

# THE STATUTORY, REGULATORY, AND POLICY FRAMEWORK FOR REDUCING METHANE FROM LIVESTOCK IN THE UNITED STATES

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Methane is a powerful greenhouse gas (GHG) that accounts for approximately 11 percent of anthropogenic GHG emissions in the United States.<sup>1</sup> Methane has a shorter atmospheric life than carbon dioxide (CO<sub>2</sub>), but it has more than 80 times the warming impact over a 20-year period than CO<sub>2</sub>.<sup>2</sup> In the US, agriculture is the largest anthropogenic source of methane emissions (37%),<sup>3</sup> followed by the oil and natural gas sector (30%) and landfills (17%). Most agricultural methane emissions come from manure decomposition and enteric fermentation (which is part of the digestive process in cows and other ruminant animals).<sup>4</sup>

To decrease methane emissions in line with US climate goals over the next twenty years, emissions from manure decomposition and enteric fermentation will need to be reduced. For manure decomposition, EPA identifies manure management practices that livestock operations can implement to reduce emissions.<sup>5</sup> One commonly used practice is capturing methane using anaerobic (without oxygen)

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- <sup>1</sup> By million metric tons of carbon dioxide equivalent. EPA, *Inventory of U.S. Greenhouse Gas Emissions and Sinks*, <https://www.epa.gov/ghgemissions/inventory-us-greenhouse-gas-emissions-and-sinks> (last visited Sep. 4, 2024).
  - <sup>2</sup> EPA, *Understanding Global Warming Potentials*, <https://www.epa.gov/ghgemissions/understanding-global-warming-potentials> (last visited Sep. 4, 2024); International Energy Agency, *Methane and Climate Change*, <https://www.iea.org/reports/methane-tracker-2021/methane-and-climate-change> (last visited Sep. 4, 2024).
  - <sup>3</sup> Some say oil and gas is a larger contributor of methane emissions because they treat enteric fermentation (27% US methane emissions) and manure management (10% US methane emissions) as separate sources. See White House Office of Domestic Policy, U.S. Methane Emissions Reduction Action Plan at 6 (Nov. 2021), <https://www.whitehouse.gov/wp-content/uploads/2021/11/US-Methane-Emissions-Reduction-Action-Plan-1.pdf>.
  - <sup>4</sup> Forty percent of total methane emissions come from natural sources, such as wetlands and permafrost. *Id.*; NASA, *Methane*, <https://climate.nasa.gov/vital-signs/methane/?intent=121> (latest measurement Feb. 2024).
  - <sup>5</sup> EPA publishes a list of the most effective manure management practices for methane emissions reductions. EPA, *Practices to Reduce Methane Emissions from Livestock Manure Management*, <https://www.epa.gov/agstar/practices-reduce-methane-emissions-livestock-manure-management> (last visited Sep. 4, 2024).



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digestion.<sup>6</sup> In anaerobic digestion, microbes decompose manure to produce, among other things, biogas (which is made up of methane, CO<sub>2</sub>, water vapor, and trace amounts of other gases).<sup>7</sup> This biogas can be captured for use in heat or electricity or purified into renewable natural gas (RNG), which is largely comprised of methane and can be sold for use as a combustion fuel for electricity, heating, or transportation.<sup>8</sup> Other manure management practices include spreading manure or anaerobic digestate on crops;<sup>9</sup> using pasture-based management, in which operators rotate the animals through a series of different pastures; and composting, in which microbes decompose manure in an aerobic setting.<sup>10</sup>

For enteric fermentation, researchers continue to research potentially effective and commercially viable solutions to reduce methane emissions from livestock often focusing on diet management and food additives,<sup>11</sup> vaccines,<sup>12</sup> and selective breeding.<sup>13</sup> In addition to these potential technological solutions, some researchers have suggested that governments in high-income countries should encourage dietary changes to reduce demand for livestock.<sup>14</sup>

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- 6 Methane emissions from landfills, flooded-rice production (paddy rice), manure, and livestock are the result of anaerobic digestion (decomposition) of organic matter though the details of the chemistry vary somewhat from case to case. The same is true of methane emissions from naturally-occurring wetlands. I refer to “anaerobic digesters” throughout this brief, which are constructed devices for *confining* methane, which is then conveyed to storage and locations where it is used. The process of anaerobic digestion inside a digester is essentially identical to what would occur in an unconfined setting for a given type of organic matter — most often in this brief, manure.
- 7 EPA, *How Does Anaerobic Digestion Work?*, <https://www.epa.gov/agstar/how-does-anaerobic-digestion-work> (last visited Sep. 26, 2024).
- 8 EPA reports that anaerobic digestion reduces methane emissions more than any other manure management practice by directly capturing methane emissions from manure and indirectly reducing emissions of other greenhouse gases. Nitrous oxide emissions may increase with anaerobic digester systems. The residual solid and liquid waste material can be stored or treated and applied to the land. *Id.*; see also EPA, *Practices to Reduce Methane Emissions from Livestock Manure Management*, *supra* note 5. Notably, some scientists, environmental advocates, and communities raise concerns with anaerobic digester systems, which can leak methane, increase the emission or discharge of co-pollutants that are harmful to human health, produce strong odors, and present risks of major accidents or explosions. Marco Tamburini *et al.*, *Analysing the Impact on Health and Environment from Biogas Production Process and Biomass Combustion: A Scoping Review*, 20 *Int. J. Environ. Res. Public Health* 5305 (2023); Ji-Qin Ni, *Cases, Causes, and Impacts of Safety Incidents at AD Systems* (March 10, 2023), <https://engineering.purdue.edu/ad/workshop/230310/ni.pdf>. Critics also argue that funding for digesters benefits large Confined Animal Feeding Operations (CAFOs) over smaller livestock operations, creates competition for solar and wind subsidies, and entrenches fossil fuel industries. This opposition can inform how policymakers engage communities, permit new and existing operations, and create new incentive programs. Energy Justice Network, *Anaerobic Digesters* <https://www.energyjustice.net/digesters> (last visited Sep. 17, 2024).
- 9 When anaerobic digesters are fed with farmyard manure and slurry (FYM&S), the feedstock may contain concentrated nutrients and pathogens capable of surviving the anaerobic digestion process. When applied to farmland, the digestate then runs off into nearby water systems and can contaminate nearby ecosystems and drinking water supplies. See, e.g., Will Atwater, *Wayne County Wetland Continues to Suffer: Farm with Massive Hog Waste Spill Nets New Violations Amid Bacteria Concerns*, *North Carolina Health News* (July 28, 2023).
- 10 EPA, *Practices to Reduce Methane Emissions from Livestock Manure Management*, *supra* note 5.
- 11 Diet management refers to feeding animals high-quality forage to increase digestibility. Juan Vargas *et al.*, *Feeding Strategies to Mitigate Enteric Methane Emission from Ruminants in Grassland Systems*, *Animals (Basel)* (May 2022), <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9099456/>; Daniel Lapidus & Kirsten Franzen, *New Feed Additives Show Promise for Reducing Enteric Methane*, RTI International (June 16, 2023); MD Najmul Haque, *Dietary Manipulation: a sustainable way to mitigate methane emissions from ruminants*, 60 *J. Animal Science & Tech.* (June 18, 2018), <https://janimscitechnol.biomedcentral.com/articles/10.1186/s40781-018-0175-7#:~:text=Md%20Najmul%20Haque,reduce%20methane%20emission%20from%20ruminants.>
- 12 Victoria Baca-Gonzales *et al.*, *Are Vaccines the Solution for Methane Emissions from Ruminants? A Systemic Review*, *Vaccines (Basel)*, <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7565300/> (Sep. 2020).
- 13 Yvette de Haas *et al.*, *Selective Breeding as a Mitigation Tool for Methane Emissions from Dairy Cattle*, 15 *Animal* 100294 (Dec. 2021), <https://www.sciencedirect.com/science/article/pii/S1751731121001373>.
- 14 Food and Agriculture Organization of the United Nations, *Pathways Towards Lower Emissions: A Global Assessment of the Greenhouse Gas Emissions and Mitigation Options from Livestock Agrifood Systems* (2023), <https://openknowledge.fao.org/server/api/core/bitstreams/a06a30d3-6e9d-4e9c-b4b7-29a6cc307208/content>.

As livestock operators implement technologies to reduce methane emissions from enteric fermentation and manure decomposition, it is important to consider the role and options for federal and state policies to drive emissions reductions from livestock operations. Currently, federal and state agencies oversee methane emissions from cattle operations by:<sup>15</sup>

- setting methane emissions targets and outlining strategies for the agricultural sector,
- providing incentives for operations to adopt climate-smart practices,
- requiring emissions tracking and reporting from large livestock operations, and
- requiring permits for certain manure management systems.<sup>16</sup>

In this paper, I focus on the first two policy options — emission targets and incentives to reduce methane emissions from livestock in the US.<sup>17</sup> In Section I describe federal and state targets to reduce emissions from the sector.<sup>18</sup> In Section II, I explain the statutory authority for federal and state programs and describe how the incentives are being implemented.

## I. Targets and action plans

The federal government, twenty-four states, and the District of Columbia have legislative or executive targets to reduce GHGs and/or methane emissions.<sup>19</sup> Though these targets vary in specificity and enforceability, even voluntary economywide targets can create momentum for governments to reduce emissions from livestock operations. Below, I describe the federal methane action plan and provide two examples of state targets — California, which has a stringent and enforceable target, and Minnesota, which has a general target similar to many other states' targets.

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<sup>15</sup> In this paper, we focus on policies to reduce emissions from cattle, though other animals also contribute to livestock methane emissions, and these animals could be a focus of future research. For example, although pigs have relatively low enteric methane emissions, pig manure produces methane emissions and federal and state incentives can be used on pig farms. EPA, *Anaerobic Digestion on Swine Farms* (last visited Sep. 26, 2024), <https://www.epa.gov/agstar/anaerobic-digestion-swine-farms>.

<sup>16</sup> For example, at the federal level, the US Department of Agriculture (USDA) administers grant and loan programs, the Internal Revenue Service (IRS) implements tax credits for biogas produced from manure, and the Environmental Protection Agency (EPA) requires emissions reporting and permits from large livestock operations and administers incentives for manure management systems. States also set goals, issue incentives, and require reporting and permitting, though the level of stringency varies across the country.

<sup>17</sup> We do not cover mandatory reporting and permitting programs, which provide state and federal agencies with information about methane emissions from manure management. Permitting and reporting could be a topic for further research. EPA generally exempts agriculture from its GHG reporting program, but requires livestock operations with manure management systems that emit more than 25,000 metric tons of carbon dioxide annually to report their annual GHG emissions, including methane. Additionally, a Clean Water Act permitting program requires large livestock facilities (CAFOs) to report the amount of manure processed each year, though environmental advocates complain that enforcement of the requirement is insufficient. Notably, a CAFO was shut down in Michigan in 2023 over a permitting dispute. See 40 C.F.R. § 98 Subpart JJ; 40 C.F.R. § 122.23(d)–(f); Food & Water Watch, *et al. v. EPA*, No. 23-2146 (9th Cir. Sep. 08, 2023); *Michigan Farm Bureau v. Michigan Department of Environment, Great Lakes, and Energy*, Docket No. 165166 (May 31, 2023 Mich.).

<sup>18</sup> For this paper, we provide examples of stringent, ambitious, or representative state policies, but we did not conduct a 50-state survey. Some local governments offer incentives, but we do not cover any municipal or county-level incentives or policies in this paper.

<sup>19</sup> C2ES, *State Climate Policy Maps*, <https://www.c2es.org/content/state-climate-policy/> (last visited Sep. 6, 2024).

## A. The Biden administration’s economywide methane target and Emissions Reduction Action Plan

At the 2021 United Nations Conference of the Parties (COP) in Glasgow, the Biden administration signed the Global Methane Pledge, in which it committed to work with 102 other countries to reduce global methane emissions 30 percent below 2020 levels by 2030. (There are 158 national governments that have signed the pledge as of March 2024.<sup>20</sup>) While the pledge did not specify what actions the US would take to contribute to the goal target, the administration also announced an economywide [Methane Emissions Reduction Action Plan](#), identifying priority actions to reduce domestic methane emissions, including four incentive-based initiatives to reduce agricultural methane emissions:

1. encouraging “the adoption of alternative manure management systems and other methane-reducing practices”;
2. encouraging “the expansion of on-farm generation and use of renewable energy”;
3. launching a climate-smart agricultural commodities partnership initiative; and
4. promoting “increased investments in agricultural methane quantification and related innovations.”

In December 2023, the administration released a [progress report](#) with updates on all four agricultural initiatives. To date, the federal policies are all incentive-based and the US does not have a national regulatory requirement to reduce methane emissions from the agricultural sector. I describe progress on these federal initiatives in the incentives section below.

## B. California’s agricultural methane target

In 2016, the California legislature passed Senate Bill 1383 (SB 1383), which requires the California Air Resources Board (CARB) to adopt a strategy to reduce methane emitted from landfills and livestock by up to 40 percent below 2013 levels by 2030.<sup>21</sup> In 2017, CARB published the Short-Lived Climate Pollutant Reduction Strategy, which explains that the agency will work to increase certainty around existing financial incentives; develop new grant programs and pilot projects; and consider whether recordkeeping, reporting, or emissions reduction regulations are needed to reduce methane from the livestock sector.<sup>22</sup> In 2022, CARB released a [progress report](#) on the strategy and concluded that emissions reductions projected under current policy and incentives, including the livestock strategy, would get the state about halfway to their 2030 goal.

SB 1383 also requires CARB to adopt regulations to reduce methane emissions from manure and to implement them on or after January 1, 2024, if CARB determines that the regulations:

- are technologically and economically feasible;
- are cost effective;

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<sup>20</sup> Global Methane Pledge, <https://www.globalmethanepledge.org/> (last visited Sep. 5, 2024).

<sup>21</sup> Short-lived climate pollutants: methane emissions, 2016 Cal. Legis. Serv. Ch. 395 (S.B. 1383).

<sup>22</sup> California’s strategy refers to the “dairy and livestock” sectors. The state has significant dairy emissions and some projects are focused solely on dairies. California Air Resources Board, Short Lived Climate Pollutant Reduction Strategy at 71 (Mar. 2017), [https://ww2.arb.ca.gov/sites/default/files/2020-07/final\\_SLCP\\_strategy.pdf](https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf).

- “include provisions to minimize and mitigate potential leakage” to other jurisdictions (although it is unclear how this would be assessed, except retroactively); and
- account for the progress made by incentive-based programs.

In March 2024, environmental organizations petitioned CARB to immediately begin rulemaking for the sector as required by SB 1383, which CARB declined in May 2024.<sup>23</sup> Although CARB is electing to only use an incentive-based strategy, SB 1383 authorizes regulation under certain criteria. Thus, California likely has the most specific, enforceable, and legally durable agricultural methane target in the US.

### C. Minnesota’s economywide GHG target

In 2007, the Minnesota legislature passed the Next Generation Energy Act SF 145, and updated the act in 2022 to require the state to reduce its total GHG emissions by 50 percent below 2005 levels by 2030 and achieve net zero by 2050.<sup>24</sup> The act requires the commissioner of agriculture to submit a climate change action plan, but the statute is otherwise silent on the extent to which the agricultural sector must contribute to state emissions reductions.<sup>25</sup>

In 2022, the Walz administration published an executive plan to achieve the state’s climate targets and indicated that the administration is currently “investigat[ing] feasibility and implementation of methane reduction activities related to livestock and manure.”<sup>26</sup> In contrast with California’s specific and enforceable target, Minnesota’s statute is not methane-specific, does not authorize regulatory action for the agricultural sector, and does not require a specific portion of the emissions reductions to come from the agricultural sector.

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<sup>23</sup> CARB granted the petition in part, but not as to immediate commencement of the rulemaking process. Petition for Rulemaking to Regulate Methane and Other Air Pollutants from California Livestock filed by Climate Action California (Mar. 1, 2024) [https://ww2.arb.ca.gov/sites/default/files/2024-03/240301\\_CAC-methane-petition.pdf](https://ww2.arb.ca.gov/sites/default/files/2024-03/240301_CAC-methane-petition.pdf); CARB Response to Petition for Rulemaking to Regulate Methane and Other Air Pollutants from California Livestock (May 30, 2024) <https://ww2.arb.ca.gov/sites/default/files/2024-05/2024-05-30-CARB-CDFA-Response-to-Dairy-Rulemaking-Petition.pdf>.

<sup>24</sup> The 2007 act had GHG emissions reduction targets, but the targets in the 2022 act are more stringent. Minn. Stat. Ann. § 216H.02.

<sup>25</sup> *Id.*

<sup>26</sup> Minnesota Climate Action Framework, *Summary of Climate Actions* (2022), <https://climate.state.mn.us/sites/climate-action/files/State%20action%20steps.pdf>.

**Table 1: Comparison of state and federal agricultural methane emissions targets**

	Jurisdiction		
	Federal	California	Minnesota
<b>Target</b>	Global methane emissions 30% below 2020 levels by 2030	State methane emissions 40% below 2013 levels by 2030	Total GHG emissions by 50% below 2005 levels by 2030
<b>Authority</b>	<b>Executive</b> , Methane Emissions Reduction Action Plan	<b>Statutory</b> , SB 1383	<b>Statutory</b> , SF 145 (as amended)
<b>Applies to livestock operators?</b>	Yes, but not agriculture-specific	Yes, includes <b>livestock and waste-specific</b> targets	Yes, but not agriculture-specific
<b>Implementation and enforceability</b>	Incentives-based only	Requires CARB to issue livestock regulations if certain factors are met <sup>27</sup>	Requires a state climate action plan, no livestock-specific regulatory authorization

## II. Incentives

In the US, most federal and state programs overseeing methane emissions from livestock rely on financial incentives — funding and support for livestock operators to adopt emissions-reducing practices or technologies. At the federal level, the USDA provides financial, planning, and technical assistance for a variety of conservation practices; Treasury and the IRS administer renewable energy tax credits to operators who use biogas produced from anaerobic digestion; and EPA provides incentives for operators who produce biogas from anaerobic digestion. States supplement this federal funding through regulatory program incentives and grant and loan programs.

All the federal and state funding sources discussed below can be spent on anaerobic digester systems (or components thereof), and in some cases, multiple funding sources can be combined to support the same digester system. This incentive structure could increase the construction and use of anaerobic digesters, which can cost between \$1.2 million to \$5 million to purchase and install.<sup>28</sup>

By contrast, fewer funding sources are available to reduce emissions from enteric fermentation, although the federal government is investing in enteric fermentation research. For example, in addition to the domestic programs we discuss below, the US is working with Ireland, New Zealand, and private and philanthropic partners on the Enteric Fermentation Research & Development Accelerator, a \$200 million grant program to coordinate and expand global research on methane emissions from enteric fermentation.<sup>29</sup>

<sup>27</sup> Even though the target is to reduce methane emissions *by 40 percent*, the regulatory authorization specifies that CARB, “shall adopt regulations to reduce methane emissions from livestock manure management operations and dairy manure management operations, consistent with this section and the strategy, by *up to 40 percent* below the dairy sector’s and livestock sector’s 2013 levels by 2030” (emphasis added).

<sup>28</sup> E3A: Anaerobic Digester Applications for the Farm or Ranch, Univ. of Missouri, <https://extension.missouri.edu/media/wysiwyg/Extensiondata/Pub/pdf/energymgmt/emo703.pdf> (Dec. 2014).

<sup>29</sup> Press Release, Global Methane Hub, *Enteric Fermentation Research & Development Accelerator, a \$200M Agricultural Methane Mitigation Funding Initiative* (Dec. 2, 2023), <https://www.globalmethanehub.org/2023/12/02/enteric-fermentation-research-development-accelerator-a-200m-agricultural-methane-mitigation-funding-initiative/>.

Below, I describe the statutory authority for and implementation of incentives offered by the USDA, Treasury, IRS, and EPA, and provide examples of selected incentives from California, Michigan, and states involved in the Regional Greenhouse Gas Initiative (RGGI).

## A. USDA financial, planning, and technical assistance

Congress authorizes the USDA to administer conservation programs through the farm bill — omnibus legislation passed approximately every five years authorizing US agriculture programs. The farm bill’s conservation title directs the USDA to offer grants, loans, and technical assistance to operations that adopt practices to reduce greenhouse gas emissions from agriculture and appropriates funding for these programs.<sup>30</sup> The USDA’s Natural Resources Conservation Service (NRCS) administers conservation programs.<sup>31</sup> The farm bill’s energy title includes loans and grants for biofuels produced through anaerobic digestion.

The Inflation Reduction Act (IRA) appropriates an additional \$19.5 billion for the USDA’s conservation programs.<sup>32</sup> The IRA specifies that this additional conservation funding must be spent on climate practices that “directly improve soil carbon, reduce nitrogen losses, or reduce, capture, avoid, or sequester carbon dioxide, methane, or nitrous oxide emissions, associated with agricultural production.”<sup>33</sup>

Congress passed the last farm bill in 2018 and is in the process of negotiating its reauthorization.<sup>34</sup> As currently written, both the House and Senate versions of the farm bill would reallocate the USDA’s unspent conservation IRA funds to the Conservation Title of the farm bill. It is not yet clear if Congress will apply the same climate constraints it defined in the IRA to the unspent conservation funds.<sup>35</sup>

USDA programs that help finance anaerobic digesters or enteric fermentation solutions include the Environmental Quality Incentives Program (EQIP), the Conservation Stewardship Program (CSP), the Rural Energy for America Program (REAP), and Partnerships for Climate Smart Commodities (PCSC). I describe these programs below.

### 1. *The Environmental Quality Incentives Program (EQIP)*

The 1996 farm bill establishes EQIP to provide flexible assistance to agricultural producers for planning and installing conservation practices and to “avoid[], to the maximum extent practicable, the need for resource and regulatory programs.”<sup>36</sup> Congress directs the USDA (through the NRCS) to implement EQIP and to provide training to help agricultural producers carry out their projects.<sup>37</sup> Congress has

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<sup>30</sup> Conservation funding typically makes up approximately seven percent of the farm bill and includes a variety of climate and conservation practices. NRCS, <https://www.nrcs.usda.gov/> (last visited Sep. 19, 2024).

<sup>31</sup> *Id.*

<sup>32</sup> Inflation Reduction Act, PL 117–169, 136 Stat 1818 § 21101 (Aug. 16, 2022).

<sup>33</sup> *Id.*

<sup>34</sup> The last farm bill was set to expire in 2023, but Congress extended it while it negotiates the new farm bill.

<sup>35</sup> The House Bill would remove the climate constraints, while the Senate Bill would not make changes to the climate constraints. *Compare* Farm, Food, and National Security Act of 2024, H.R. 8467 118th Cong. (2024); *with* The Rural Prosperity and Food Security Act of 2024, Section-by-Section Summary, [https://www.agriculture.senate.gov/imo/media/doc/rural\\_prosperity\\_and\\_food\\_security\\_section-by-section.pdf](https://www.agriculture.senate.gov/imo/media/doc/rural_prosperity_and_food_security_section-by-section.pdf) (last visited Sep. 26, 2024).

<sup>36</sup> 16 U.S.C. § 3839aa.

<sup>37</sup> *Id.*

continued to fund EQIP in subsequent farm bills, and most recently with \$8.45 billion in the IRA. The current versions of the farm bill in the House and Senate would reauthorize the program without major changes.<sup>38</sup>

Congress requires NRCS to rank applications on their cost-effectiveness and conservation benefits and to award at least 50 percent of EQIP funding to livestock operations. NRCS assists agricultural producers through the EQIP application process, ranks and selects projects based on published program criteria, and provides funding and implementation assistance to individual livestock producers.<sup>39</sup>

The IRA's additional EQIP funding may only be used for "climate-smart" conservation projects.<sup>40</sup> NRCS maintains a list of conservation activities, a subset of which it classifies as "climate-smart".<sup>41</sup> NRCS classifies feed management to reduce enteric fermentation as a "climate-smart" practice, and the IRA directs NRCS to prioritize proposals for feed management.<sup>42</sup> NRCS also classifies compost-bedded manure storage facilities (where manure is composted within the animal housing) and roofs that cover stored manure and capture biogas to be "climate-smart practices," however, EQIP cannot be used for equipment that uses anaerobic digestion to generate combustible fuel.<sup>43</sup>

EQIP has some significant limitations — it can only be used for the adoption of *new* conservation practices and cannot fund the maintenance of existing projects. Additionally, the program can only reimburse up to 75 to 90 percent of project costs, and awards are capped at \$450,000.<sup>44</sup> The program is oversubscribed, and only about 25 percent of projects that apply receive awards.<sup>45</sup>

## 2. The Conservation Stewardship Program (CSP)

The 2008 farm bill establishes the CSP to "encourage producers to... undertak[e] additional conservation activities; and...improv[e], maintain[] and manag[e] existing conservation activities."<sup>46</sup> The farm bill requires USDA to "identify priority resource concerns" for each state and gives USDA discretion to allocate funding based on how much eligible land each state has, the conservation needs of each state, the effectiveness of each state's program, and other considerations to achieve equitable distribution.<sup>47</sup>

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<sup>38</sup> H.R. 8647, 118th Cong. (2024); NRCS, *Inflation Reduction Act*, <https://www.nrcs.usda.gov/about/priorities/inflation-reduction-act> (last visited Sep. 17, 2024).

<sup>39</sup> Ranking criteria generally vary by state and operation-type. Ranking criteria for FY 2023 are available at <https://www.nrcs.usda.gov/sites/default/files/2022-11/2023%20EQIP%20Ranking%20for%20Publication.pdf>.

<sup>40</sup> Inflation Reduction Act, PL 117–169, 136 Stat 1818 § 21101 (Aug. 16, 2022).

<sup>41</sup> NRCS, *Climate-Smart Agriculture and Forestry Mitigation Activities List for FY2025*, <https://www.nrcs.usda.gov/sites/default/files/2023-10/NRCS-CSAF-Mitigation-Activities-List.pdf>.

<sup>42</sup> H.R. 5376, 117th Cong. § 21001(a)(1).

<sup>43</sup> Jeff Porter, *Presentation at USDA Agstar Utilizing NRCS for Anaerobic Digester Systems* (May 2018), [https://www.epa.gov/sites/default/files/2018-05/documents/agstar\\_webinar\\_9may2018\\_porter.pdf](https://www.epa.gov/sites/default/files/2018-05/documents/agstar_webinar_9may2018_porter.pdf).

<sup>44</sup> The maximum federal award can cover 75% of the project for most farmers and 90% of the project for new farmers and certain categories of minority farmers and farmers from underserved communities. Environmental Quality Incentives Program, 7 C.F.R. § 1466.24.

<sup>45</sup> Michael Happ, *Opening the Door for More Conservation: The Inflation Reduction Act's Impact on Access to farm bill Conservation Programs*, Inst. For Ag. & Trade Pol. (Jan. 2024), <https://www.iatp.org/opening-door-more-conservation>.

<sup>46</sup> Food Energy and Conservation Act of 2008, PL 110–246, June 18, 2008, 122 Stat 1651.

<sup>47</sup> 16 U.S.C § 3839aa.



Congress has continued to fund the CSP in subsequent farm bills.<sup>48</sup> Most recently, the IRA appropriated an additional \$3.25 billion for climate-smart CSP investments, and the program would be reauthorized under the current versions of both the House and Senate farm bill without any major changes.

Similar to EQIP, CSP provides agricultural producers with funding and technical assistance to develop and implement conservation, but unlike EQIP, CSP funding is available to continue implementing existing practices and there are no livestock set asides. NRCS recently raised the minimum annual payments under CSP to \$4,000 per year, and caps awards at \$50,000 per year.<sup>49</sup> About 35 percent of CSP applicants receive awards.<sup>50</sup>

### 3. Rural Energy for America Program (REAP)

The 2008 farm bill creates the Rural Energy for America Program (REAP) program and directs USDA to provide grants and loan financing for agricultural producers and rural small businesses to make energy efficiency improvements and install renewable energy systems, including anaerobic digesters.<sup>51</sup> Congress has continued to reauthorize the program in subsequent farm bills, and the IRA appropriates an additional \$1 billion to the program.<sup>52</sup> The USDA holds quarterly competitions to obligate REAP funding.<sup>53</sup> In 2023, the REAP program awarded grants of up to \$1 million to 12 anaerobic digester projects.<sup>54</sup>

### 4. Partnerships for Climate-Smart Commodities

The Commodity Credit Corporation Charter Act establishes a financial institution within the USDA, called the Commodity Credit Corporation (CCC), to stabilize and support agricultural commodity prices.<sup>55</sup> The act authorizes CCC to use its powers to “aid[] in the expansion of domestic markets,”<sup>56</sup> and USDA has interpreted this mandate to authorize grant programs for climate-smart practices.<sup>57</sup>

Using its existing authority in the Commodity Credit Corporation Charter Act and responding to President Biden’s methane pledge, the CCC launched the Partnerships for Climate-Smart Commodities (PCSC)

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48 There was a precursor program to the Conservation Stewardship Program, but it was much more limited in geographic and project scope.

49 USDA, *USDA Increases Minimum Annual Payment for Conservation Stewardship Program*, (Nov. 7, 2023) <https://www.nrcs.usda.gov/news/usda-increases-minimum-annual-payment-for-conservation-stewardship-program-o>.

50 Megan Stubbs, *Agricultural Conservation: A Guide to Programs*, Cong. Rsch. Serv. 40763 (Jul. 28, 2022), <https://sgp.fas.org/crs/misc/R40763.pdf>.

51 Food, Conservation, and Energy Act of 2008, *supra* note 43.

52 Inflation Reduction Act, PL 117–169, 136 Stat 1818 §§ 22002 (Aug. 16, 2022).

53 USDA Rural Energy for America Programs, *Announcing \$145 Million to Expand Access to Renewable Energy and Lower Energy Costs for Rural Americans*, <https://www.rd.usda.gov/inflation-reduction-act/rural-energy-america-program-reap> (last visited Aug. 8, 2024).

54 USDA Rural Development, *Rural Energy for America Program* (Nov. 1, 2023), <https://www.rd.usda.gov/media/file/download/usda-rd-reap-chart-11-01-2023.pdf>.

55 15 U.S.C. § 714.

56 *Id.*

57 In 2023, the Government Accountability Office released a report concluding that USDA’s proposed Partnerships for Climate Smart Commodities did not violate the CCC Charter Act. Government Accountability Office, *Decision on U.S. Department of Agriculture — Use of Commodity Credit Corporation Funds for Various Programs*, B-334146.1 (Sep. 20, 2023), <https://www.gao.gov/assets/870/861191.pdf>.

grant opportunity in 2022. The PCSC has awarded over \$3 billion to 141 projects on farms,<sup>58</sup> including several projects to reduce methane from livestock.<sup>59</sup>

For manure management, PCSC awarded the California Dairy Research Foundation up to \$85 million for financial incentives for dairy operators to adopt climate-smart manure management practices.<sup>60</sup> The California Dairy Research initiative is also attempting to create a market for “climate-smart” dairy, and some PCSC funding will be used for consumer-messaging analyses. This was the largest PCSC award for manure management, though many other awards support manure management. PCSC has also awarded grants for selective breeding of bulls designed to reduce enteric methane emissions in the next generations of dairy cows and beef cattle, and for methane emissions tracking and measurement on farms.

## B. IRS tax credits

The Internal Revenue Service (IRS) incentivizes anaerobic digester systems through three tax credit provisions.<sup>61</sup> Unlike the USDA grant programs, which typically award a fixed total amount through a competitive application process, these tax credits are unlimited while they are in effect.

### 1. The Investment Tax Credit (ITC)

Congress created the energy tax credit (now called the ITC) in 1978 to support non-fossil energy resources.<sup>62</sup> Congress has amended this credit several times, most recently in the IRA.<sup>63</sup> Under the IRA’s amendments to the tax code, anaerobic digester systems may generally claim a 30 percent tax credit for installation provided they begin construction before January 1, 2025 and convert biomass into at least 52 percent methane by volume.<sup>64</sup> In February 2024, the IRS and Treasury proposed a rule that would clarify what kinds of anaerobic digestion equipment are eligible for the credit.<sup>65</sup>

### 2. The Production Tax Credit (PTC)

Congress created the Production Tax Credit (PTC) in the Energy Policy Act of 1992 to support energy generated by renewable sources and most recently amended the credit in the IRA.<sup>66</sup> The PTC is available

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<sup>58</sup> See Request for Information, 86 Fed. Reg. 54149 (Sep. 30, 2021); USDA, *Partnerships for Climate Smart Commodities Dashboard*, [https://publicdashboards.dl.usda.gov/t/FPAC\\_PUB/views/PartnershipsForClimate-SmartCommodities/Overview?%3Aembed=y&%3AisGuestRedirectFromVizportal=y&%3Atoolbar=top](https://publicdashboards.dl.usda.gov/t/FPAC_PUB/views/PartnershipsForClimate-SmartCommodities/Overview?%3Aembed=y&%3AisGuestRedirectFromVizportal=y&%3Atoolbar=top), (last visited Aug. 8, 2024).

<sup>59</sup> USDA, *Partnerships for Climate-Smart Commodities Project Summaries*, <https://www.usda.gov/climate-solutions/climate-smart-commodities/projects> (last visited Aug. 8, 2024).

<sup>60</sup> *Id.*

<sup>61</sup> The Energy Tax Act of 1978 (P.L. 95–618). For more background on these tax credits, see Sam Strimling, *Clean Energy Tax Credits & Changes Made by the IRA*, EELP, <https://eelp.law.harvard.edu/wp-content/uploads/2024/08/IRA-tax-credits-explainer.pdf>.

<sup>62</sup> See 26 U.S.C. § 48E, as amended by the Inflation Reduction Act, PL 117–169, 136 Stat 1818 § 13702 (Aug. 16, 2022).

<sup>63</sup> *Id.*

<sup>64</sup> To receive the 30 percent tax credit, the project must meet wage and apprenticeship requirements. The tax credit may increase above 30 percent for projects in low-income communities, on Indian, or brownfield sites or communities that have historically produced or extracted fossil energy. *Id.*

<sup>65</sup> For systems constructed after 2025, the ITC will be replaced with Section 48E, which is a technology-neutral credit. Only zero emission technologies will qualify for the new credit, and therefore, digester systems constructed after 2025 will not be eligible for the new 48E credit. See Definition of Energy Property and Rules Applicable to the Energy Credit; Correction, 89 Fed. Reg. 13293 (Feb. 22, 2024).

<sup>66</sup> See 26 U.S.C. § 45Y, as created by the Energy Policy Act of 1992, Pub. L. 102–486, Oct. 24, 1992 and amended by the Inflation Reduction Act, PL 117–169, 136 Stat 1818 § 13701 (Aug. 16, 2022).

for energy generated by anaerobic digester systems that begin construction before January 1, 2025, with the size of the credit being based on the number of kilowatt hours generated by the digester system.<sup>67</sup>

An operator cannot claim both the ITC and the PTC for the same equipment, and the Department of Energy (DOE) has published guidance indicating which tax credit is appropriate for different types of projects.<sup>68</sup>

### 3. Clean Fuel Production Tax Credit (CFPC)

The IRA also established the Clean Fuel Production Tax Credit to support renewable transportation fuel produced after 2024 and sold before 2028.<sup>69</sup> This credit allows anaerobic digester systems that use manure to produce transportation fuel to earn a tax credit based on the secretary of the treasury's emissions factors beginning on January 1, 2025.<sup>70</sup> In May 2024, the IRS released [guidance on the CFPC](#). The IRS indicated that taxpayers who want to claim this credit must register with the IRS prior to 2025 and stated that the agency would release additional guidance on this tax credit at a later date.

## C. Environmental Protection Agency (EPA) renewable fuel credits

The Clean Air Act, the Energy Policy Act of 2005, and the Energy Independence and Security Act of 2007 require EPA to set a volume of renewable fuel to be used in transportation fuel, home heating oil, and jet fuel.<sup>71</sup> This volume is known as the Renewable Fuel Standard, or RFS. Under EPA's 2023 rule implementing the RFS, RNG produced by an anaerobic digester qualifies as a renewable fuel,<sup>72</sup> and refiners and importers of gasoline and diesel can purchase credits from livestock operators to comply with the standard.<sup>73</sup> Thus, although the program is not aimed at regulating digesters, it may provide an additional source of revenue to livestock operators with anaerobic digesters.

RFS rules are frequently litigated, and the D.C. Circuit upheld the 2020–2022 targets earlier this year, noting that it had also “resolved challenges to the Program’s renewable fuel requirements for every year between 2010 and 2019.”<sup>74</sup> Environmental, renewable fuel, and traditional oil and gas advocacy groups have challenged the 2023 rule, arguing that it is arbitrary and capricious and violates the Clean Air Act, the Endangered Species Act, and the Regulatory Flexibility Act.<sup>75</sup> The groups asked the D.C. Circuit to vacate and remand the standards. The court heard oral argument on November 1, 2024.

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<sup>67</sup> For anaerobic digester systems “placed in service” after December 31, 2024, it is unclear whether systems will continue to qualify for the production tax credit, and it likely depends on how the IRS defines lifecycle emissions in its final rule interpreting the IRA’s amendments to the tax code. See Section 45Y Clean Electricity Production Credit and Section 48E Clean Electricity Investment Credit, 87 Fed. Reg. 47792 (June 3, 2024).

<sup>68</sup> Department of Energy, *Federal Solar Tax Credits for Businesses*, <https://www.energy.gov/eere/solar/federal-solar-tax-credits-businesses> (last visited Sep. 17, 2024).

<sup>69</sup> Inflation Reduction Act, PL 117–169, 136 Stat 1818 § 13704 (Aug. 16, 2022).

<sup>70</sup> IRS, Section 45Z Clean Fuel Production Credit; Registration Notice 2024–49 (July 2024), <https://www.irs.gov/pub/irs-drop/n-24-49.pdf>.

<sup>71</sup> 42 U.S.C. § 7545.

<sup>72</sup> Provided that the RNG meets the required 60% lifecycle GHG emissions reductions. Renewable Fuel Standard (RFS) Program: Standards for 2023–2025 and Other Changes, 88 Fed. Reg. 44468 (July 12, 2023).

<sup>73</sup> *Id.*

<sup>74</sup> *Sinclair Wyoming Refining Company LLC v. EPA*, Docket No. 22–1210 (D.C. Cir.).

<sup>75</sup> *Center for Biological Diversity v. EPA et al.*, Docket No. 23–01177 (D.C. Cir.).

## D. State incentives

Similar to EPA's RFS program, state environmental regulatory programs may generate additional revenue that can be used to incentivize methane emissions reductions from livestock. I briefly outline four examples of state regulatory programs that are generating revenue for manure management practices. In addition to the incentives in these regulatory programs, states offer low-cost loans, tax credits, and smaller grant programs to encourage methane emission reductions from livestock, but we do not cover these in this overview.

### 1. California cap and trade

In 2006, California's legislature passed Assembly Bill 32 (A.B. 32), a comprehensive climate package that requires CARB to adopt regulations to reduce GHG emissions in the state. A.B. 32 establishes a statewide cap-and-trade program, though CARB exempts agricultural producers from having to comply with the program.<sup>76</sup> However, the state directs cap-and-trade allowance auction proceeds into a state environmental fund, and the state has used this fund to create grant opportunities for the implementation of manure management practices.

In 2023, the state directed \$319 million from cap-and-trade auction proceeds to support two manure management programs.<sup>77</sup> The Alternative Manure Management Program provides financial incentives for non-digester management practices and the Dairy Digester Research and Development Program provides financial incentives for digesters.<sup>78</sup>

### 2. Clean Fuel Standards

California, Washington, and Oregon each have Clean Fuel Standard (CFS) policies that require transportation fuel producers to lower the lifecycle GHG emissions associated with their fuel or to purchase credits to comply with the standard.<sup>79</sup> Although the programs do not require livestock operators producing RNG through anaerobic digestion to participate in the program, RNG producers can opt in to sell program credits to higher carbon fuel producers.

### 3. RGGI

The Regional Greenhouse Gas Initiative (RGGI) is a carbon trading effort to limit emissions from the power sector in participating states in the northeast United States. Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania,<sup>80</sup> Rhode Island, and

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<sup>76</sup> California Global Warming Solutions Act of 2006, A.B. 32, 2005 Leg. Sess.

<sup>77</sup> According to the program's website, the Alternative Manure Management Program does not currently have funding from cap-and-trade auctions, but it continues to be funded through the state's general fund. Cal. Climate Investments, *Alternative Manure Management Program*, <https://www.caclimateinvestments.ca.gov/alternative-manure> (last visited Sep. 18, 2024).

<sup>78</sup> California Climate Investments, *Dairy Digester Research and Development Program*, <https://www.caclimateinvestments.ca.gov/dairy-digester> (last visited Sep. 18, 2024).

<sup>79</sup> AB 32 established the broad authority for CARB to implement this program, and Governor Schwarzenegger directed CARB to establish the standard in an executive order.

<sup>80</sup> The Pennsylvania Supreme Court will soon hear a case about the state's participation in RGGI. *Bowfin Keycon Holdings, LLC et al. v. Pennsylvania Department of Environmental Protection et al.* Docket No. 86 MAP 2022. Additionally, in Sep. 2024, the Pennsylvania Senate passed a bill repealing Pennsylvania's participation in RGGI, and the bill is now before the Pennsylvania House of Representatives. S.B. 1058, 2023–2024 Leg. Sess. (Pa. 2024).

Vermont participate,<sup>81</sup> and all have rules outlining when and how biogas produced from anaerobic digesters can qualify for offset allowances.<sup>82</sup> For example, Vermont allows the “portion of methane generated by an anaerobic digester that would have been generated in the absence of the offset project through the uncontrolled anaerobic storage of manure” to qualify for auction.<sup>83</sup>

### III. Next steps

In coming years, federal and state policymakers will need to evaluate whether current incentives are sufficient to reduce methane emissions from livestock consistent with their climate goals. As researchers continue to evaluate the emission reductions resulting from state and federal incentives, it will be important to assess what changes are needed to drive further reductions and account for other equity and public health concerns, including the use of command-and-control regulatory approaches. While political factors may create significant barriers for direct regulation of methane emissions, understanding which policy tools result in greater emission reductions will be essential to ensure policymakers are using incentives and regulatory requirements to effectively reduce agricultural methane emissions.

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<sup>81</sup> The Regional Greenhouse Gas Initiative, *Elements of RGGI*, <https://www.rggi.org/program-overview-and-design/elements> (last visited Sep. 19, 2024).

<sup>82</sup> The Regional Greenhouse Gas Initiative, *Agricultural Methane*, <https://www.rggi.org/allowance-tracking/offsets/offset-categories/agricultural-methane> (last visited Sep. 19, 2024).

<sup>83</sup> 16-3 Vt. Code R. § 101 et seq.

**Table 2: Federal and selected state incentives supporting methane emissions reductions from livestock**

Program Name	Incentive Type	Implemented by	Is used to support		
			Anaerobic Digestion	Non-digester Manure Management	Enteric Fermentation Solutions
EQIP	Grant	USDA/NRCS	✓	✓	✓
CSP	Grant	USDA/NRCS	✓	✓	✓
REAP	Grant and Loan	USDA/NRCS	✓		
PCSC	Grant	USDA/CCC	✓	✓	✓
ITC	Tax credit	IRS	✓		
PTC	Tax credit	IRS	✓		
CFPC	Tax credit	IRS	✓		
RFS	Regulatory	EPA	✓		
Cap-and-Trade	Regulatory	CARB and other California agencies	✓	✓	
CFS	Regulatory	State environmental agencies (CARB, Wash, Ecology, Or. DEQ, NMED)	✓		
RGGI	Regulatory	Northeast states	✓		

## About the Program

The Harvard Methane Initiative seeks meaningful and sustained progress in reducing global emissions of this very important greenhouse gas — through research and effective engagement with policymakers and key stakeholders. This Initiative is supported by the Salata Institute for Climate and Sustainability at Harvard University. The Harvard Methane Initiative and other Research Clusters supported by the Salata Institute comprise interdisciplinary teams of researchers from across Harvard’s schools, whose varied expertise is required to address the complexity of the climate-related problems that they seek to solve. Robert N. Stavins, A.J. Meyer Professor of Energy and Economic Development at Harvard Kennedy School, directs the Harvard Methane Initiative. The findings, views, and conclusions in this publication are those of the authors alone.