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The False Promises of Biogas: Why Biogas Is an Environmental Justice Issue

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ABSTRACT

Years of community-driven research and participatory action have shed an important light on the copious negative health issues burdening communities adjacent to industrial agriculture. Rural communities in Wisconsin and Delaware have helped us in establishing an emerging source of pollution toward environmental justice communities—biogas. Biogas is being falsely marketed as a renewable energy solution to solve the problems of an already polluting industry, Concentrated Animal Feeding Operations (''CAFOs''). This greenwashing is problematic for many reasons and is in itself an environmental justice issue. The production of biomethane from manure-to-energy projects, such as manure digesters, is hazardous to local communities, locks farmers into more debt, and perpetuates the expansion of our current harmful agriculture practices, while increasing fossil fuel infrastructure by entrenching CAFOs with pipelines for the gas that is produced. In this article, we breakdown why biogas is not sustainable, how manure-to-energy projects perpetuate environmental injustices, examine current state policies on manure-to-energy projects, and how policy can be improved to protect frontline communities and farmers.

Keywords: CAFO, biogas, manure digesters, biomethane, environmental justice, factory farm

INTRODUCTION

There is a suite of social science and public health studies that have documented environmental injustices in rural areas stemming from industrialized agriculture and other extractive industries.[1] A pattern of negative pollution and public health consequences of industrial animal agriculture facilities threatening environmental justice communities in rural areas has been established.[2]

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[1]Kendall Thu and E. Paul Durrenberger. *Pigs, Profit, and Rural Communities.* (State Albany, NY: University of New York Press, 1998); John Gaventa. *Power and Powerlessness: Quiescence and Rebellion in an Appalachian Valley*. (Urbana, IL: University of Illinois Press, 1980); Pew Commission on Industrial Farm Animal Production. *Putting Meat on the Table: Industrial Farm Animal Production*. (A Project of the Pew Charitable Trusts and Johns Hopkins Bloomberg School of Public Health, 2008).

[2]Kelley J. Donham, Steven Wing, David Osterberg, Jan L. Flora, Carol Hodne, Kendall M. Thu, and Peter S. Thorne. ''Community Health and Socioeconomic Issues Surrounding Concentrated Animal Feeding Operations.'' *Environmental Health Perspectives* 15 (2007): 317–320; Sacoby M. Wilson, Frank Howell, Steve Wing, and Mark Sobsey. ''Environmental Injustice and the Mississippi Hog Industry.'' *Environmental Health Perspectives* 110 (suppl 2) (2002): 195–201; Steve Wing. ''Social Responsibility and Research Ethics in Community-Driven Studies of Industrialized Hog Production.'' *Environmental Health Perspectives* 110 (2002): 437–444; S. Wing and S. Wolf. ''Intensive Livestock Operations, Health, and Quality of Life Among Eastern North Carolina Residents.'' *Environmental Health Perspectives* 108 (2000): 233–238; S. Wing, D. Cole, and G. Grant. ''Environmental Injustice in North Carolina's Hog Industry.'' *Environmental Health Perspectives* 108 (2000): 225–231.

Research has shown that improving sustainable healthy rural communities is found to be dependent on integrating socioeconomic development and environmental protection.[3] The concentration and industrialization of agriculture are associated with economic and community decline locally and regionally,[4] and one of the most significant social impacts of Concentrated Animal Feeding Operations (''CAFOs'') is found to be the disruption of quality of life for neighboring residents.[5] Furthermore, it has been established that CAFOs are disproportionally located in communities of color and, or low income communities—a form of environmental injustice that has negative impacts on community health.[6]

We identify a growing problem in this realm that is disguised as a solution to the waste problems caused by CAFOs—biogas or manure-to-energy projects. Although the agribusiness industry, government, and even public interest environmental organizations have touted this technology as beneficial to the environment, farmers, and rural communities, we find the opposite to be true. We bring to light government regulatory failures, failures in environmental justice initiatives, and the reality of environmental harms that are exacerbated by biogas systems.

Our research seeks to bridge the divide between social science and public health research with laws and policies that perpetuate the problem, as opposed to address it. We offer policy solutions to address some of the problems rural communities are experiencing as a result of the false promises of biogas technology.

BACKGROUND

Dr. Sacoby Wilson's groundbreaking research in ''Environmental Injustice and the Mississippi Hog Industry'' revealed that living near industrial hog operations is a major public health concern for disproportionately burdened communities.[7] This study and others also referenced herein indicate that emissions from swine confinement houses are associated with adverse respiratory problems and a decline in quality of life for communities in their proximity.[8] The high density of hogs grown in confinement houses produce vast amounts of waste,[9] and community members who live close to these operations may have adverse health effects such as irritation to their eyes, noses, and throats; decline in quality of life; and possible mental health disorders. There are also water quality problems associated with leakage from the manure lagoons, and runoff from the spray fields that can contaminate surface and groundwater.[10] Some of the environmental contaminants emitted into the atmosphere include ammonia, hydrogen sulfide, volatile organic compounds, particulates, and other pollutants.[11] Wilson's research reveals the disproportionate amount of CAFOs in Black communities and how these hazardous operations adversely impact the physical, mental, and economic health of rural communities.

Dr. Wilson continued to expand on this research in ''An Ecologic Framework to Study and Address Environmental Justice and Community Health Issues'' (2009).[12] In this study, Wilson discusses the history of environmental justice and expands the vocabulary needed to accurately describe the many layers of intersecting structural oppression. He states as follows:

> I introduce the terms ''environmental slavery'' and ''environmental servitude'' as interchangeable conceptualizations that capture the experience of disadvantaged and vulnerable communities who are differentially exposed to unhealthy environmental conditions and resource-poor settings. Vulnerable communities are used (directly or indirectly) to host social and environmental disamenities and externalities through planning, zoning, industrial siting, infrastructure and development inequities; while communities consisting of dominant racial and class populations benefit from the inequities, access to more amenities, and the ecological goods and services of host communities. There is an underdevelopment and/or destabilization in the growth, health, and quality of life of host communities overburdened by environmental and social externalities and spatially and socially bounded by limited access to environmental amenities. Moreover, the footprints (ecological, economic, and social) of dominant racial and class populations lead not only to the use of host communities as sinks, but also the use of individual community members as sinks for environmental and psychosocial stressors.[13]

In Paul Mohai and Robin Saha's ''Reassessing Racial and Socioeconomic Disparities in Environmental Justice

[3]Kelley J. Donham, Steven Wing, David Osterberg, Jan L. Flora, Carol Hodne, Kendall M. Thu, and Peter S. Thorne. ''Community Health and Socioeconomic Issues Surrounding Concentrated Animal Feeding Operations.'' *Environmental Health Perspectives* 115 (2007): 318.

[4]Ibid at 317.

[5]Ibid at 318.

[6]Ibid. See also S. Wing and S. Wolf. ''Intensive Livestock Operations, Health, and Quality of Life Among Eastern North Carolina Residents.'' *Environmental Health Perspectives* 108 (2000): 233–238; S. Wing, D. Cole, and G. Grant. ''Environmental Injustice in North Carolina's Hog Industry.'' *Environmental Health Perspectives* 108 (2000): 225–231.

[7]Sacoby M. Wilson, Frank Howell, Steve Wing, and Mark Sobsey. ''Environmental Injustice and the Mississippi Hog Industry.'' *Environmental Health Perspectives* 110 Supplement 2 (2002): 199.

[8]Ibid.

[9]The new trend of large-scale production involves a high density of hogs grown in confinement houses and producing vast amounts of waste. The hog waste is collected and stored through different systems, including below-floor slurry storage (deep pit), underground slurry storage, anaerobic lagoons, and oxidation pits. One of the most popular methods is the storage of the waste in anaerobic cesspools, commonly called ''lagoons,'' where it undergoes microbial digestion. The hog waste effluent is later sprayed onto fields. Ibid at 195.

[10]Ibid at 195–196.

[11]Ibid.

[12]Sacoby M. Wilson. ''An Ecologic Framework to Study and Address Environmental Justice and Community Health Issues.'' *Environmental Justice* 2 (2009): 16.

[13]Ibid.

Research'' (2006), the authors examine the significant racial and socioeconomic disparities associated with hazardous sites, and the variation within the disparities found.[14] Their study addresses the failures of current methods used to assess environmental disparities adequately in accounting for the proximity between the hazard under investigation and nearby residential populations.[15]

Christopher W. Tessum expands on these inequities in ''Inequity in Consumption of Goods and Services Adds to Racial–Ethnic Disparities in Air Pollution Exposure'' (2019). This seminal study found that Black and Hispanic communities on average bear a ''pollution burden'' of 56% and 63% excess exposure, respectively, relative to the exposure caused by their consumption.[16] $PM_{2.5}$ air pollution is disproportionately induced by the racial–ethnic majority and disproportionately inhaled by racial–ethnic minorities.[17]

Dr. Wilson lays out a holistic framework to address environmental justice and health issues by reiterating that we must take an ''ecological systems approach to community health, [which] incorporates spatial and temporal concepts on the social organization of our living environments, considers ecologic features of the built and social environments that influence health, and utilizes contextual expertise to address environmental justice and health issues at the community level.''[18]

Although social and public health scientists have identified rural areas as a geo-special dimension of environmental justice research,[19] rural environmental injustices have lacked proper attention by the environmental justice movement as a whole. Notably there is a void of adequate legal and policy solutions available to rural people.[20] Correspondingly, research is revealing how government-driven agricultural policies legalize pollution and the differential treatment of rural people. The greenwashing of biogas as a solution to the environmental hazards associated with CAFOs is an example of this kind of legalized pollution.

METHODS

Our research is community driven in nature—in that questions about whether farmers should invest in manure-to-energy projects, and how and why governments are supporting them, were questions that needed immediate answers in communities already burdened by manure-to-energy projects. In collaboration with our community partners significant data was collected through publicly available government records, or records obtained from various governmental agencies through the Freedom of Information Act. We also researched government laws and regulations; scientific and other kinds of peer-reviewed journals, biogas industry trade magazines and other types of publications. In addition, we incorporate both participant observation and participatory action research conducted via community engagement with the Socially Responsible Agriculture Project (''SRAP''), and the rural communities in which SRAP works. We participated with our community partners in the engagement of public officials and regulatory entities to try to address problems or anticipated problems from CAFO biogas facilities. For example, we explored how California's cap-and-trade program generates carbon-offset credits for factory farms with biogas digesters in Wisconsin. From this background research,[21] we were able to better understand the motivation for the expansion of biogas infrastructure to factory farms. Through these methods we observed how harmful biogas projects were being perpetuated in part through government action, despite the sunlight being shown on their false promises.

FINDINGS

One of our major findings that became apparent throughout our engagement was the government's lack of understanding and lack of transparency regarding how industrial agriculture facilities, and their waste streams, directly harm rural communities that are fenceline to CAFOs. In this article, we shine a light on the budding issue of manure-to-energy projects because rural communities are alarmed by the transformation of CAFOs into combined factory farms and biogas facilities under the guise of ''green energy'' or ''compost projects.'' In this study, we explain how a lack of oversight, regulation, and transparency perpetuates the expansion of industrial agriculture in already burdened environmental justice communities. We argue that biogas is not a solution and

[14]P. Mohai and R. Saha. ''Reassessing Racial and Socioeconomic Disparities in Environmental Justice Research.'' *Demography* 43 (2006): 383–399.

[15]Ibid.

[16]Christopher W. Tessum, Joshua S. Apte, Andrew L. Goodkind, Nicholas Z. Muller, Kimberley A. Mullins, David A. Paolella, Stephen Polaskyf, Nathaniel P. Springer, Sumil K. Thakrar, Julian D. Marshall, and Jason D. Hill. ''Inequity in Consumption of Goods and Services Adds to Racial–Ethnic Disparities in Air Pollution Exposure.'' *PNAS* 116 (2019): 6001–6006.

[17]Ibid at 6003.

[18]Sacoby M. Wilson. ''An Ecologic Framework to Study and Address Environmental Justice and Community Health Issues.'' *Environmental Justice* 2 (2009): 18.

[19]David Pellow. ''Environmental Justice and Rural Studies: A Critical Conversation and Invitation to Collaboration.'' *Journal of Rural Studies* 47 (2016): 381–386; Loka Ashwood and Kate MacTavish. ''Introduction: Tyranny of the Majority and Rural Environmental Injustice.'' *Journal of Rural Studies* 47(A) (2016): 271–277.

[20]Lisa R. Pruitt. ''The Rural Lawscape: Space Tames Law Tames Space.'' In: I. Braverman, N. Blomley, D. Delaney, and A. Kedar (eds.) *The Expanding Spaces of Law: A Timely Legal Geography*. (Stanford University Press, 2013); Lisa R. Pruitt, Amanda L. Kool, Lauren Sudeall, Michele Statz, Danielle M. Conway, and Hannah Haksgaard. ''Legal Deserts: A Multi-State Perspective on Rural Access to Justice.'' *Harvard Law & Policy Review* (2018): 15–156; Ann M. Eisenberg. *Distributive Justice and Rural America*. 61 B.C. L. Rev. 189 (2020): 223. <https://lawdigitalcommons.bc.edu/bclr/vol61/iss1/5> (Last accessed on March 10, 2021).

[21]Socially Responsible Agriculture Project. ''Trading Pollution: Wisconsin Industrial Dairies with Documented Regulatory Compliance Problems Benefit from California Greenhouse Gas Cap-and-Trade Program.'' August 2020. <https://sraproject.org/2020/08/2016/> (Last accessed on March 10, 2021).

examine current policy while also suggesting policy recommendations that shift away from this polluting industry and instead invest back into communities.

Biogas is an environmental justice issue

Biogas is not sustainable. Although biogas comes from organic materials such as animal waste or food waste, it is hardly ''clean'' or ''green'' in the way most people understand those concepts.[22] Biogas is flammable, highly toxic, and potentially explosive.[23] Harmful compounds and air contaminants are introduced into the environment during biogas production and use through both combustion processes and diffusive emissions.[24] Burning manure-produced gas emits the same air contaminants as the combustion of fossil fuels. To make matters worse, the factory farms that produce the biomethane can emit harmful pollutants into the air and discharge nitrates into groundwater.[25]

Manure-to-energy projects, specifically manure digesters,[26] are sold as a solution to farmers to help them mitigate the costs of production by turning excess animal waste into energy through biogas. The installation of a manure digester on a factory farm is the first step for farmers in the process of turning their manure into a revenue stream, but it is also the first step in entrenching factory farms in more fossil fuel infrastructure, as producing and transporting biogas requires pipelines, fleets of trucks, and interconnection with the local power grid.[27] Furthermore, gas pipelines and other infrastructure leak tremendous volumes of methane that contribute to climate change, negating any alleged ''renewable natural gas'' savings.[28] Annual methane emissions have increased by about 50 million tonnes from the 2000–2006 average, mainly driven by agriculture and the natural gas industry,[29] and atmospheric concentrations of methane are now >2.5 times above preindustrial levels.[30] Although methane is only one component of total factory farm greenhouse gas emissions, these also include enteric methane, nitrous oxide (NOx) from fertilizer and manure application, and carbon dioxide from fuel combustion and input manufacture.[31]

Studies show that even if manure digesters were installed on every single dairy farm across the country and worked at optimal efficiency, this would still fall short of the industry's goal of reducing its total greenhouse gas emissions by 25%.[32] Similar to biogas, natural gas has been falsely marketed as a renewable and clean energy source, whereas in reality it destroys communities and has been proven to be a radioactive and hazardous energy source.[33] Biogas is the industry's next attempt at greenwashing another polluting fuel to save their industry. Fossil fuels, including natural gas fields and leaking pipelines, contributed 108 million tonnes of methane emissions in 2017, a rise of 17%.[34] Ultimately, biomethane is a false solution that perpetuates the expansion of big ag monopolies, the toxic, hazardous, and destructive practices of CAFOs and fossil fuel infrastructure.

Manure-to-energy projects perpetuate environmental injustices. Factory farms are inherently polluting entities that poison adjacent rural communities with toxic chemicals that eventually cause local public health disasters, economic hardship, and generational trauma.

[22]Jessica McKenzie. ''The Misbegotten Promise of Anaerobic Digesters.'' *The Counter*, 3 December 2019. <https://thecounter.org/misbegotten-promise-anaerobic-digesters-cafo/> (Last accessed on March 10, 2021).

[23]U.S. Department of Agriculture. ''Conservation Practice Overview: CPS Anaerobic Digester (Code 366).'' October 2017. <https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs143_026500.pdf> (Last accessed on March 10, 2021).

[24]Valerio Paolini, Francesco Petracchini, Marco Segreto, Laura Tomassetti, Nour Naja, and Angelo Cecinato. ''Environmental Impact of Biogas: A Short Review of Current Knowledge.'' *Journal of Environmental Science and Health Part A* 53 (2018): 899–906.

[25]Center for Food Safety. ''Stop the Dairy Digester Scam.'' 23 April 2019. <https://www.centerforfoodsafety.org/issues/305/food-and-climate/blog/5580/take-action-stop-the-dairy-digester-scam> (Last accessed on March 10, 2021).

[26]Manure digesters use anaerobic digestion to convert organic material into biogas, which can then be refined into biomethane and used to produce electricity. Three main substances come out of the process of manure digestion, methane gas, also known as biomethane, that can be used as an energy source; liquid manure that can be used for fertilizer; and solid manure that can be used for composting and animal bedding. (Scott Gordon. ''What Manure Digesters Can and Can't Do.'' *WisContext*, 30 November 2016. <https://www.wiscontext.org/what-manure-digesters-can-and-cant-do> (Last accessed on March 10, 2021).

[27]Daniel P. Duffy. ''The Costs and Benefits of Anaerobic Digesters.'' *MSW Management*, 4 June 2017. <https://www.mswmanagement.com/landfills/article/13030153/the-costs-and-benefits-of-anaerobic-digesters> (Last accessed on March 10, 2021) (to be referred to as ''*The Costs and Benefits of Anaerobic Digesters*'' throughout the rest of the document).

[28]Robert W. Howarth, *et al.* ''Methane and the Greenhouse-Gas Footprint of Natural Gas from Shale Formations.'' *Climatic Change* (April 2011): 679, 687, 688; Robert W. Howarth. ''A Bridge to Nowhere: Methane Emissions and the Greenhouse Gas Footprint of Natural Gas.'' *Energy Science & Engineering* 2 (2014): 1, 2; Robert B. Jackson, *et al.* ''Natural Gas Pipeline Leaks Across Washington, DC.'' *Environmental Science & Technology* 48 (2014): 2051; Lavoie. *Environmental Science & Technology* 52 (2017): 3373.

[29]Quirin Schiermeier. ''Global Methane Levels Soar to Record High.'' *Nature*, July 14, 2020. <https://www.nature.com/articles/d41586-020-02116-8?utm_source=Nature±Briefing&utm_campaign=8a93e2b69c-briefing-dy-20200715&utm_medium=email&utm_term=0_c9dfd39373-8a93e2b69c-44035969> (Last accessed on March 10, 2021).

[30]Ibid.

[31]Jude L. Capper, Roger A. Cady, and Dale E. Bauman. ''The Relationship Between Cow Production and Environmental Impact.'' 2011: 10. <https://wcds.ualberta.ca/wcds/wp-content/uploads/sites/57/wcds_archive/Archive/2011/Manuscripts/Capper.pdf> (Last accessed on March 10, 2021).

[32]Ibid.

[33]Justin Nobel. ''America's Radioactive Secret.'' *Rolling Stone*, 21 January 2020. <https://www.rollingstone.com/politics/politics-features/oil-gas-fracking-radioactive-investigation-937389/> (Last accessed on March 10, 2021).

[34]Quirin Schiermeier. ''Global Methane Levels Soar to Record High.'' *Nature*, 14 July 2020. <https://www.nature.com/articles/d41586-020-02116-8?utm_source=Nature±Briefing&utm_campaign=8a93e2b69c-briefing-dy-20200715&utm_medium=email&utm_term=0_c9dfd39373-8a93e2b69c-44035969> (Last accessed on March 10, 2021).

Several studies have shown that a disproportionate number of CAFOs are located in low-income and nonwhite areas and near low-income and nonwhite schools.[35] These facilities and the hazardous agents associated with them are generally unwanted in local communities and are often thrust upon those sectors with the lowest levels of political influence.[36]

CAFOs can house anywhere from hundreds to millions of animals—the quantity of urine and feces from even the smallest CAFO is equivalent to the urine and feces produced by 16,000 humans.[37] The waste produced at factory farms contains antibiotics, hormones, pathogens, heavy metals, and other animal drugs and chemicals that contaminate significant ground and surface water across the country. Noxious gases are also released through ventilation systems from the CAFO confinement houses, and environmental contaminants are also released through volatilization from the waste decomposing in lagoons, spray fields, and other waste collection sites.[38] Furthermore, studies show that manure management activities are the third major category of U.S. agricultural emissions, releasing NOx and methane in quantities that total 16% of total U.S. agricultural emissions.[39]

Manure-to-energy projects have a direct negative impact on frontline communities. In a recent study, ''the Composition and Toxicity of Biogas Produced from Different Feedstocks in California,'' scientists found that the concentrations of minor chemical and biological components in biogas have ''the potential to be toxic to human health and the environment, to form toxic substances during the combustion process, or to form toxic substances after photochemical aging in the atmosphere.''[40] Furthermore, The California Air Resources Board (CA-ARB) and the Office of Environmental Health Hazzard Assessment compiled a list of 12 trace components potentially present in biogas at levels significantly above traditional fossil natural gas, including carcinogens (arsenic, p-dichlorobenzene, ethylbenzene, n-nitroso-di-n-propylamine, and vinyl chloride) and noncarcinogens (antimony, copper, hydrogen sulfide, lead, methacrolein, mercaptans, and toluene).[41] Because the composition of biogas varies so greatly between feedstocks, and being that there are so few studies on the differences in trace contaminates, it is irresponsible to invest in anaerobic digestion until the public health consequences are determined.

Although manure digesters might have the potential to reduce methane emissions, emissions of other air pollutants, such as NOx may increase to unacceptable levels.[42] Breathing air with a high concentration of NO_x can cause breathing problems, headaches, chronically reduced lung function, eye irritation, loss of appetite, and corroded teeth.[43] Community environmental air quality assessments have shown concentrations of hydrogen sulfide and gaseous ammonia that exceed U.S. Environmental Protection Agency (''EPA'') and Agency for Toxic Substances and Disease Registry recommendations.[44] Studies have reported that neighbors of confinement facilities experienced increased levels of mood disorders, including anxiety, depression, and sleep disturbances attributable to exposures to malodorous compounds.[45] Research has also found that lower concentration and secretion of salivary immunoglobulin among swine CAFO neighbors during times of moderate to high odor compared with times of low or no odor, suggesting a stress-mediated physiological response to malodor.[46] Such stressors, coupled with inadequate health-promoting infrastructure (e.g., supermarkets, parks, open spaces, and medical facilities), reduce the community's ability to defend against the adverse health consequences of their differential burden and exposure.[47]

One recent study, ''Mortality and Health Outcomes in North Carolina Communities Located in Close Proximity to Hog Concentrated Animal Feeding Operations'' (2018), explains that residents living in proximity to hog CAFOs are chronically exposed to contaminants from land-applied wastes and their overland flows, leaking lagoons, and pit-buried carcasses, as well as airborne

[35]Kelley J. Donham, Steven Wing, David Osterberg, Jan L. Flora, Carol Hodne, Kendall M. Thu, and Peter S. Thorne. ''Community Health and Socioeconomic Issues Surrounding Concentrated Animal Feeding Operations.'' *Environmental Health Perspectives* 115 (2007): 318.

[36]Ibid.

[37]Sierra Club. ''Why Are CAFOs Bad.'' <https://www.sierraclub.org/michigan/why-are-cafos-bad> (Last accessed on March 10, 2021).

[38]Sacoby M. Wilson, Frank Howell, Steve Wing, and Mark Sobsey. ''Environmental Injustice and the Mississippi Hog Industry.'' *Environmental Health Perspectives* 110, Supplement 2 (2002): 195.

[39]Peter Lehner and Nathan A. Rosenberg. *Legal Pathways To Carbon-Neutral Agriculture* 47 Envtl. L. Rep. News & Analysis 10845, 10847. <https://earthjustice.org/sites/default/files/files/Legal-Pathways-Carbon-Neutral-Agriculture.pdf>. (Last accessed on March 10, 2021).

[40]Yin Li, Christopher P. Alaimo, Minji Kim, Norman Y. Kado, Joshua Peppers, Jian Xue, Chao Wan, Peter G. Green, Ruihong Zhang, Bryan M. Jenkins, Christoph F.A. Vogel, Stefan Wuertz, Thomas M. Young, and Michael J. Kleeman. ''Composition and Toxicity of Biogas Produced from Different Feedstocks in California.'' *Environmental Science & Technology* 53 (2019): 11569–11579.

[41]Ibid at 11569.

[42]Jude L. Capper, Roger A. Cady, and Dale E. Bauman. ''The Relationship Between Cow Production and Environmental Impact.'' 2011: 10. <https://wcds.ualberta.ca/wcds/wpcontent/uploads/sites/57/wcds_archive/Archive/2011/Manuscripts/Capper.pdf> (Last accessed on March 10, 2021).

[43]''NOx Gases in Diesel Car Fumes: Why Are They so Dangerous?'' *Phys.org*, September 2015. <https://phys.org/news/2015-09-nox-gases-diesel-carfumes.html#:~:text=NOx%20has%20direct%20and%20indirect,land%E2%80%94harming%20animals%20and%20plants> (Last accessed on March 10, 2021).

[44]Kelley J. Donham, Steven Wing, David Osterberg, Jan L. Flora, Carol Hodne, Kendall M. Thu, and Peter S. Thorne. ''Community Health and Socioeconomic Issues Surrounding Concentrated Animal Feeding Operations.'' *Environmental Health Perspectives* 115 (2007): 318.

[45]Ibid.

[46]Ibid.

[47]Sacoby M. Wilson, Herb Fraser-Rahim, Edith Williams, Hongmei Zhang, LaShanta Rice, Erik Svendsen, and Winston Abara. ''Assessment of the Distribution of Toxic Release Inventory Facilities in Metropolitan Charleston: An Environmental Justice Case Study.'' *American Journal of Public Health* 102 (2012): 1974.

emissions, resulting in higher risks of certain diseases.[48] In fact, a previous survey based on studies of residential communities reported significant health risks for residents, including higher risks of bacterial infections, higher frequencies of symptoms of respiratory and neurological disorders, and depression.[49] This exposed that people living in southeastern North Carolina communities located near hog CAFOs had poorer outcomes for a variety of health conditions in different age groups than the residents of North Carolina communities located in zip codes without hog CAFOs; they had higher mortality due to infections, anemia,[50] kidney disease, and perinatal conditions, and higher rates of hospital admissions and emergency department visits for low birth weight infants.[51] The authors conclude that people who live in these types of rural fenceline communities may simultaneously be affected by multiple risk factors, including low income and education, higher smoking prevalence, and lower access to medical care.

In addition, manure digesters installed at CAFOs require supplementary fossil fuel infrastructure, such as miles of pipelines stretching from the CAFO to the refinement facility. This funnels more pollution into and through already burdened local communities. Odor abatement, noise mitigation, truck queuing, effluent discharge, gas pipeline usage, and interconnection with the local power grid requires both physical hookups, and net metering agreements that can impact the health and wellness of neighboring families.[52]

Incentivizing farmers to install manure-to-energy projects instead of encouraging farmers to shift to sustainable farming practices solely profits developers, while locking communities into a cycle of sickness, loss, injury, and destruction. For example, from 2010 through 2019 fifteen Wisconsin dairy CAFOs received 1,317,236 carbon credits for their manure digesters,[53] despite the fact that in May of 2017 the CA-ARB's Environmental Justice Advisory Committee (EJAC)[54] made a priority recommendation to the Board to: ''[S]top investing in dirty energy [and] [e]liminate subsidies and financing for fossil fuels and in technologies such as corn-based biofuels, agricultural methane, biomass burning, waste-to-energy, or other unsustainable technologies that result in negative impacts on environmental justice communities.''[55] In addition, the EJAC advised against committing California ''Cap-and-Trade through the Clean Power Plan,'' since ''carbon trading cannot be verified…''[56] Furthermore, these funds are supposed to be aimed at ''Improving public health, quality of life and economic opportunity in California's most burdened communities at the same time they're reducing pollution that causes climate change.[57]'' Expanding any polluting industry in areas already burdened by factory farms perpetuates the systemic oppression of environmental justice communities.

Manure-to-energy projects are rarely beneficial for farmers. Manure-to-energy projects are expensive, temperamental, and require farmers to produce more waste to

[48]Julia Kravchenko, Sung Han Rhew, Igor Akushevich, Pankaj Agarwal, and H. Kim Lyerly. ''Mortality and Health Outcomes in North Carolina Communities Located in Close Proximity to Hog Concentrated Animal Feeding Operations.'' *NCMJ* 79 (2018): 277–288.

[49]Ibid.

[50]Studies have suggested that exposure to ammonia, hydrogen sulfide, methane, and particulate matters near the CAFOs, contamination of water and soil with zinc, exposure to the antibiotic chloramphenicol previously widely used to treat infections in hogs, and inappropriate human use of veterinary medications (certain NSAIDs or antibiotics) cause anemia. Ibid at 284.

[51]Ibid at 284.

[52]''The Costs and Benefits of Anaerobic Digesters.'' <https://www.mswmanagement.com/landfills/article/13030153/the-costs-and-benefits-of-anaerobic-digesters> (Last accessed on March 10, 2021).

[53]California Air Resources Board [hereinafter CA-ARB], Offset Credit Issuance Table. <https://ww3.arb.ca.gov/cc/capandtrade/offsets/issuance/issuance.htm>. (Last accessed on May 22, 2020).

[54]The California Environmental Protection Agency (Cal/EPA) Advisory Committee on Environmental Justice was formed in 2001 to help Cal/EPA incorporate environmental justice into all of its programs and policies. Three key recommendations called for Cal/EPA to recognize the significant burden of toxics and pollution on impacted communities. The advisory committee recommended that Cal/EPA: (1) Use a precautionary approach: A precautionary approach to decision making means that regulations should prevent harm when there is credible evidence that harm is occurring, or is likely to occur—even when complete scientific evidence or proof is not available—in drafting and enforcing regulations. (2) Prioritize pollution prevention over pollution control: All too often communities of color have been left feeling sorry by pollution control—sorry for their lost health and quality of life. (3) Evaluate the cumulative impacts of toxics in an impacted community when making regulatory decisions. This process requires that the health effects of all sources of pollution be taken into consideration when determining the impact of pollution in individuals, communities, and the environment. The landmark environmental justice policies were adopted by Cal/EPA. <https://www.environmentalhealth.org/index.php/en/where-we-work/state-of-california/california-environmental-justice> (Last accessed on March 10, 2021).

[55]CA-ARB, 2017 Scoping Plan, Appendix A, AB 32 Environmental Justice Advisory Committee Recommendations. November 2017: 14. <https://ww3.arb.ca.gov/cc/scopingplan/2030sp_appa_ejac_final.pdf>. (Last accessed on May 22, 2020).

[56]CA-ARB, 2017 Scoping Plan, Appendix A, AB 32 Environmental Justice Advisory Committee Recommendations. November 2017: 6. <https://ww3.arb.ca.gov/cc/scopingplan/2030sp_appa_ejac_final.pdf>. (Last accessed on May 22, 2020).

[57]California Environmental Protection Agency. ''California Climate Investments to Benefit Disadvantaged Communities.'' <https://calepa.ca.gov/envjustice/ghginvest/#:~:text=Known%20as%20California%20Climate%20Investments,pollution%20that%20causes%20climate%20change>. (Last accessed on January 21, 2021).

meet the needs of the digester.[58] The costs to build and run a manure digester are rarely recovered, especially when taking into consideration both the construction and operating costs. One study revealed that the economic concentration of agricultural operations tend to remove a higher percentage of money from rural communities than when the industry is dominated by smaller farm operations, which tend to circulate money within the community.[59]

Without outside funding from a designee, operator, or developer, it simply does not make financial sense for most farms to build or operate a digester.[60] The capital costs for a digester include lift station pumps, mixing tanks, the digester tank itself, piping for gas and hot water, gas pumps, flow meters, safety features, generators, electrical wiring and controls as well as power transmission lines, design engineering, and on-site buildings for generators, maintenance, and operations.[61] In addition to direct financial considerations, there is considerable overhead generated by legal and management issues, such as insurance premiums, building permits, design and consulting fees, licensing and zoning, sales agreements with utilities to buy back electricity, and more.[62] With capital costs often exceeding $1 million, anaerobic or manure digesters are beyond the price range of most farmers in the United States.[63] The payback period (capital costs divided by annual net benefits) of this capital investment can be between 5 and 6 years.[64]

Grants and cost-share agreements from states, federal programs, and utility companies help fund the cost of manure digesters.[65] For example, in just under a 4-year period beginning in 2010, 12 Wisconsin dairy CAFOs received >13 million dollars in grants from the U.S. Department of Agriculture's Rural Energy for America Program.[66] Additional financial incentives have also been provided to these projects through the U.S. Department of Treasury's administrative of Section 1603 of the American Recovery and Reinvestment Tax Act of 2009,[67] among other programs.[68] California alone has funded >100 digester projects, spending nearly $200 million of its ambitious California Climate Investments dollars on digesters instead of using the money to help fund farmers through its Smart Agriculture Programs.[69] According to the California Climate Investments Annual Report (2020), $69.1 million dollars has been assigned for future dairy digester development and research.[70] Tax payer dollars should be used to fund sustainable farming practices that go directly to farmers instead of to major developers. Unfortunately, these digester projects are also helping to fund gas infrastructure and development, rather than sustainable farming practices, which would create jobs,

[58]The size of a conventional digester is equal to 15–20 times the daily waste volume produced, or more if the waste is diluted before digestion (Don D. Jones, John C. Nye, and Alvin C. Dale. ''Methane Generation from Livestock Waste.'' *Energy Management in Agriculture*. Department of Agricultural Engineering, Purdue University. <https://www.extension.purdue.edu/extmedia/AE/AE-105.html>. (Last accessed on March 10, 2021). The volume of waste that must be disposed of increases accordingly if dilution water is used. The EPA's ''minimum'' requirements reveal what large investment manure digesters are and how they do not reduce the waste on CAFOs, but instead incentivize the farmer to produce even more to *potentially* be successful in making any profit or breaking even from the digester. The U.S. EPA states that for farms to be potentially successful with anaerobic digestion, a minimum of 500 head of cattle, 2000 hogs with anaerobic lagoons or liquid slurry manure management systems, or 5000 hogs with deep pit manure management systems are suggested. (U.S. Environmental Protection Agency. ''Is Anaerobic Digestion Right for Your Farm?'' <https://www.epa.gov/agstar/anaerobic-digestion-right-your-farm>). This significantly limits their use, as more than 90% of dairy farms in the United States have fewer than 500 cows, accounting for 40% of all dairy cows in the country (Peter Lehner and Nathan A. Rosenberg. *Legal Pathways to Carbon-Neutral Agriculture*, 47 Envtl. L. Rep. News & Analysis 10845: 10865. <https://earthjustice.org/sites/default/files/files/Legal-Pathways-Carbon-Neutral-Agriculture.pdf>. (Last accessed on March 10, 2021).

[59]Kelley J. Donham, Steven Wing, David Osterberg, Jan L. Flora, Carol Hodne, Kendall M. Thu, and Peter S. Thorne. ''Community Health and Socioeconomic Issues Surrounding Concentrated Animal Feeding Operations.'' *Environmental Health Perspectives* 115 (2007): 317.

[60]''The Misbegotten Promise of Anaerobic Digesters.'' <https://thecounter.org/misbegotten-promise-anaerobic-digesters-cafo/>. (Last accessed on March 10, 2021).

[61]''The Costs and Benefits of Anaerobic Digesters.'' <https://www.mswmanagement.com/landfills/article/13030153/the-costs-and-benefits-of-anaerobic-digesters>. (Last accessed on March 10, 2021).

[62]Ibid.

[63]''Legal Pathways To Carbon-Neutral Agriculture.'' 10865. <https://earthjustice.org/sites/default/files/files/Legal-Pathways-Carbon-Neutral-Agriculture.pdf>. (Last accessed on March 10, 2021).

[64]''The Costs and Benefits of Anaerobic Digesters.'' <https://www.mswmanagement.com/landfills/article/13030153/the-costs-and-benefits-of-anaerobic-digesters>. (Last accessed on March 10, 2021).

[65]A reference document by the U.S. EPA and Aster regarding digester funding showed case studies in which operators paid between 0% and 30% of the capital cost of the manure digester, with the remaining costs subsidized through grants and cost-share agreements from states, federal programs, and utility companies. See Aster, U.S. EPA. *Funding On- Farm Anaerobic Digestion* (September 2012).

[66]USDA, Rural Development, Rural Business-Cooperative Service, Wisconsin Recipients Renewable Energy Systems/Energy Efficiency Loan and Grant Program, see ''List of REAP Recipients in Wisconsin.'' <https://www.rd.usda.gov/programs-services/rural-energy-america- program-renewable-energy-systems-energy-efficiency/wi>/. (Last accessed on May 22, 2020); see also List of REAP Recipients in Wisconsin. <https://www.rd.usda.gov/files/WI_REAP_Awards.pdf>. (Last accessed on May 22, 2020).

[67]U.S. Department of the Treasury, American Recovery and Reinvestment Act of 2009 1603 Program (providing payments for specified energy property in lieu of tax credits). <https://home.treasury.gov/policy-issues/financial-markets-financial-institutions-and-fiscal-service/1603- program-payments-for> (see List of Awards). (Last accessed on May 22, 2020).

[68]See Good Jobs First, Tracking Subsidies, Promoting Accountability in Economic Development, Subsidy Tracker. <https://www.goodjobsfirst.org/subsidy-tracker>. (Last accessed on May 22, 2020).

[69]<https://civileats.com/2020/04/24/are-dairy-digesters-the-renewable-energy-answer-or-a-false-solution- to-climate-change/>. See also State of California, California Climate Investments website. <www.caclimateinvestments.ca.gov>. (Last accessed on July 31, 2020).

[70]California Climate Investments 2020 Annual Report. <https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/auctionproceeds/2020_cci_annual_report.pdf>. (Last accessed on March 10, 2021).

facilitate carbon sequestering, and empower and rehabilitate rural and frontline communities.

The gas industry has an inherent incentive to convince farmers to invest in manure digesters. From their perspective, it is easier to transform an existing factory to produce and process biogas than to build a new one. Developers and energy executives have been selling the production of biogas as a solution to problems already existing on factory farms (too much manure, open lagoons, etc.), falsely motivating farmers to invest in ''composting[71]'' infrastructure that in actuality is much more complex and extensive, and is built to produce, process, and transport biogas, allowing the gas industry to profit from the dividends of the farmers' practically unpaid labor.

Unfortunately, some states are buying the industry's sales pitch about renewable natural gas and are allowing factory farms to receive carbon offset credits or compliance credits for installing manure-to-energy projects on farms. Carbon cap-and-trade programs allow industrial polluters to pay other pollution sources for their claimed pollution reductions.[72] For example, manure-to-energy projects that meet California's carbon offset protocols can be traded through its cap-and-trade program by approved national registries or through private contractors, or designees, who are registered with the state.[73] The polluting entity can then use the credits obtained from the trade to meet states' air pollution control standards. Negotiated agreements for the exchange of carbon credits are generally done in a private market, so it is difficult to know exactly how much money or other benefits manure digester projects receive.[74] Also, many factory farms that are receiving these credits are not in compliance with environmental and health regulations.[75] Critics such as the Institute for Agriculture and Trade Policy and the National Family Farm Coalition have argued that carbon markets are inherently inequitable, lock out most farmers, and could lead to more pollution, particularly in disadvantaged communities.[76] In short, the public is footing the bill for manure digesters,[77] whereas the CAFO industry profits by offsetting operation costs, selling the energy to utilities, and selling their claimed air pollution reductions to other polluters. Taxpayer dollars should be used to fund sustainable farming practices that go directly to farmers and environmental justice communities instead of to the pockets of major developers.[78]

[71]Glenn Rolfe. ''Environmental Groups: Seaford Poultry Digester Project Needs Public Input.'' *Delaware State News*, December 17, 2020. <https://delawarestatenews.net/business/environmental-groups-seaford-poultry-digester-project-needs-public-input/>. (Last accessed on March 10, 2021).

[72]''California Cap-and-Trade Program Summary.'' *Socially Responsible Agriculture Project*. August 2020. <https://sraproject.org/2020/09/california-cap-and-trade-program-summary/>. (Last accessed on March 10, 2021).

[73]Ibid.

[74]Ibid, see also SRAP. ''Trading Pollution: Wisconsin Industrial Dairies with Documented Regulatory Compliance Problems Benefit from California Greenhouse Gas Cap-and-Trade Program.'' Press Release, August 2020. <https://sraproject.org/2020/08/2016/>. (Last accessed on January 31, 2021).

[75]SRAP. ''Trading Pollution: Wisconsin Industrial Dairies with Documented Regulatory Compliance Problems Benefit from California Greenhouse Gas Cap-and-Trade Program.'' Press Release, August 2020. <https://sraproject.org/2020/08/2016/>. (Last accessed on January 31, 2021). Even if compliance issues at these CAFOs result in an invalidation of credits, the CA-ARB's regulations only call for invalidations for the number of days a facility is out of compliance. Seventy-five percent of the examples of invalidation on CA-ARB's website are of dairy operations (California Air Resources Board. ''California Air Resources Board Offset Credit Regulatory Conformance and Invalidation Guidance.'' February 2015. <https://ww2.arb.ca.gov/sites/default/files/classic//cc/capandtrade/offsets/arboc_guide_regul_conform_invalidation.pdf>; California Air Resources Board. ''Offset Credit Invalidation.'' <https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/offset-credit-invalidation>).

[76]Gosia Wozniacka. ''Are Carbon Markets for Farmers Worth the Hype?'' *Civil Eats*, 24 September 2020. <https://civileats.com/2020/09/24/are-carbon-markets-for-farmers-worth-the-hype/>. (Last accessed on March 10, 2021).

[77]Gosia Wozniacka. ''Are Dairy Digesters the Renewable Energy Answer or a 'False Solution' to Climate Change?'' *Civil Eats*, 24 April 2020. <https://civileats.com/2020/04/24/are-dairy-digesters-the-renewable-energy-answer-or-a-false-solution-to-climate-change/>. (Last accessed on March 10, 2021).

[78]Manure to energy projects that meet California's carbon offset protocols can be traded by approved registries or through private contractors, or designees, that are registered in the state's Compliance Instrument Tracking System Service before these manure-to-energy projects are submitted. The California-based polluting entity can then use the credits obtained from the trade to meet the state's air pollution control standards. Negotiated agreements for the exchange of carbon credits are generally done in a private market. Thus, it is difficult to know exactly how much money or other benefits manure digester projects receive. However, the private company 3Degrees Group explains that digester projects are very expensive and carbon credits provide a very important stream of revenue to help make the projects economically viable <https://3degreesinc.com/resources/sunny-knoll-farm-digester/>. (Last accessed on March 10, 2021).What's important to understand, is that this program only benefits those that are able to comply with the rigorous guidelines of the California Air Resource Board's (''ARB'') Offset Protocols. Those that abide by these standards can generate offset credits that are facilitated by Offset Project Registries (''Registries'') <https://ww2.arb.ca.gov/our-work/programs/compliance-offset-program/offset-project-registries>. These Registries help facilitate the listing, reporting, and verification of offset projects developed, and issue Registry offset credits (''ROCs''). Id. But these ROCs cannot be used for compliance with the Cap-and-Trade Program, they need to be converted to ARB offset credits to be eligible for use in the Cap-and-Trade Program. After the issuance of ROCs, the ARB determines whether ARB offset credits should be issued for each offset project. If a project wants to deliver voluntary offsets, they may monitor, report, and verify greenhouse gas emission reductions under the Livestock Offset Protocol, but elect not to transition the resulting ROCs issued by the Registries to ARB offset credits, and are free to deliver the ROCs on the voluntary market. <https://ww2.arb.ca.gov/sites/default/files/classic/cc/capandtrade/protocols/livestock/livestock.2014.faq.pdf>. (Last accessed on March 10, 2021): 5. This complex system of compliance to even be eligible to receive carbon credits or participate in the carbon market is just another example of the powerful agriculture industry consolidating and dominating against those that are not part of the system. Funding and developing manure-to-energy projects does not benefit your average farmer because to actually profit from the project, you need to spend copious amounts of time and money toward being recognized by the ARB as an offset project, and even so, might not be granted the credits by the Registries to participate in the market. Those that opt in to allowing ARB recognized developers to front and fund the projects do not benefit from the cap-and-trade revenue and are stuck with operating costs.

Current national and state policies perpetuate environmental injustices and fail to support rural communities and sustainable farming practices

As of now, our national agriculture policies do not protect or incentivize sustainable farming practices that are necessary to build back national soil health and sequester carbon. Instead of subsidizing false solutions such as manure-to-energy projects, we must organize to reform our national and local-level farm bills and other government programs to invest and insure renewable, just, and equitable farming practices.

Some states are already taking the initiative to fight against the expansion of biogas. New York State just recently passed one of the country's most progressive climate-forward policies in its Climate Leadership and Community Protection Act (''CLCPA'').[79] The CLCPA ''prohibits waste-to-energy projects'' and ''biofuels used for energy or transportation purposes.[80]'' In essence, the state has banned the future development of manure-to-energy projects from its renewable energy platform. This kind of innovative lawmaking protects and prioritizes environmental justice communities, ensuring disadvantaged communities are not disproportionally burdened with more polluting infrastructure.

As we explained earlier, unlike New York, other states are propping up manure-to-energy projects as a gateway to regulatory ''compliance'' and profit through carbon cap-and-trade markets. For example, SRAP found Wisconsin CAFOs, which already struggle with pollution and other compliance issues, participate in and, therefore, benefit from the CA-ARB carbon trading program.[81] Regardless of the claimed air pollution reductions by CAFO manure digesters, we found numerous types of pollution events and regulatory problems caused by CAFOs participating in the program.[82] The CA-ARB carbon trading program does not take into account the severity of the environmental or health consequences of the regulatory violation.[83] CA-ARB invalidation verifiers should be checking for all violations of local, state, and federal laws that occur between initial waste collection and final disposal—not just specific dates of air-related noncompliance issues.[84] Strengthening regulations for factory farm operations and manure-to-energy projects is essential in protecting local communities from unnecessary health and economic burdens.

There are many ways that we can expand the programs currently in place to benefit struggling farmers and fenceline communities. Ensuring funding from existing federal conservation programs such as the Conservation Stewardship Program and Environmental Quality Incentives Program are directed toward truly sustainable farming practices, as well as expanding and creating local programs such as California's Healthy Soils Program Incentives, will help farmers and communities in numerous ways.[85] It is also imperative that we create new agriculture programs that lead with Indigenous knowledge, while creating equity and economic opportunities for Tribes and Indigenous communities. Shifting away from factory farming will create more jobs while bringing integrity, joy, and community back to farming.

The agribusiness industry's position that manure-to-energy projects help address climate change and CAFO waste problems needs to be more thoroughly studied and scrutinized. The reality experienced by those living in surrounding communities is that CAFOs rarely, if ever, actually deal with the pollution problems they create.[86] If nothing else, manure-to-energy projects have served as a facade to further a failed system that benefits the few at the expense of the public and the environment. Policymakers should be effectively enforcing existing environmental and public health regulations, as well as supporting and promoting more sustainable forms of livestock production and legitimate renewable energy programs.

RECOMMENDATIONS

Other policy suggestions include the following:

- There needs to be more openness and government transparency in permitting and other regulatory issues related to manure-to-energy projects.
- Governmental bodies need to stop providing financial incentives for the development of CAFO manure-to-energy technologies and instead focus funding on the promotion of sustainable agricultural practices.
- Subsidies that go to CAFOs must be eliminated so that traditional pasture-based animal agriculture and regenerative agriculture has a fair opportunity to compete and succeed in a free market.
- The federal government and states should establish, strengthen, and effectively enforce existing air and water pollution laws against CAFOs and stop subsidizing these facilities, particularly those that have caused pollution.
- States and local governments should provide citizens with more robust citizen suit provisions for enforcing environment regulations (similar to those provided under the federal Clean Water Act and Michigan's Environmental Protection Act). This way, the public would have greater ability to enforce environmental regulations when responsible agencies fail to act.

[79]Senate Bill S6599 (New York state climate leadership and community protection act). *The New York State Senate* 2019–2020. <https://www.nysenate.gov/legislation/bills/2019/s6599>.

[80]Ibid at page 13, line 6.

[81]SRAP. ''Trading Pollution: Wisconsin Industrial Dairies with Documented Regulatory Compliance Problems Benefit from California Greenhouse Gas Cap-and-Trade Program.'' Press Release, August 2020. <https://sraproject.org/2020/08/2016/>. (Last accessed on January 31, 2021).

[82]Ibid.

[83]Ibid.

[84]Ibid.

[85]''Are Carbon Markets for Farmers Worth the Hype?.'' <https://civileats.com/2020/09/24/are-carbon-markets-for-farmers-worth-the-hype/>. (Last accessed on March 10, 2021).

[86]SRAP. ''Trading Pollution: Wisconsin Industrial Dairies with Documented Regulatory Compliance Problems Benefit from California Greenhouse Gas Cap-and-Trade program,'' Press Release, August 2020. <https://sraproject.org/2020/08/2016/>. (Last accessed on January 31, 2021).

- Environmental protection and enforcement measures should be strengthened to reduce pollution, as opposed to using pay-to-pollute schemes.
- Congress could condition the receipt of federal subsidy funds in the agricultural sector on the implementation of truly sustainable farming and feedstock practices, and federal government should rescind support for manure biogas projects. Companies participating in the carbon market should have to demonstrate certification of sustainable operations before receiving any federal permits or other government approvals.[87]
- States should adopt or expand programs aimed at greenhouse gas emissions mitigation or sequestration from the forestry or agricultural sectors, such as[88] the following:
  - Create more local subsidy programs, such as California's Smart Agriculture Programs, that create value in land's carbon sink potential and shape cultivation techniques consistent with decarbonization objectives.
  - State governments should consider requiring farm owners to comply with basic climate-friendly practices, such as installing buffer strips next to streams, to receive tax benefits for agricultural activities or easements.[89]
    - The CA-ARB's program should take into consideration the type and magnitude of regulatory violations in addition to total periods of noncompliance when invalidating carbon credits. The current program that invalidates credits only for the time period in which the violation occurred is an inadequate deterrence for poor management.
    - The CA-ARB should meaningfully address input provided by its EJAC to ''[s]top investing in dirty energy'' and to eliminate subsidies and financing for ''waste-to-energy and other unsustainable technologies'' that impose negative impacts on environmental justice communities.
- The carbon credit market should be nationalized, instead of privatized, and credits should only be traded locally.
  - The CA-ARB should place geographic restrictions on trading and limit the amount of pollution ''offset'' credits that companies can use to comply with the program. This will help incentivize local emissions reductions and the annual statewide reduction of GHGs.
- Congress should require the Farm Service Agency and the Farm Credit System lending institutions to offer programs providing favorable credit to farmers and ranchers using truly sustainable and climate-friendly practices relating to all loans.
- States should look to New York State and its climate-forward policy in its Climate Leadership and Community Protection Act (''CLCPA'') and create more innovative laws that protect and prioritize environmental justice communities, ensuring disadvantaged communities are not disproportionately burdened with more polluting infrastructure.
- All states should look to New York's policy that disallows manure-to-energy projects in its renewable energy portfolio and follow suit.

CONCLUSION

Overall, manure-to-energy projects have the potential to be helpful for small farms (not CAFOs) if the biogas produced on the farm is reused only at that farm. When manure-to-energy projects are installed on factory farms, the processing of the methane produced for the power grid or for the transportation sector releases CO_2 and hazardous air pollutants, and requires the installation of gas pipelines and other infrastructure that leak tremendous volumes of methane. Biomethane production burdens and poisons local communities while degrading our planet's health and sustainability. Manure-to-energy projects are not a sustainable solution to the problems caused by CAFOs because they entrench an already polluting facility with more contamination mechanisms. Local, state, and national governmental entities need to stop promoting and incentivizing CAFO manure-to-energy projects at the expense of the environment and rural communities.

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[87]Blake Hudson and Uma Outka. ''Chapter 25: Bioenergy Feedstocks,'' *Legal Pathways to Deep Carbonization in the United States Summary and Key Recommendations,* November 2018: 65. <https://biotech.law.lsu.edu/blog/deep_decarb_summary_booklet_online.pdf>. (Last accessed on March 10, 2021).

[88]Ibid.

[89]Peter H. Lehner and Nathan A. Rosenberg. ''Chapter 30: Agriculture.'' *Legal Pathways to Deep Carbonization in the United States Summary and Key Recommendations*, November 2018: 77–78. <https://biotech.law.lsu.edu/blog/deep_decarb_summary_booklet_online.pdf>. (Last accessed on March 10, 2021).