

Agriculture Sector Action Plan – Revised February 2013

United States Agriculture Sector Action Plan for the Global Methane Initiative

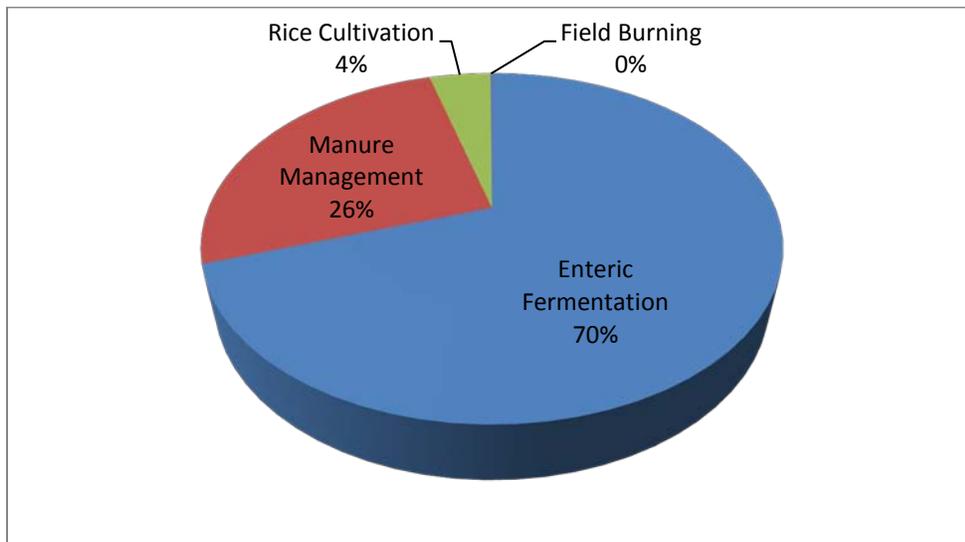
Introduction

The U.S. focus on methane reductions at an institutional level is in the promotion of anaerobic digestion (AD) of livestock wastes, although research related to reducing methane emissions from enteric fermentation is ongoing. While some agro-industrial facilities employ anaerobic digestion as a pretreatment step to create energy and reduce the organic load of their wastewater, the wastewater is ultimately sent to treatment plants. Therefore, U.S. activities in this sector focus on those related to anaerobic digestion of livestock manures.

Country Background and Overview of Methane Emissions

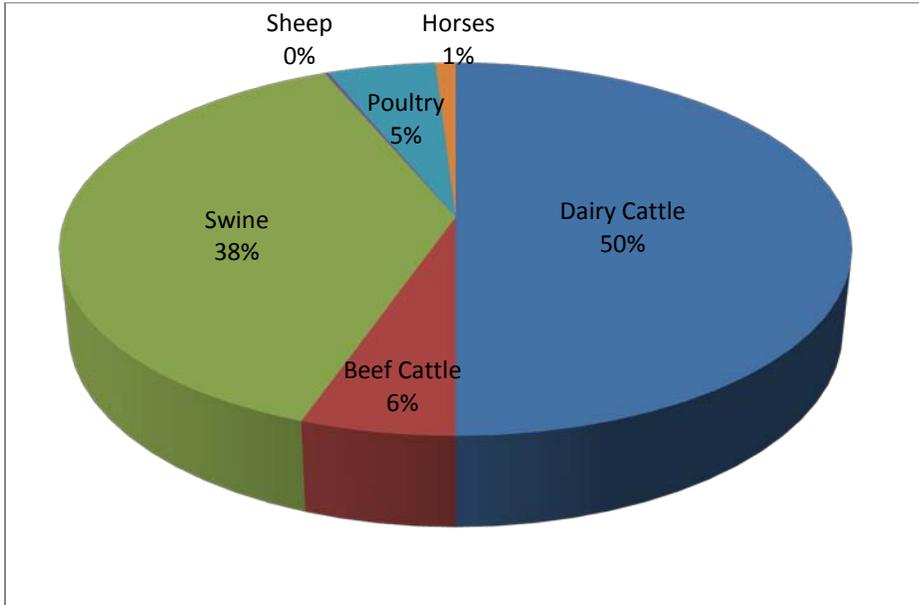
The U.S. Environmental Protection Agency (EPA) develops a national greenhouse gas inventory each year to track the national trends in emissions and sinks since 1990¹. The Inventory of U.S. Greenhouse Gas Emissions and Sinks is submitted to the United Nations in accordance with the Framework Convention on Climate Change. According to the latest inventory, methane emissions from agricultural activities in the United States were estimated to be 428.4 Tg CO₂e (132.5 MMTCO₂e) in 2010, which represents approximately 6 percent of total U.S. greenhouse gas emissions. Methane emissions from enteric fermentation and manure management represent about 21 percent and 8 percent of total methane emissions from anthropogenic activities, respectively. Of all domestic animal types, beef and dairy cattle were by far the largest emitters of methane. Rice cultivation and field burning of agricultural residues were minor sources of methane.

Figure 1: 2010 Methane Emissions from Agriculture (Tg CO₂e)



¹ See <http://www.epa.gov/climatechange/ghgemissions/usinventoryreport.html>

Figure 2: Methane Emissions from Manure Management (MMT CO_{2e})



Opportunities for Methane Reductions from Manure Management

There is great potential to reduce emissions in the U.S. An estimated 8,200 U.S. dairy and swine operations could support biogas recovery systems using solely manure as a feedstock. Biogas recovery systems at these facilities have the potential to collectively generate more than 13 million megawatt-hours (MWh) per year and displace about 1,670 megawatts (MW) of fossil fuel-fired generation. In addition, biogas recovery systems are also feasible at other livestock operations, as well as additional swine and dairy farms that could supplement manure with other organic wastes as feedstocks. Currently, there are only about 200 operating systems serving livestock facilities in the U.S.

Characterization of Public and Private Sector Involvement

An overview of key actors in the agriculture methane arena in the United States

Typical anaerobic digestion projects in the US involve some funding from the public sector with project development, ownership, and operation by the private sector². Many industry associations and renewable energy organizations promote the use of AD for its ability to improve the environment and

² A few municipalities or other local-level public sector groups are becoming involved in the development or ownership and operation of centralized AD projects, often in areas where water quality is compromised due to excess nutrient loading. This has not been a common model, but is starting to emerge more and offers great opportunities, which are discussed in the *Challenges and Drivers for Mitigation or Abatement of Methane Emissions* section of this Action Plan.

potential to provide a source of revenue. In addition to providing funding, the public sector also maintains standards for the construction of AD systems and handles the permitting of the AD systems.

Anaerobic digesters utilizing livestock waste have traditionally been located on single farms (that supply the manure) and have been owned and operated by that farm. In recent years, there have been an increase in the number of systems owned and operated by third-parties, but these still represent a small segment of the overall market (about five percent). General environmental guidelines are set at the national level, but state and local agencies are responsible for determining what permits are required by each facility; these requirements vary across the country. Extremely limited amounts of federal and state level funding is available, therefore most systems are financed through loans at traditional banks.

For a list of key players in the U.S. market, along with a short description of their role and links to additional information, please see the *Additional Resources* section at the end of this document.

Challenges and Drivers for Mitigation or Abatement of Methane Emissions

The U.S. market for anaerobic digestion lags behind that of many other countries, such as those in the European Union. Many important differences exist that have impeded rapid development of the market. These challenges are categorized in three major areas: financing, biogas utilization, and permitting.

Financing

- Biogas recovery systems have very high capital costs and there are virtually no funding programs to assist with up-front costs.
- Very few grant and loan programs exist to fund digesters and those that do often do not differentiate biogas projects from other renewable energy applications.
- U.S. projects typically have long payback periods (8-10 years is not uncommon).
- Some financial institutions view anaerobic digester projects as risky investments based on perceptions formed by the failure of many “first-generation” systems in the 1970s.

Biogas Utilization

- There is no overarching energy policy in the U.S. Major publicly-owned utilities must follow standards set by the Public Utility Commission, but many agricultural digesters are served by co-operatives or other rural utilities not subject to these guidelines. Each utility offers their own rate to biogas projects in their territories and some negotiate different rates with individual customers.
- Most projects in the U.S. use the biogas to generate electricity using internal combustion engines (while recovering the heat for other uses); however, these projects often receive \$0.05/kWh or less for this power. A common estimation is that projects need to receive at least \$0.14/kWh to have a reasonable payback period.
- Most states in the U.S. have relatively inexpensive electricity and natural gas.
- Very little infrastructure exists to allow biogas to replace CNG – both CNG-fueled vehicles and fueling stations are sparse in the U.S.

Permitting

- Anaerobic digestion projects can be subject to a variety of environmental permits (air emissions, water quality, waste handling, etc.) and these vary by location.
- Due to the low number of operational digesters in the U.S., many locations have little or no experience issuing permits for these types of projects, which can lead to delays in obtaining the needed approvals.

However, the number of operational digesters for livestock wastes has been steadily increasing over the last decade, with about 10 new digesters starting up each year. Various financial, regulatory, and market drivers propel this sector.

Financial

- Biogas used to create electricity can be eligible for Renewable Energy Certificates (RECs), which are required by some utilities to meet requirements that a certain portion of their energy portfolio come from renewable sources. For more information, see <http://www.epa.gov/agstar/tools/funding/renewable.html>
- Biogas from anaerobic digesters processing livestock manure that is used as a transportation fuel may qualify for Renewable Identification Numbers (RINs). For more information, see <http://www.epa.gov/otaq/fuels/renewablefuels/index.htm>
- While there is no nationwide program, California has established a Cap-and-Trade Program through which digesters may be eligible to earn carbon credits. For more information, see <http://www.arb.ca.gov/cc/capandtrade/capandtrade.htm>

Regulatory

- Some local governments are beginning to establish mandatory requirements to divert organic materials from landfills. This can increase the availability of other organic feedstocks that can be codigested with manure. The resultant increase in gas production (or other factors, such as tipping fees) can improve the financial viability of anaerobic digestion projects.
- More watersheds in the U.S. are facing issues due to the presence of high levels of nitrogen and/or phosphorus. As these areas face increased scrutiny and restrictions, digesters can be a key part of an integrated waste management system to treat or recover these nutrients.

Market

- Many companies are looking into the development of markets for digester byproducts – such as the use of effluent solids as a replacement for peat moss or the development of proprietary fertilizer blends.
- As transportation fuel prices continue to rise throughout the U.S., many people are interested in the use of biogas as CNG, especially those who manage large fleets.

Activities to Promote Methane Mitigation and Abatement

The US is involved in a number of activities to promote methane mitigation and abatement, both domestically and internationally. Domestic activities within the US involve outreach and promotion of livestock AD projects; project development assistance provided by the AgSTAR program; information sharing through various conferences and workshops; funding at both national, state, and local levels;

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implementation of voluntary renewable portfolio standards advocating for the use of renewable energy, including biogas; and various industry initiatives.

EPA plays a major role in promoting methane abatement in the agriculture sector through a voluntary program, AgSTAR, which promotes the use of anaerobic digestion at large livestock operations. The program was a joint initiative founded by the US EPA, USDA, and the US DOE in 1992. The program performs outreach related to anaerobic digestion and its benefits and potential in the US; provides credible information and tools that facilitate project development and show that systems really work; maintains a national database of anaerobic digester systems at livestock operations (<http://www.epa.gov/agstar/projects/index.html>); works with private sector partners and federal/state agencies to develop standards, protocols, programs, and initiatives; and delivers technical support and tools at the local level through extension events, workshops, training, and conferences. Each year, AgSTAR hosts a nationwide conference to discuss issues, trends, and innovations with anaerobic digestion in the livestock sector. Information about this and other biogas-related events can be found at: <http://www.epa.gov/agstar/news-events/events/index.html>.

USDA also plays an important role in domestic methane mitigation activities in the livestock sector. USDA has provided a number of grants and guaranteed loans to help offset the costs of anaerobic digester systems (http://www.epa.gov/agstar/documents/agstar_federal_incentives.pdf lists these opportunities); maintains standards for the construction of the systems; and works jointly with other organizations to fund initiatives that promote anaerobic digestion through a variety of means, including research and demonstration projects. The offices of Rural Development (<http://www.rurdev.usda.gov/Home.html>) and the Natural Resources Conservation Service (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/home>) have played key roles in these efforts.

Additionally, USDA signed a Memorandum of Understanding (MPU) with EPA to support the AgSTAR program and expand on the amount of outreach and technical assistance offered by the program. USDA also signed an MOU with the Innovation Center for US Dairy dedicated to increasing the number of anaerobic digestion systems processing dairy wastes.

Various state and local agencies also offer funding to anaerobic digestion projects. An up-to-date list of these sources can be found at: <http://www.epa.gov/agstar/tools/funding/index.html>.

Internationally, EPA leads US government efforts to promote methane mitigation from agricultural sources (both livestock and agro-industrial facilities) through their participation in the Global Methane Initiative (GMI). EPA provides assessments, tools, analyses, demonstration projects, training, and various other forms of institutional and capacity building. EPA also coordinates with multi-national lending agencies such as the World Bank, Global Environment Facility, Interamerican Development Bank, and Asian Development Bank to provide technical assistance to broad agricultural projects that establish or improve anaerobic digestion practices and programs around the world. EPA has also helped in the development of applications for these projects to establish Programs of Activities (PoA) for the Clean Development Mechanism. Finally, EPA shares success stories and lessons learned in the development of anaerobic digestion projects with all levels of countries through GMI meetings and its annual accomplishments report (available at: <http://www.epa.gov/globalmethane/accompreport.htm>)

Generally, EPA's assistance to developing countries involves a number of steps aimed at providing the level of capacity building, institutional building, and technical assistance needed to create an environment that fosters the development of a thriving anaerobic digestion sector. This involves conducting *Resource and Capacity Assessments* to determine the status and potential of anaerobic digestion in the country's agricultural sector, as well as any existing policies and incentives that promote these projects. Then, targeted demonstration and phased implementation of a PoA (where appropriate) develops awareness and transfers appropriate technologies through certified training. Thirdly, we address technical, financial, and policy barriers. Finally, we work with the country to expand on this success through extension-style workshops and events

Country Priorities

Domestically, AgSTAR focuses on providing credible information to the public, project developers, regulatory officials and policymakers. This involves gathering data, conducting analyses, and dissemination through the AgSTAR website, as well as direct outreach. AgSTAR also collaborates with other organizations and government agencies on projects involving AD research or the development of tools.

For 2013, EPA aims to:

- Create a comprehensive mapping tool that will provide information on existing AD systems and aid in future project development.
- Develop prototype information for an investment focused on projects with beneficial environmental impacts (specifically, AD).
- Convene a national conference focused on promotion of AD systems in the livestock waste management sector.

Internationally, U.S. actions through GMI in the agriculture sector focus on countries where reductions are obtainable, country partners are committed to action, and multilateral climate initiatives or other climate finance approaches create market drivers that foster project development. It is important to recognize that countries with high emissions do not necessarily coordinate to high reductions if there is not a national commitment to fostering AD development. Also, collaboration is enhanced when programmatic frameworks are already in place or viable.

For 2013, EPA is focusing on the following activities:

- China – expand work on a provincial scale program in Guangdong province; connect project activities in Guangdong to Hubei and Hunan provinces; conduct supporting environmental performance evaluations of existing AD systems; and support the development of an alternative swine hi-rise production building that provides a new methane mitigating option to the swine sector.
- Philippines – expand awareness and technology options available to the swine PoA and incorporate small and medium scale farms into the Philippine Methane Partnership program.
- Thailand – Evaluate appropriate methane mitigating options for market wet waste; continue support of large scale farms under the operating PoA and expand the deployment of small scale AD technology and skills transfer.
- Vietnam – Create an awareness of technical opportunities in the food processing industry and explore opportunities to expand deployment of AD's through swine cooperatives and small-scale farms.

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- India – Develop AD technology for medium-scale dairy sector.
- Mexico – Verify and improve AD technology.
- Indonesia – Explore programmatic and technical opportunities with the World Bank and USAID.
- Nicaragua – Coordinate a Resource and Capacity Assessment with the IDB.
- Brazil – Initiate awareness and transfer AD technology to the swine sector.
- Indonesia – Coordinate activities with World Bank and USAID.
- Nicaragua – Conduct a Resource and Capacity Assessment.

Additional Resources

Key players in the U.S. market:

Public Sector

- US Department of Agriculture (USDA)
 - Provides funding through grants and guaranteed loan programs to AD projects, as well as related research (<http://www.epa.gov/agstar/tools/funding/index.html>)
 - Sets standards for AD system construction (<http://www.epa.gov/agstar/documents/366.pdf>)
 - Assists producers with nutrient management plans related to crop application and other disposal/spread of manure through the Natural Resources Conservation Service (<http://www.nrcs.usda.gov/wps/portal/nrcs/main/national/home>)
 - Works in other countries through Foreign Agricultural Service (<http://www.fas.usda.gov/>)
- US Environmental Protection Agency (USEPA)
 - Promotes livestock manure-based AD projects through AgSTAR, a voluntary program that provides outreach and technical tools for the sector (www.epa.gov/agstar)
 - Provides overall guidance and regulations related to air and water pollution; rules for meeting these regulations are usually promulgated at a State or local level (<http://www.epa.gov/agstar/tools/permitting.html>)
- State and local agencies (environmental, agricultural, solid waste, etc)
 - Provide permits for AD projects depending on size, location, and feedstock. AgSTAR has a summary of the major requirements for states with multiple AD projects at: (<http://www.epa.gov/agstar/tools/permitting.html#statereqs>)
- US Department of State (USDoS)
 - Provides funding for US assistance in foreign agricultural methane emission reduction activities through the Global Methane Initiative (www.globalmethane.org)
- US Agency for International Development (USAID)
 - Develops on-the-ground programs in foreign countries that may include agricultural AD projects (http://www.usaid.gov/our_work/agriculture/)

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- US Department of Commerce (USDoC)
 - o Promotes the export of US renewable energy technologies (<http://www.commerce.gov>; <http://www.commerce.gov/news/secretary-speeches/2010/02/04/national-exports-initiative-remarks>)
- US Department of Energy (USDOE)
 - o Historically promoted AD and funded research of novel applications; no current work in this area (<http://www1.eere.energy.gov/biomass/>)
- US Department of the Treasury
 - o Offers tax credits for producers of renewable energy (<http://www.irs.gov>; http://www.irs.gov/irb/2006-42_IRB/ar07.html)

Private Sector

- Project Developers and Equipment Providers
 - o Refer to AgSTAR's Industry Directory (<http://www.epa.gov/agstar/tools/directory.html>) for self-reported listings by companies offering these services
 - o Refer to AgSTAR's Database (<http://www.epa.gov/agstar/projects/index.html>) to see the companies who have developed AD projects
- Investors/Lenders
 - o As noted above, have historically been agricultural lenders. Overall there is no comprehensive source, but some may be listed in the AgSTAR Industry Directory (<http://www.epa.gov/agstar/tools/directory.html>)
- Recycling Associations/Waste Haulers (<http://www.biocycle.net/resources/recycling-associations/>) – potential feedstock suppliers
- Trade & Industry Associations –
 - o Innovation Center for US Dairy – national dairy industry association's arm that handles dairy sustainability (<http://www.usdairy.com/Pages/Home.aspx>)
 - o National Pork Producers Council – national swine industry association (<http://www.nppc.org/>)
 - o American Biogas Council – trade association for companies in the biogas industry (<http://www.americanbiogascouncil.org/>)
 - o Producer Groups – vary by region/state (e.g. Northeast Dairy Producers Association, Western United Dairywomen, NC Pork Producers Council) (<http://nedpa.org/new/>, <http://www.pdmp.org/>, <http://www.westernuniteddairywomen.com/>, etc.)
- Carbon credit related
 - o Climate Action Reserve – develops standards for project registration of carbon credits (<http://www.climateactionreserve.org/>)
 - o Gold Standard (<http://www.cdmgoldstandard.org/>)

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- Renewable energy groups
 - o American Council on Renewable Energy – dedicated to building a secure and prosperous America with clean, renewable energy (<http://www.acore.org/>)
 - o 25x25 – coalition with the goal of securing 25 percent of the nation’s energy needs from renewable sources by the year 2025 (<http://www.25x25.org/>)
 - o Interstate Renewable Energy Council – committed to accelerating the sustainable utilization of renewable energy (<http://www.irecusa.org/>)

Non-profits/NGOs (Non-governmental organizations)

- World Wildlife Fund
 - o Collaborates on beef and dairy sustainability projects in the US and around the world (<http://www.worldwildlife.org/what/globalmarkets/agriculture/beef.html>)
- Farm Pilot Project Coordination, Inc.
 - o Oversees the implementation and administration of a pilot project program to demonstrate economically viable innovative treatment technology systems that reduce the nutrient content of the waste stream from animal feeding operations by 75 percent or greater. (<http://www.fppcinc.org/>)
- Great Plains Institute
 - o Focuses on developing a “healthy and economically viable society” in the Midwest (<http://www.gpisd.net/>)
- Wisconsin Bioenergy Initiative
 - o Statewide effort focused on coordination of research and promotion of bioenergy, including agricultural and agro-industrial AD (<http://www.energy.wisc.edu/research-centers/wisconsin-bioenergy-initiative/>)

Utilities

- Multiple utilities exist in each state; public utilities have to follow guidelines set by the Public Utility Commission but private utilities and/or cooperatives set their own guidelines

Universities

- For a listing of some of the universities involved in AD research, please see AgSTAR’s webpage at: (<http://www.epa.gov/agstar/lib/index.html>)

Publications

- Biocycle - Composting and organics recycling magazine covers the processing of organic residuals - woody materials, yard trimmings, municipal solid waste (MSW), food residuals, biosolids, manure and other feedstocks into value-added products (<http://www.biocycle.net/>)

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Key Industry Conferences

- AgSTAR National Conference (<http://www.epa.gov/agstar/news-events/events/index.html>)
- Biocycle Renewable Energy (www.biocycleenergy.com) and Biocycle West (www.jgpress.com/westcoast),
- Biogas USA and Biogas East & Midwest (http://www.greenpowerconferences.com/home/allevents?search_topic=Biogas&search_product=&search_region=&period=Upcoming)