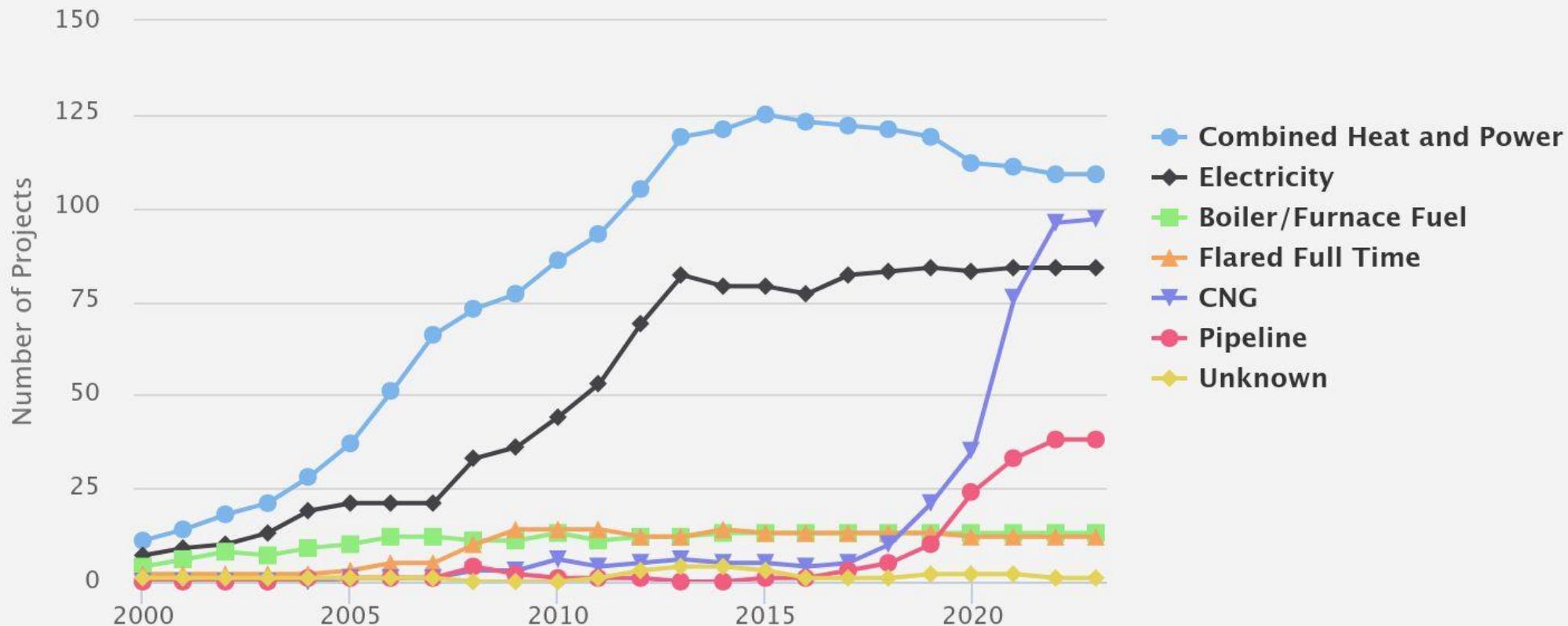
Potential biogas systems



Equivalent electricity generation to power
1.3 MILLION HOMES
or
displace equivalent energy needs for
1.5 million passenger cars per year

How is biogas from agriculture used?

Biogas Uses for Manure-based Anaerobic Digestion Systems (Updated through January 2023)



In January 2023, 97 projects produced CNG, and 38 produced RNG for pipeline used.

Project Profile: Dane County Digester

Digester with nutrient management

- Uses manure for multiple farms, co-digests food waste
- 90k gallons of manure per day
- Biogas sold as RNG vehicle fuel: 50K MMBtu per year
- Digestate is routed through centrifuge for phosphorus removal
 - 60 percent of the phosphorus is removed
 - Manure solids then used for animal bedding



Clean Fuel Partners installed a new roof on digester tank #2 in November 2015.
Photo Credit: Clean Fuel Partners



Vienna, Wisconsin

COMPLETE MIX



CO-DIGEST



RNG



NUTRIENTS



FERTILIZER



BEDDING



Question and Answer



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