

# Using Food Waste in Anaerobic Digestion Systems

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# Presentation Outline

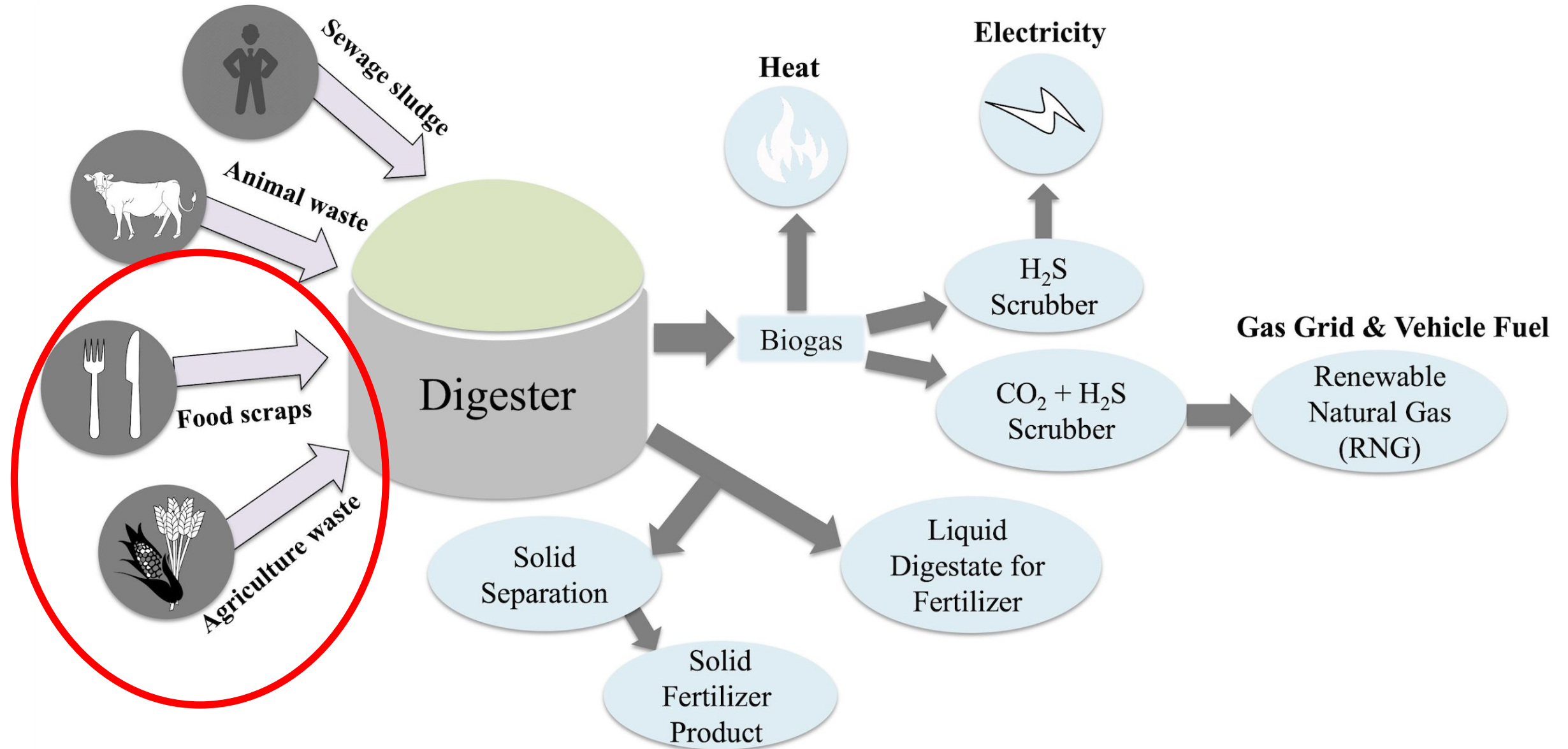
Anaerobic Digestion Basics

Food Waste Categories

Case Study: Kilby Farm Digester

Food Waste Digestion Policy

# Anaerobic Digestion



# Benefits of Anaerobic Digestion

Produces non-intermittent, renewable energy:

- Heat
- Electricity
- Renewable natural gas
- Waste Heat

Reduces methane and CO<sub>2</sub> emissions that would be released into the atmosphere.

Processes food waste and produces power from waste that could otherwise go to landfills

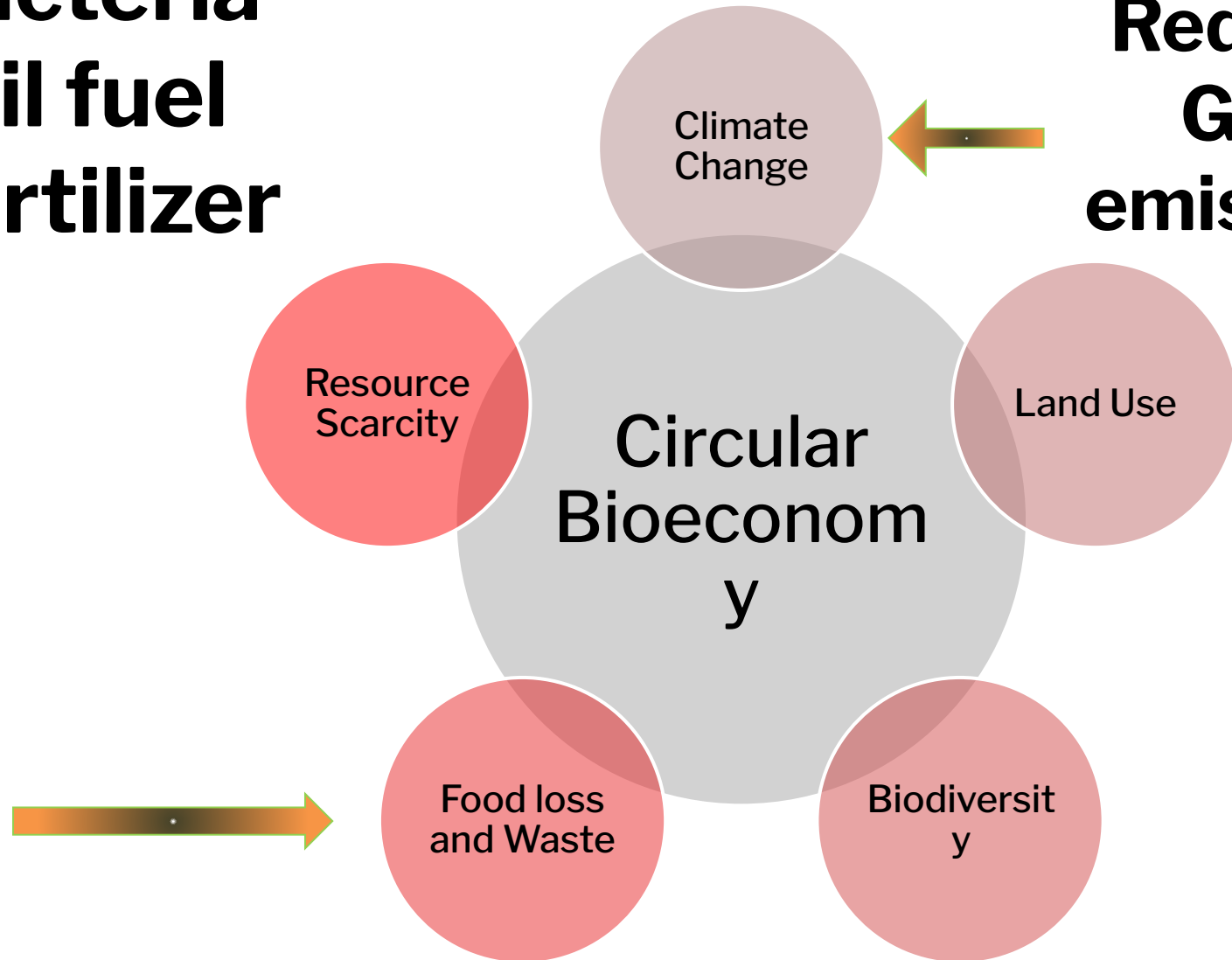
Creates a liquid fertilizer that can be recycled for food production

# Anaerobic Digestion Integral to Circular Bioeconomy

**Uses natural bacteria to reduce fossil fuel and chemical fertilizer use.**

**Reduces GHG emissions**

**Spoiled food that cannot be repurposed**

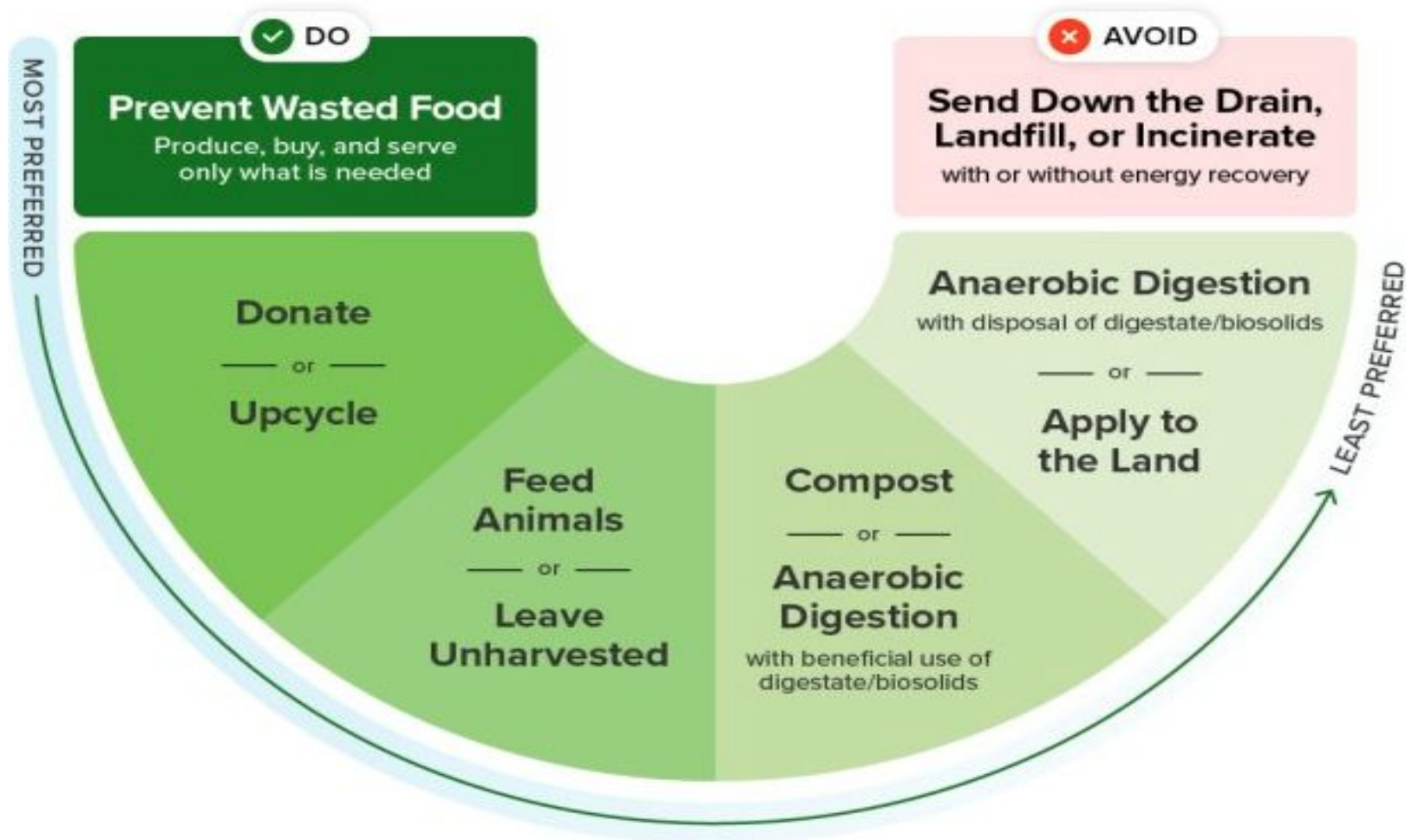


# EPA Wasted Food Scale



## Wasted Food Scale

How to reduce the environmental impacts of wasted food





# Food Waste Categories



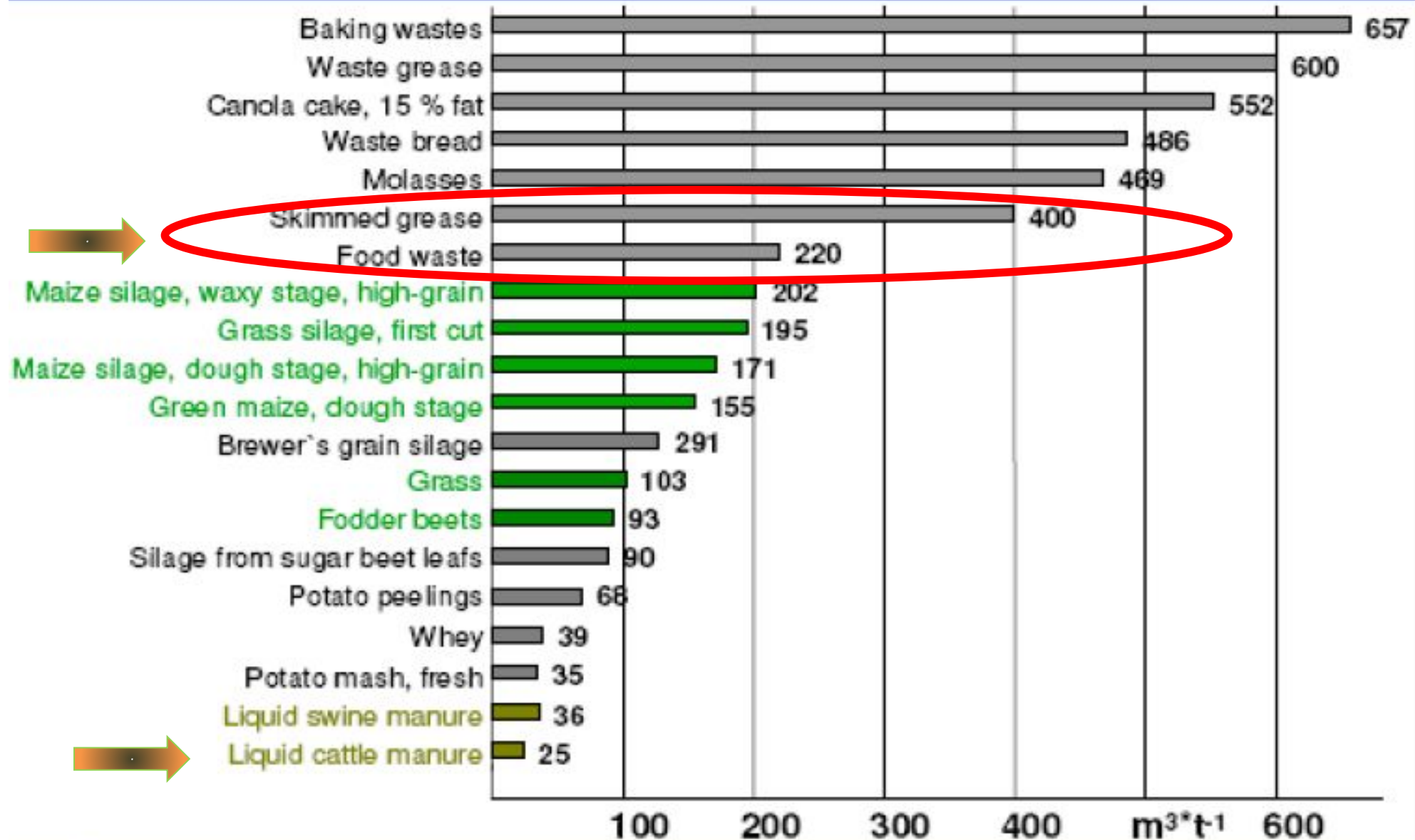
- Pre-consumer waste
  - Food Processing Residuals (i.e., DAF)
  - On-farm processing waste (i.e., dairy)
  - Packaged food – not fit for consumption
  - Crop waste
- Post-consumer waste
  - Banquet/cafeteria prepared food
  - Placed on the consumer's plate
  - Household waste

# Dissolved Air Flotation (DAF)

- DAF is composed of dissolved solids, proteins, and fat (with their associated nutrients) that rise to the surface and removed by mechanical scraping during waste processing at food processing facilities, with the remaining water cleaned and discharged.
- DAF is a byproduct contains nutrients that can be used to grow crops.
- DAF in Maryland now required to be digested, composted, injected, or incorporated due to odor concerns with field application.



# Potential Biogas Yields



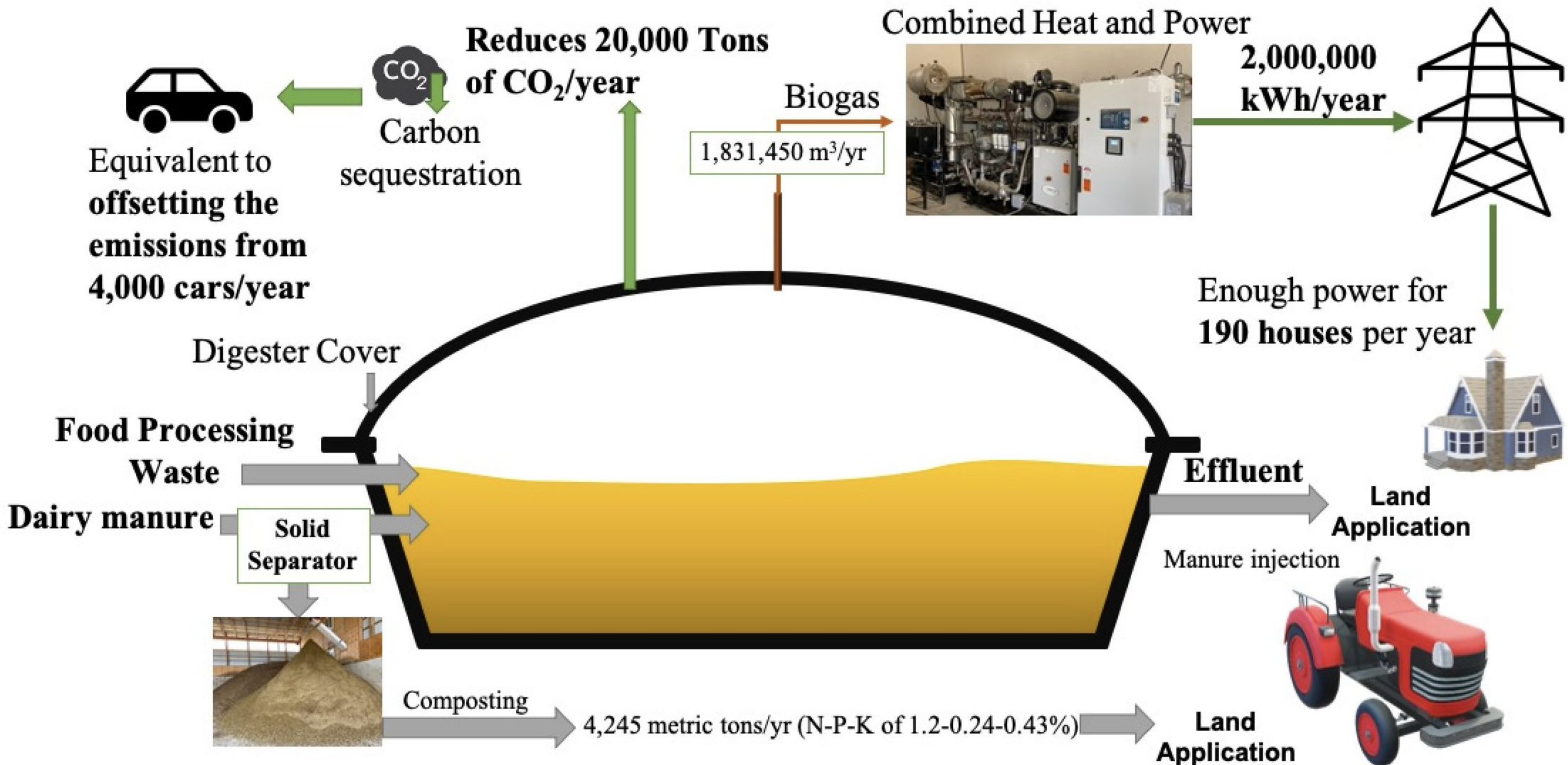
# Kilby Farm (MD) Digester Case Study



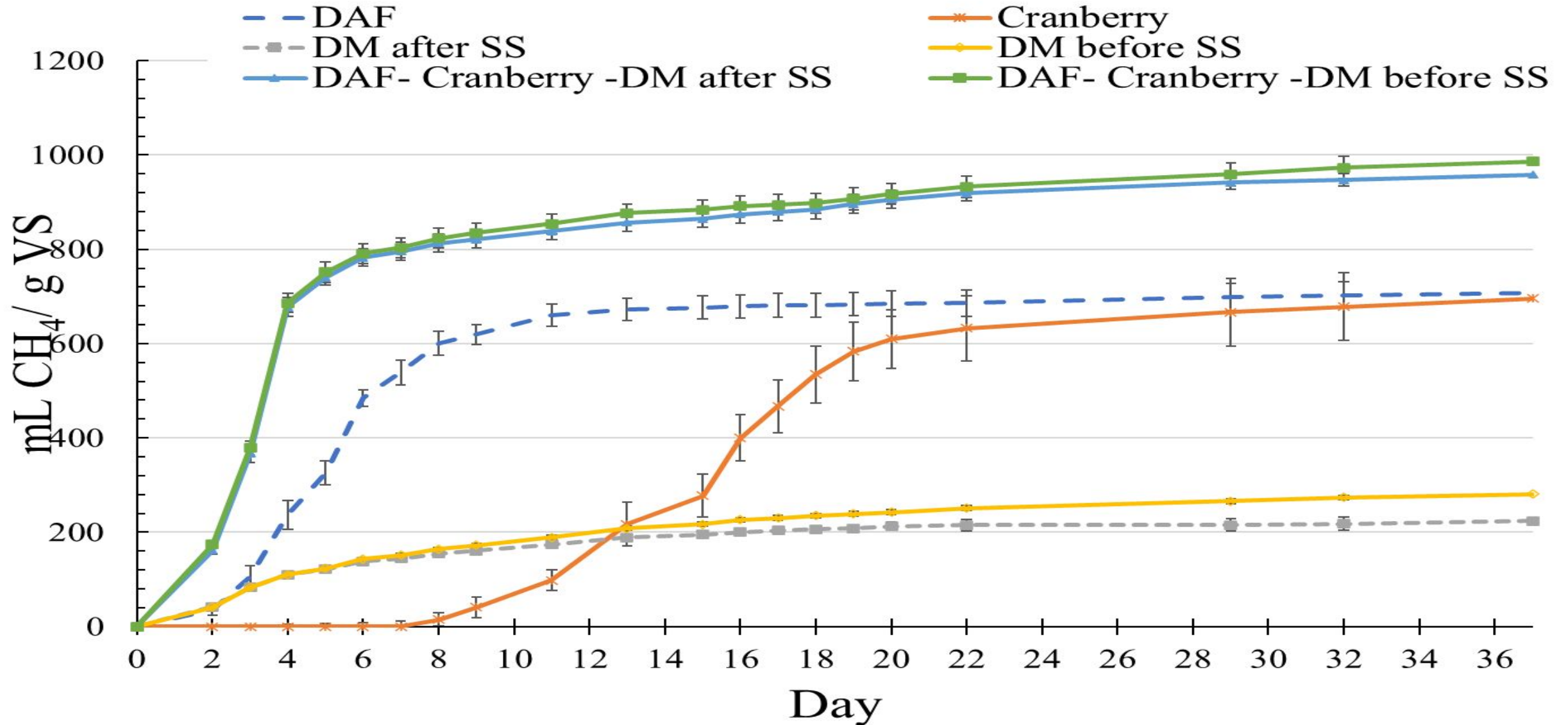
Covered lagoon digester treating liquid dairy manure, cranberry processing waste, and DAF producing electricity – Kilby Farm in Cecil County, MD



# 12-month study of Kilby Farm Digester Impacts



# Higher Energy Potential from Co-Digestion



# Digester Planning for Food Waste

**My Advice:** Start with volume and water content of food waste, as this effects the managing digester outputs

# Managing Digester Effluent with Co-Digestion

## Farmer: Food waste co-digestion with manure

- What is your extra nutrient management capacity?
  - Food waste will be part of an approved nutrient management plan.
  - Can you handle the entire liquid effluent stream on your land?
  - How much fertilizer do you purchase that you could offset for your land?
- Will you install a solid separator?
  - If selling the solids off-farm, do you have a storage area and a market?
  - What is your bedding material? Digested solids be used as cow bedding.



# Bar-Way Farm Digester in Massachusetts

## FARM FACTS

- 600-acre dairy farm
- Founded in 1919
- 250 cows milked daily
- Produces more than 1,700 gallons of milk daily
- Located in Deerfield, Mass.

## DIGESTER FACTS

- Construction 2016
- 660,000-gallon capacity

### *Annual Digester Input:*

- 9,125 tons of manure
- 36,500 tons of food waste

### *Annual Digester Output:*

- Produces 7,700 MWh of renewable energy/year
- Offsets 5,500 lbs. of CO<sub>2</sub> emissions daily
- Produces renewable energy equivalent to 1,600 homes
- Provides energy via net metering credits to food companies



More information:

<http://www.barwayfarm.com/anaerobic-digester/>

# Managing Digester Effluent with Food Waste Digesters

Not a farmer: Food waste digesters or third-party digester

- Will you treat the effluent or field apply?
- What is the transport distance for food waste, effluent solids, and liquids?

\*Digesters reduce solids and create conditions for nutrient removal from solids substrates (i.e., food waste), but do NOT reduce volume.

- The volume into the AD system equals the volume out. May come in as a solid but will go out at the same volume with an increased moisture content.
- Allows for advanced processes (such as reverse osmosis) to remove nutrients

# Maryland Policies: Food Waste Diversion



- Maryland legislature passed the Organics Recycling and Waste Diversion - Food Residuals law requiring large food waste generators to separate food residuals, reduce food waste, donate edible food surplus, or diverted to composting, anaerobic digestion, or animal feed (if there is a processor capable of taking the waste within 30 miles).
- Maryland Senate bill in this current legislative session: SB 808 Anaerobic Digestion Technology – Coordination and Guidance



# Tools at EPA AgSTAR: www.epa.gov/agstar

## Technical Resources for Anaerobic Digester Systems

These resources provide technical information about anaerobic digestion and biogas recovery systems and are intended to help with planning and optimizing projects.

- [Biogas Toolkit](#)
- [How Biogas Systems Work](#) 
- [Recovering Value from Waste: Anaerobic Digester System Basics](#)
- [Basics of Energy Production through Anaerobic Digestion of Livestock Manure \(pdf\)](#) 
- [AgSTAR Project Development Handbook](#)
- [\[ARCHIVED\] Original AgSTAR Project Development Handbook](#)
- [Risk Analysis and Technical Review Checklist for Biogas Projects](#)
- [Anaerobic Digestion on Swine Farms](#)
- [Anaerobic Digestion on Dairy Farms](#)
- [Estimating Methane Reductions from Operating Anaerobic Digestion Systems](#)
- [Using Biochemical Methane Potentials and Anaerobic Toxicity Assays](#)
- [Increasing Anaerobic Digestion Performance with Codigestion](#)
- [Common Safety Practices for On-Farm Anaerobic Digestion Systems](#)
- [Interconnection Guidelines](#)

## AgSTAR Projects, Case Studies and Vendors

These resources provide information about farm-based anaerobic digester projects within the United States, including a directory of vendors.

- [Livestock Anaerobic Digester Database](#)
- [AgSTAR Project Profiles](#)
- [AgSTAR Case Studies](#)
- [Anaerobic Digestion Ombudsman Case Studies](#)



### [Anaerobic Digestion Screening Tool](#)

This tool estimates biogas production and methane emission reductions from anaerobic digestion projects based on the amount and type of feedstocks available.

TOOL



### [Biogas Wastewater Assessment Tool](#)

This tool provides a quick and preliminary assessment of wastewater-to-energy projects.

TOOL



### [CCAC Waste Initiative City Assessment Tool](#)

This tool assists cities in collecting and managing data about solid waste management practices, facilities, and financing.

TOOL



### [Central and Eastern European Landfill Gas Model](#)

This tool helps evaluate the feasibility and potential benefits of collecting and using LFG at municipal solid waste disposal sites in Central and Eastern Europe including, Ukraine, Serbia, Poland, and Bulgaria.

TOOL



### [Co-Digestion Economic Analysis Tool \(CoEAT\)](#)

CoEAT is designed for decision-makers with technical experience in anaerobic digestion to evaluate the costs and benefits of accepting and processing wasted food, fats, oils and greases (FOG) or other organic materials.

TOOL



### [Colombia Landfill Gas Model](#)

This tool helps evaluate the feasibility and potential benefits of collecting and using LFG at municipal solid waste disposal sites in Colombia.

TOOL



### [Example Request for Proposal Files](#)

These files are several requests for proposals (RFPs) that have been issued by landfill owners or other entities. LMOP has provided these files as examples only. LMOP acquired these examples through the Program's assistance to communities or companies who issued the procurements and obtained permission to post them.

DOCUMENT




### [Excess Food Opportunities Map](#)

The U.S. EPA Excess Food Opportunities Map supports nationwide diversion of excess food from landfills. The interactive map identifies and displays facility-specific information about potential generators and recipients of excess food in the industrial, commercial and institutional sectors and also provides estimates of excess food by generator type.

TOOL





**Thank you!**  
**Questions and Dialogue**



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