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LEADERSHIP COUNSEL FOR JUSTICE & ACCOUNTABILITY

A Brown Cloud Over the Golden State:

How Dairy Digesters Are Driving CAFO Expansion and Environmental Injustice in California

Acknowledgments

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Executive Summary

Tulare County lies in the San Joaquin Valley, nestled in Central California between Fresno and Bakersfield.[1] It is one of the top producers of agricultural commodities in the United States and has the highest number of dairy concentrated animal feeding operations (CAFOs) in the state, up to 295 dairies according to records obtained from Tulare County.[a,2] This has come at a significant cost to the health and well-being of county residents, workers, farmed animals, and the environment. Now, a push to expand the use of anaerobic digesters to convert animal waste into so-called "biogas" could exacerbate these harms.

Around a third of California's dairy cows reside in Tulare County, and the vast majority[b] of the county's dairy operations have 500 or more cows.[3] The proliferation of industrial-scale dairy CAFOs has created significant environmental and public health concerns in Tulare County due to the overwhelming volume of animal waste produced by these facilities. Community members struggle to access clean water and are suffocated by dismal air quality. Yet rather than reign in the explosive growth of dairy CAFOs, California has gone in the opposite direction, encouraging the development of anaerobic digesters—a technology that captures methane emissions from animal waste to produce manure biogas, also known as factory farm gas—claiming they will help reduce the climate impacts of animal agriculture. The reality is the state's full-throated support of factory farm gas will exacerbate the region's air pollution and further entrench industrial dairies and all the harms that come with this sector.

An anaerobic digester, a closed, oxygen-free environment, is employed to capture methane released from livestock manure and turn it into biogas. During anaerobic digestion, bacteria break down organic material (in this case, animal waste) in the digester.[4] What is left behind from bacteria "eating" the waste is a combination of gases, primarily methane and carbon dioxide, as well as solid and liquid material (also called "digestate" or "effluent").[5] Biogas can be burned for heat or electricity or processed and injected into natural gas pipelines or used as vehicle fuel. Labeling this gas as "biogas" or "renewable" is industry greenwashing; manure "biogas" is inseparable from the highly polluting factory farming industry. Because "factory farm gas" better reflects the true nature of this form of dirty energy, these terms are used interchangeably throughout this report.

In Tulare County, there are 49 dairy digesters operating, which accounts for roughly 11% of all manure digesters in the entire U.S.[c,6]

[a] These data are based on Tulare County Annual Compliance Reports, which dairies and feedlots are required to submit to Tulare County as part of its Animal Facilities Confinement Plan (AFCP). Herd sizes are self-reported by the facilities. Tulare County's Annual Compliance Report Data (Appendix A) and the U.S. Department of Agriculture's Census of Agriculture reported very different numbers for total dairies in the county in 2022: 295 versus 187. We regularly found inconsistencies between available data sources. See the call out box Unverified, Incomplete, and Inconsistent Herd Size Data for Tulare County below for more information.

[b] Both the Census of Agriculture and Tulare County's Annual Compliance Report Data support this claim despite reporting different figures for the overall number of dairies in the county: The Census of Agriculture reports 94% of dairies having 500 or more cows, and the Annual Compliance Data reports 97% of dairies having 500 or more cows.

Daizy, a mother of three who has lived in Tulare County for 14 years, told us point blank: *"I can't make it clear enough that digesters do not benefit the community."* This is because factory farm gas production not only fails to resolve existing environmental and public health concerns for communities living near CAFOs, but it can also exacerbate already toxic conditions. Tulare County community members continue to face contaminated water, widespread toxic air pollutants, and putrid odors from the CAFOs nearby. Due to the digesters, they must now also contend with increased ammonia emissions,[7] increased air pollution due to biogas combustion,[8] and a perpetuation of the factory farm system that continues to consolidate smaller farms into mega-dairies.[9]

This report, based on research, public records, and interviews with residents, highlights the harmful community impacts of factory farm gas in Tulare County. While the report tells just one locality's story, it reflects many communities' concerns with the buildout of manure biogas in California as well as across the United States. Not only do factory farm gas systems fail to resolve the negative environmental and public health impacts of CAFOs, they worsen pollution and safety risks to communities living near industrial livestock operations and biogas plants.[10] They also entrench the current, inherently unsustainable system of factory farms—all for overstated and inadequate methane reduction benefits.[11] Under the deceptive banner of "renewable natural gas," anaerobic digesters are portrayed as a technology that can substantially reduce the emission of methane, a potent greenhouse gas.

However, evidence, including previous research from Friends of the Earth and Socially Responsible Agriculture Project, shows that anaerobic digesters yield a much lower reduction in methane emissions than estimated by both the federal government and California and that these reductions are highly variable and uncertain due to a lack of monitoring.[12]

[c] There is a slight difference between Environmental Protection Agency's AgSTAR Database and Tulare County's Annual Report of Dairy and Feedlot GHG Emissions in 2022 (referred to as "Annual GHG Report," which the county is required to prepare and publish as part of a 2019 lawsuit settlement) for total digesters. EPA lists 42 as operational while the Annual GHG Report lists 49. Since EPA acknowledges it cannot guarantee the accuracy of its data, and it did not always have accurate facility names, we chose to rely on the county's data. We do use the AgSTAR database for nationwide digester numbers because it is the only data source available that attempts to catalogue anaerobic digesters across the U.S.

Environmental Injustice in the Heart of California's Dairy Industry

Industrial agriculture in Tulare County has been a major economic engine for California but at a significant cost to its water resources, air quality, and climate impacts. **Over 93% of dairy CAFOs in Tulare County pose threats to water quality via surface water contamination.**[13] The hazardous byproducts from factory farms have caused serious contamination of groundwater, including high rates of nitrates, directly impacting the health of local communities.[14] Air quality is similarly a major issue in Tulare County due to industrial-scale dairies. Primary pollutants such as particulate matter (PM2.5) and ozone (O3) are prevalent,[15] causing respiratory issues, such as coughing, difficulty breathing, asthma, emphysema, and chronic bronchitis.[16] **According to a 2021 study in the Proceedings of the National Academy of Sciences, pollution from livestock waste results in around 1,700 premature deaths each year in the Central Valley, primarily due to ammonia emissions and PM2.5.**[17] Extensive research has shown that CAFO pollution disproportionately impacts low-income communities and communities of color,[18] and Tulare County is a stark example: The community is predominantly Hispanic/Latinx (67%),[19] with 18.2% of people living in poverty.[20]

Community members have continuously voiced concern about the lack of regulation of CAFOs and the subsidization of the industry with public dollars, yet California CAFOs continue to receive extensive subsidies and minimal oversight. The power of the agricultural sector in Tulare County is enhanced by public officials' deep connections to the industry. Rather than curb the negative effects of dairy CAFOs, Tulare County's political leadership is supporting a new profit stream for dairies and the fossil fuel industry: factory farm gas.

The Growth and Cumulative Impacts of Factory Farm Gas in Tulare County

Of the 49 anaerobic digesters now operating in Tulare County, the majority belong to digester clusters—a centrally located operation that receives raw biogas from surrounding digesters. **California has 15 clusters, a quarter of which are located in Tulare County.** Currently, the largest cluster in the county (by digester number) is Calgren Dairy Fuels with 20 digesters.[d,21] All of the livestock operations supplying the digester clusters in Tulare County are large, ranging from 1,200 to over 15,000 cows.[e,22] As explained further in this report, it was difficult to determine changes in herd sizes because historical herd size data are incomplete, unverified, and inconsistent, with numbers often varying substantially from source to source.

Due to federal and state programs encouraging construction of anaerobic digesters and rewarding production of biogas with lucrative subsidies and incentives, there is little motivation for dairy corporations and CAFO operators to change the existing system of factory farms to a more sustainable method of raising cows. As a result, the communities closest to dairy CAFOs in Tulare County continue to suffer from the harms associated with industrial livestock operations. Now, due to the explosive growth of manure biogas production, they are also harmed by novel forms of pollution from digesters and other factory farm gas infrastructure, as well as from the burning of biogas.

Factory Farm Gas Production Worsens Air and Water Quality Problems

Studies have shown that anaerobic digestion can cause increased ammonia emissions, nitrous oxide emissions, residual methane, hydrogen sulfide emissions, and odorous gasses.[23] Digestate, a nutrient-rich byproduct of digestion, can also put water quality at risk because compounds such as nitrogen, phosphorus, and other elements are both in higher concentrations and become more soluble than fresh compost due to anaerobic digestion and therefore have higher potential to leach into waterways.[24] The production and combustion of manure biogas also creates additional harm to nearby communities. When biogas is used to power internal-combustion engines that generate electricity on-site, it produces high levels of NOx, SOx, and VOC emissions.[25]

Ultimately, this increased pollution is a devastating consequence of manure biogas production for communities like those in Tulare County that are already grappling with serious air and water quality problems due to the excessive pollution from CAFOs. Moreover, the one community benefit commonly touted by factory farm gas proponents is that digesters reduce odors. **However, according to the community members we interviewed, that is not the case. When asked whether the odors from the dairies decreased due to the installation of digesters, Gloria, a 50-year resident, told us no and that "it is the same smells."**

[d] This number includes only digesters that are presumed to be operational and is based on Tulare County's Annual GHG Report (which lists Calgren's developer, Maas Energy Works). EPA's AgSTAR Database only listed 15 digesters in this cluster as operational, and Dairy Cares lists 18. We relied on the Annual GHG Report because it appeared to have the most comprehensive records, including facility names and addresses.

[e] These data are based on Tulare County's Annual Compliance Reports.

Lack of Transparency Clouds True Impact of Digesters

In Tulare County, there has been questionable accounting around both the development of anaerobic digesters and the CAFOs themselves. Investigative reporting by *Capital and Main* reported at least one of the digesters in the county may have been constructed under false pretenses as the biogas companies behind the cluster **contracted with a professor who had a history of data fabrications** to provide information that directly contributed to the digester receiving California tax dollars.[25]

Lack of transparency on animal herd sizes is another alarming issue. Multiple CAFOs in the county report varying herd sizes across county data, federal data, state permits, and as part of LCFS pathway applications. Herd size numbers from all of these sources are self-reported, and in some cases, dairy operators are incentivized to report higher herd sizes (e.g., to capitalize on LCFS subsidies), while in other cases they are incentivized to report lower herd size numbers (e.g., to comply with permits capping allowable herd sizes).

The lack of consistent data and oversight leaves residents in the dark about the true impact of the factory farms and digesters in their community. It also reinforces the need for third-party verification of herd sizes to accurately assess the impacts of manure biogas policies on methane emissions, industry consolidation, and nearby communities.

Factory Farm Gas Is Flourishing Thanks to Government Policies

Despite concerns from researchers, environmental and public health organizations, and Tulare County residents about the negative health and environmental impacts of dairy CAFOs and digesters, state and federal policies are propping up the manure biogas market as a false climate solution.

While federal conservation dollars are helping to build anaerobic digesters in Tulare County, **no state has offered more support for factory farm gas than California, which is home to a third of all digesters in the U.S.**[26] Multiple state programs, including the Dairy Digester Research and Development Program (DDRP) and the California Energy Commission (CEC)'s Clean Transportation Program, have provided millions of dollars to build digesters.[27] Dairy digesters in Tulare County have received over $81 million in state funding just from DDRDP, which is **nearly a third of total DDRDP funding for anaerobic digesters.**[28] In most cases, constructing an anaerobic digester is not viable without public subsidies, so the large number of digesters would likely not exist without the extensive state support.

Local land use laws are similarly being used to push through anaerobic digester construction. **A number of counties in California, including Tulare, have adopted land use policies that allow dairies to expand and add a digester without requiring project-level California Environmental Quality Act (CEQA) review.**[29] Moreover, a number of practical barriers block public engagement in the zoning process, shutting community members out of the process entirely. For example, **50% of Tulare County community members speak a language other than English at home,**[30] **yet the county website, resources, and meetings are held in English without clear transcription or interpretation services advertised.**

Government policies, such as the federal Renewable Fuel Standard and, notably, California's Low Carbon Fuel Standard, are also incentivizing the sale of biogas, **creating perverse incentives for CAFOs to utilize inferior manure management practices that maximize methane production to receive lucrative rewards.** Because anaerobic digesters are typically only feasible at the largest CAFOs and rely on the operations using the most hazardous—and methane-generating—manure management practices, like liquid or slurry manure maintained in lagoons or ponds, producers that do not maintain manure in lagoons are fundamentally excluded from these programs. As a result, **these policies are increasing the competitive advantage for large-scale producers at the cost of small, sustainable farmers.** Consolidation of dairies in California is a major issue that biogas production exacerbates: From 2017 to 2022, the number of California dairies with fewer than 500 cows decreased by 50% from 769 to 394.[31]

Almost all of the dairies with digesters (87%) participate in these fuel programs. Through Calgren Dairy Fuels LLC, 40% of the dairy digesters in Tulare County participate in both the federal Renewable Fuel Standard and California's Low Carbon Fuel Standard, while through California Bioenergy, 47% participate exclusively in the Low Carbon Fuel Standard.

Policy Recommendations

The Tulare County residents we spoke with do not believe that anaerobic digesters are the solution to their extensive health and environmental problems. Instead, they want the government to hold the dairy CAFOs accountable for their pollution, increase oversight of these operations, and properly enforce current laws. They want to see investment in the community through infrastructure improvements, job opportunities, and affordable housing—not factory farm gas production.

Rather than investing in manure biogas, public resources should be redirected to more effective methane reduction solutions that do not exacerbate environmental injustice and industry consolidation. California policymakers should implement the following measures to better protect people and the environment from the harms of manure biogas and CAFOs:

1. Reform California's Low Carbon Fuel Standard (LCFS) to eliminate the "avoided methane crediting;" fix the inaccurate Life Cycle Assessment that ignores upstream and downstream greenhouse gas emissions associated with factory farm gas production.

2. Prevent double-dipping between subsidies, tax incentives, and programs like the Renewable Fuel Standard (RFS) and California's Low Carbon Fuel Standard (LCFS). Related, ensure GHG reductions attributed to manure biogas are not double counted among California climate programs.

3. Do not fund or incentivize manure biogas. Sunset the Dairy Digester Research and Development Program.

4. Prohibit construction of new large CAFOs and expansion of those currently operating in California, particularly those facilities sited in the Central Valley.

5. Regulate waste from CAFOs and digesters, including treatment and application of digestate.

6. Regulate air emissions from CAFOs, including ammonia emissions and volatile organic compounds.

7. Require and improve methane monitoring and reporting from livestock operations.

8. Pursue methane reduction strategies that support environmental justice and fair markets for producers, including regulating methane emissions from industrial dairies, leveraging statewide food procurement toward plant-forward menus, reducing food waste, and prioritizing conservation funding for pasture-based livestock production.

9. Require publicly available reporting of basic data from CAFOs and digester operators, including herd sizes and methane emissions. Fund and conduct research to assess the impact of manure biogas policies on methane emissions, industry consolidation, and rural communities.

I. Introduction

California is the top dairy producing state in the United States, and Tulare County is the heart of the industry. A rural, agriculture-intensive community, it is plagued by the negative effects of concentrated animal feeding operations (CAFOs), industrial-scale facilities that confine hundreds—or in many cases, tens of thousands—of animals without access to pasture. The consolidation and expansion of dairy CAFOs has created significant environmental and public health concerns in Tulare County due to the overwhelming volume of animal waste produced by these industrial operations. Residents' air and water are being poisoned by the nearby dairies, yet regulation and oversight are severely lacking.

Compounding the harms from industrial-scale dairies is the increase in anaerobic digesters. This technology is employed on large livestock operations to capture the gas released from animal waste and produce manure biogas, or factory farm gas, which can be used for heat and electricity or refined into pipeline-quality gas that can be used as transportation fuel. The explosion in the number of digesters, particularly in Tulare County, is largely driven by extensive government support and policies like the federal Renewable Fuel Standard (RFS) and California's Low Carbon Fuel Standard (LCFS), which incentivize manure biogas production. For the community, the impact of digesters is not limited to the landscape—it extends to their health. Respiratory issues, unsafe drinking water, and skin conditions are just some of the adverse effects residents have experienced living in proximity to CAFOs and digester operations. Public outcry has done little to slow the rampant expansion of digesters, despite the evidence that it is further entrenching a toxic, unsustainable model of dairy production. In many instances, decisions by public officials who have been heavily influenced by large agribusiness interests have enabled the unchecked growth of digesters and factory farms without adequate engagement of the communities they impact. The result is a system that prioritizes manure biogas production—under the greenwashed banner of renewable natural gas—over the health and wellbeing of communities.

This report, based on research and interviews with four Tulare County residents, details community members' experiences living amid chronic, industrial-scale pollution from factory farms and digesters and how their home has been sacrificed in the name of an ineffective, insufficient climate mitigation strategy. Lived experience, rigorous academic inquiry, and investigative reporting all point to the same truth: Calling digesters a "solution" requires the public, policymakers, and industry to turn a blind eye to the manifold documented harms of factory farms and the additional negative impacts of digesters.

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Unverified, Incomplete, and Inconsistent Herd Size Data for Tulare County

There are multiple, conflicting sources of data related to year-to-year herd sizes at dairies in California and specifically, Tulare County, which precluded a meaningful quantitative analysis of the relationship between changing herd sizes, adoption of anaerobic digesters, and incentives for producing manure biogas. Herd size numbers are self-reported, do not always include all animals (e.g., some facilities just report mature milking cows), and there is no requirement for state, regional, or local government agencies to verify these numbers. For purposes of this report, we primarily rely on the U.S. Department of Agriculture's 2022 Census of Agriculture, Tulare County's 2023 Annual Report of Total Greenhouse Gas Emissions from Dairies and Feedlots, and Tulare County's Individual Dairy Annual Compliance Report Data (2011–2022). As this report was being completed, the California Air Resources Board released its California Dairy and Livestock Database (CADD). CADD calculated herd sizes using several sources, including Regional Waterboard annual reports, inspection reports, state air permits, Google Images, waste management plans, and nutrient management plans. Although a full analysis of the database was beyond the scope of this work, we did identify shortcomings detailed in Section III of this report. Table 1 summarizes each of these data sources.

Considering the significant evidence that dairies in the Central Valley negatively impact the health and well-being of the people who live in the community and that lucrative subsidies for producing manure biogas incentivize increased herd sizes for dairies with digesters, it is imperative that the government comprehensively collect and independently verify annual herd size data. With reliable and comprehensive data, examining causal impacts of California's state incentives for biogas on herd size trends would be possible. These steps are critical to fully understand the policy implications for California's programs incentivizing manure biogas and its broader methane reduction initiatives.

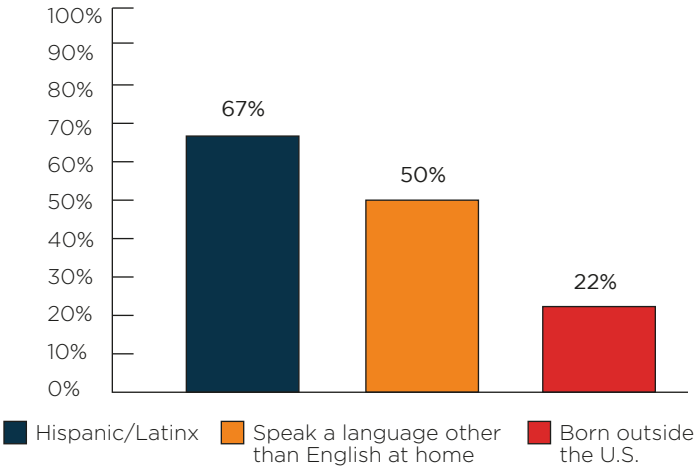
II. Environmental Injustice in the Heart of California's Dairy Industry

Tulare County lies in the San Joaquin Valley, nestled in Central California between Fresno and Bakersfield.[32] It is the top producer of agricultural commodities in the United States and has the highest number of dairy CAFOs in the state.[33] This has come at a significant cost to the health and well-being of county residents, workers, farmed animals, and the environment.

Studies show a troubling pattern of harmful industrial practices, including the deliberate siting of CAFOs in low-income communities or those with high percentages of People of Color.[34] A 2022 study from Earthjustice underscores this disparity, revealing that, "of people in Census tracts with the least access to resources, 27% live [within] 3 miles of a CAFO in [California]."[35] This report finds that "the proportion of people of color (POC), Hispanic, and American Indian residents living within 3 miles of a Large Dairy CAFO in the CA study area is 1.29, 1.54, and 1.15, times higher, respectively, than the percent of non-Hispanic Whites."[36]

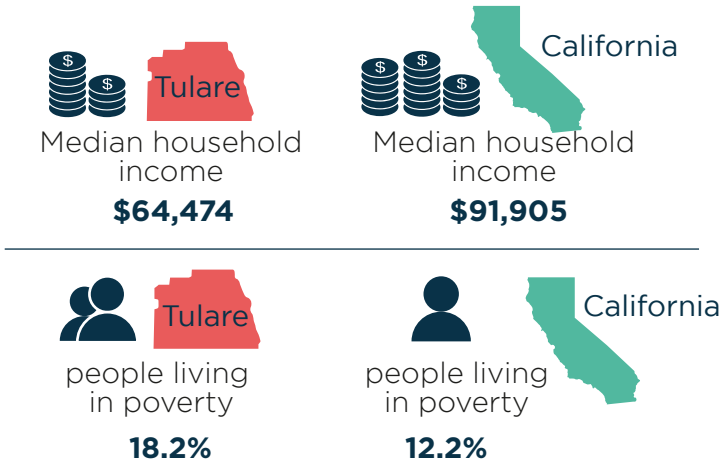
Tulare County, with a population of 479,000, is a predominantly Latinx community, where 67% of residents identify as Hispanic/Latinx.[37] Approximately 22% of residents in Tulare are foreign-born, and 50% speak a language other than English at home.[38] This extends into the overall Californian workforce, where 92% of farmworkers are Latinx, and an estimated half of farmworkers lack legal residency.[39] With a significant portion of residents unable to communicate fluently in English or without a family member proficient in the language, advocating for their rights and sharing their struggles becomes much more difficult.

Figure 1. Tulare County Demographics



Tulare County also struggles with high rates of poverty, especially compared to the rest of California: The median household income in Tulare County is $64,474 (compared to $91,905 in California) and 18.2% of people live in poverty (compared to 12.2% across the state).[40] The industrial livestock industry's exploitation of marginalized and vulnerable communities in Tulare County serves as a stark example of a systemic problem.[41]

Figure 2. Poverty in Tulare County



California's Agriculture Industry: Growth at Its Own Expense

Industrial agriculture in Tulare County and across the state has been a major economic engine for California but at a significant cost to its water resources, air quality, and the climate. Large-scale, industrial dairy operations dominate Tulare County with around a third of California's dairy cows residing in the county. Of the dairy operations in Tulare County, the vast majority have 500 or more cows. Just 30 years ago, only 58% of the dairies in the county had 500 or more cows. This trend is occurring across the state: From 2017 to 2022, the number of California dairies with fewer than 500 cows decreased by 50% from 769 to 394.[45]

In addition to harming small-scale producers, the consolidation of livestock operations undermines environmental justice and increases environmental and public health issues due to the massive quantities of waste generated by these industrial-scale farms. Unsurprisingly, one of the biggest challenges facing Tulare County is water pollution from industrial-scale livestock operations.

Extensive research has consistently highlighted water contamination attributed to the discharge of manure and waste from dairy farms in the county.[46] These findings are further supported by the daily experiences of residents.

In California, 80% of all developed water is used for agriculture,[47] leading to groundwater overdraft and land subsidence,[48] as well as water insecurity throughout the state. Tulare County was once known for its abundant water resources but has since deteriorated into a dry lakebed[49] due to decades of exploitation and diversion of water from Tulare Lake for agriculture.[50] Some communities in Tulare County regularly lack sufficient drinking water due to agricultural overuse, requiring the state to provide bottled water.[51]

California dairies alone use about 142 million gallons of water daily just for the cows to drink and to wash the animals and buildings.[52] This is equivalent to over 215 Olympic-size swimming pools, yet it does not even include the water used to grow feed for the cows or any water used in manure management.[53]

[f] Both the Census of Agriculture and Tulare County's Annual Compliance Report Data support this claim despite reporting different figures for the overall number of dairies in the county: The Census of Agriculture reports 94% of dairies having 500 or more cows, and the Annual Compliance Data reports 97% of dairies having 500 or more cows.

Water Contamination in Tulare County: High Nitrate Levels and Public Health Risks

Over 93% of dairy CAFOs in Tulare County pose threats to surface water quality.[54] The hazardous byproducts of industrial practices have also caused immense contamination of groundwater, which "approximately 2.6 million people [in this region] rely on…for their drinking water."[55] Tulare County's water contains various contaminants, including trichloropropane, dibromo-3-chloropropane (DBCP), arsenic, chromium, nitrate, radium, and uranium.[56] This type of groundwater contamination can lead to soil contamination and the degradation of land quality.[57] These chemicals also leach into surface waters, creating eutrophication, which causes algal blooms and dead zones, and harms aquatic life.[58]

Water contamination adversely affects the residents of Tulare County and has led to health complications and struggles. Daizy, a mother of three who has been living in Tulare County for 14 years, noted the extreme conditions that she lives in: "They [the dairy industry] are contaminating our water to the point that you take a shower, and the water runs white and smells of chlorine. We are more likely to get cancer because of the water. Many people already have skin cancer, eczema, and dermatitis." Josefa, a community member for 19 years, told us they receive a letter almost monthly "saying how we can't drink the water because it has arsenic in it. If you read the letter, it says that you can get cancer. It's scary."[59]

Nitrates are common pollutants linked to dairy operations in the Tulare Lake Basin and Salinas Valley; around 254,000 people are at risk of exposure to nitrate contamination in their drinking water.[61] Nitrate levels in Tulare County are known to cause eye and skin irritation, anemia, gastrointestinal illnesses,[62] various forms of cancer, and adverse reproductive outcomes, including methemoglobinemia (also known as blue baby syndrome).[63]

Despite the legal limit for nitrates in drinking water being 10 mg/l[64] (a limit set in the 1960s),[65] more recent research suggests levels as low as 0.87mg/l can result in deadly consequences.[66] Extreme weather, which is increasingly frequent due to climate change, can compound these conditions. For example, during flooding in 2023, dairies and their manure lagoons were overrun with rain, which threatened to flush even more nitrates into the community's drinking water. In other words, industrial dairies are poisoning Tulare County residents' water, impacting already vulnerable populations.

Poor Air Quality in Tulare County

Air quality issues are similarly pervasive across the county. Volatile organic compounds (VOCs), which form ground level ozone (O_3), and particulate pollution (PM2.5), are a major problem in the Central Valley due to the dairies.[68] The American Lung Association lists Tulare County as the fourth most ozone-polluted county in the nation and the second most polluted county in terms of year-round particle pollution.[69] Exposure to ozone pollution in particular causes myriad respiratory issues, including coughing, difficulty breathing, asthma, emphysema, chronic bronchitis, and an increased frequency of asthma attacks.[70] Children are especially vulnerable to ozone because their lungs are still developing.[71] The impacts of air pollution are evident throughout Tulare County and the community continuously reports worrying health trends; over 7,000 cases of pediatric asthma, more than 29,000 cases of adult asthma, over 14,000 cases of chronic obstructive pulmonary disease (COPD),[72] and over 170 cases of lung cancer were reported in 2023 alone.[73] According to a 2021 study in the Proceedings of the National Academy of Sciences, pollution from livestock waste results in around 1,700 premature deaths each year in the Central Valley, primarily due to ammonia emissions and PM2.5.[74]

According a 2021 study in the Proceedings of the National Academy of Sciences, pollution from livestock waste results in around 1,700 premature deaths each year in the Central Valley, primarily due to ammonia emissions and PM2.5.

Every one of the women we spoke with are suffering from the consequences of this air pollution. Maria, who has lived in Tulare County since the 1970s, told us:

> *"I have had three days of heart pain; the doctor told me it was because I am not getting enough oxygen to breathe. It has come to the point where the doctor will have to hook me up to an oxygen machine. My 40-year-old son also sleeps with a CPAP machine, and my 11-year-old grandson also has these [respiratory] issues...I am fearful for my grandson because he is a kid. It's [like] seeing your grandkid dying slowly every day."*

Daizy similarly sees firsthand the effects of this toxic air pollution on her children's health, stating:

> *"I have three kids with chronic asthma, one is always sick and had two surgeries for Adenoiditis.75 They have sleep apnea from the air quality...The cows, the dairies, they all affect me."*

Community members told us that in addition to these air quality issues, noxious odors from livestock operations pervade and interfere with everyday life. Josefa said:

> *"In the summertime, when we don't want to use our dryer and want to put our clothes out on a line, we can't do that because they just reek and smell like manure."*

She added:

> *"we want to BBQ outside with family, and they don't want to come...when we invite them, they make faces. We feel embarrassed because it stinks! It's nasty..."*

Both Josefa and Maria described how even the local schools are disturbingly close to the CAFOs' toxic pollution. For example, Pleasant Elementary School is just three miles from the nearest dairy, while Alpine Vista School is only 2.7 miles from its nearest dairy. Maria said:

> *"for the kids, this is their everyday life. This is what they smell every day."*

Daizy added:

> *"Not everyone can afford to send [their] kid to school with bottled water, so kids are drinking contaminated water."*

This highlights how not even schools, public institutions meant to safeguard children, are protected from the industry's pollution. This is particularly egregious as children are more susceptible to chronic health issues and developmental illnesses from the byproducts of the industry's practices.[76]

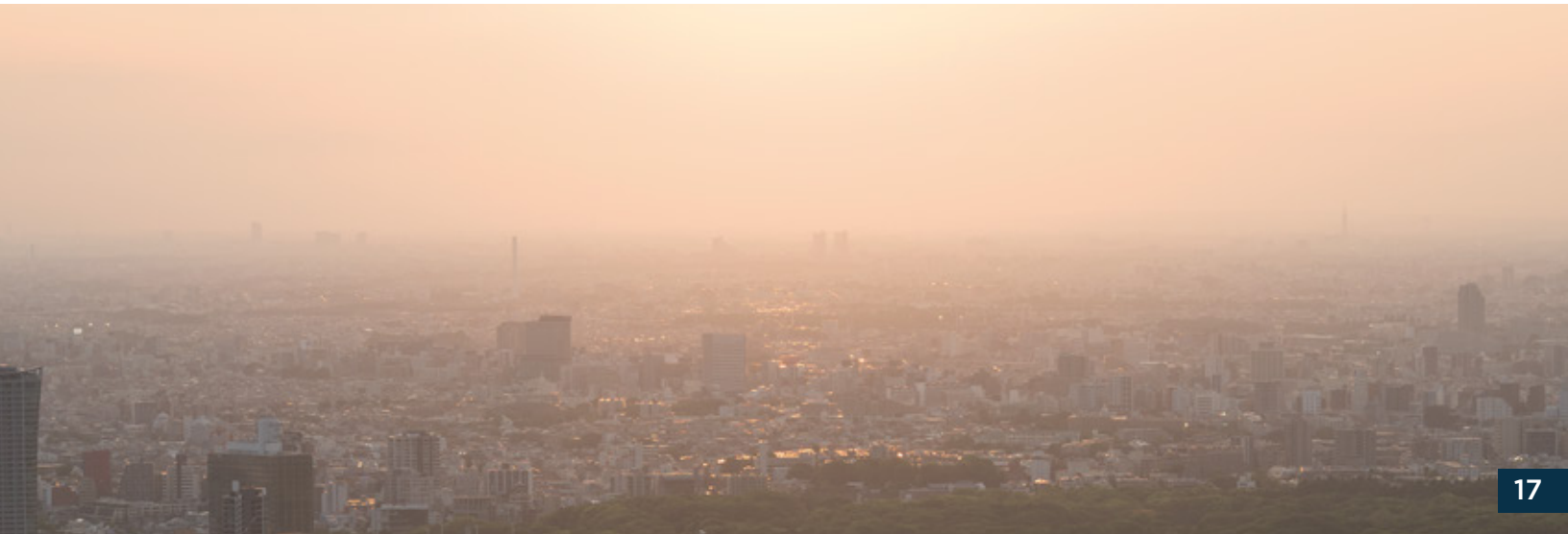
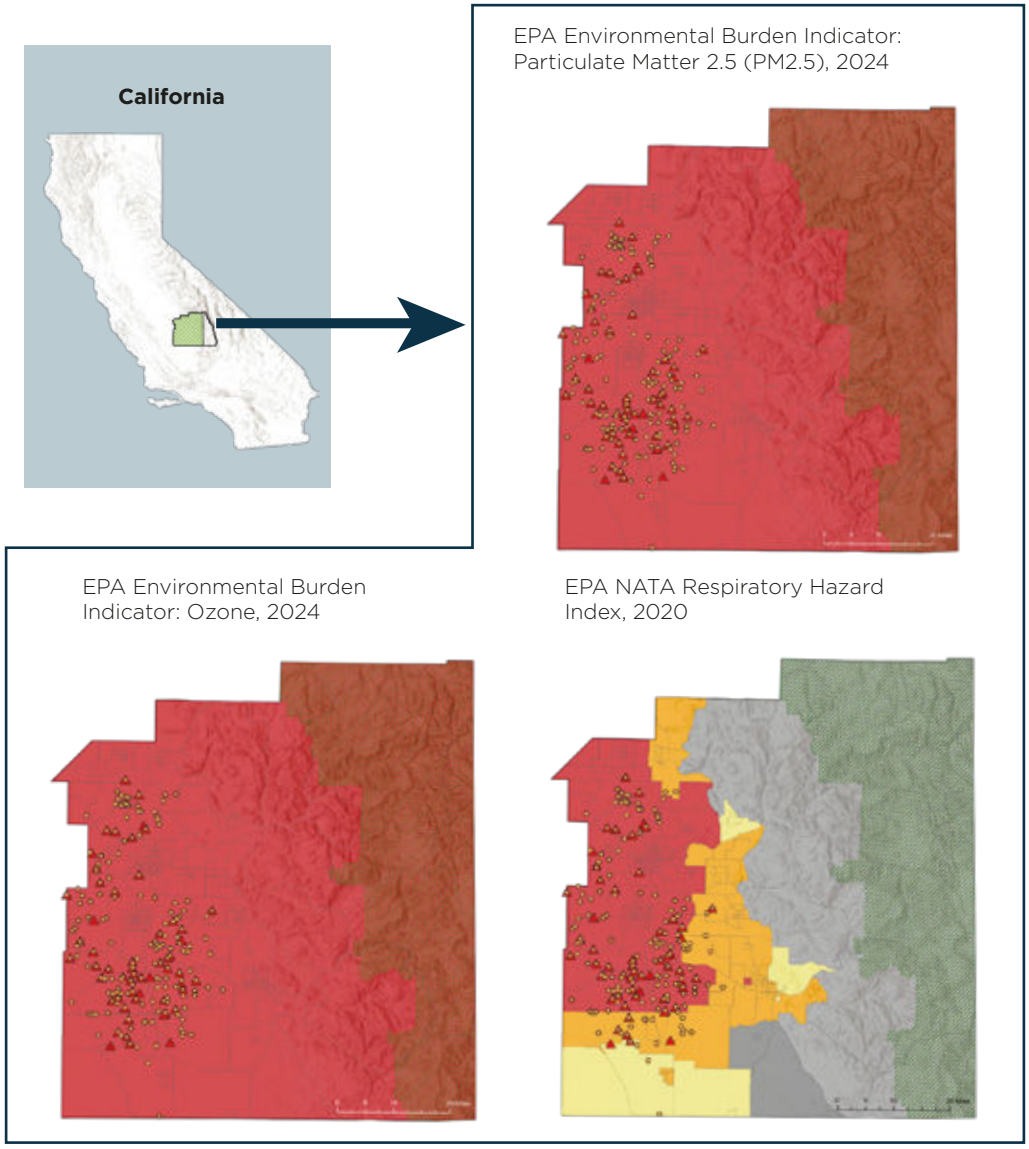


Figure 3. **Air Quality Maps**



Legend

Manure Digesters[a]

Large Dairy CAFOs[b]

National & State Parks & Forested Areas

Percentile Ranks (0–100) for Concentrations of PM 2.5,[c] Concentrations of Ground-Level Ozone,[d] and Risk of Noncancerous Adverse Health Effects Over a Lifetime of Exposure[e]

- Data Not Available
- Less than 50 percent
- 50-60 percentile
- 60-70 percentile
- 70-80 percentile
- 80-90 percentile
- 90-95 percentile
- 95-100 percentile

Map Layer Sources:

a Tulare County Resource Management Agency. (2023). Annual Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2022. https://tularecounty.ca.gov/rma/permits/dairy/

b California Water Boards. (2024). Tulare County Regulated CAFO Facility Report https://www.waterboards.ca.gov/water_issues/programs/ciwqs/publicreports.html#:~:text=amount%20and%20status.-,Facilities%20Reports,-Facility%2DAt%2DA

c U.S. EPA. (2024). EJScreen Indexes—2024 Public Release, Environmental Burden Indicator, PM 2.5. https://catalog.data.gov/dataset/ejscreen-indexes-2024-public-release2

d U.S. EPA. (2024). EJScreen Indexes—2024 Public Release, Environmental Burden Indicator, Ozone. https://catalog.data.gov/dataset/ejscreen-indexes-2024-public-release2

e U.S. EPA. (Updated 2018). EnviroAtlas—Selected National Air Toxics Assessment Results by County—2014, National Air Toxic Assessments (NATA) Respiratory Hazard Index. https://catalog.data.gov/dataset/enviroatlas-selected-national-air-toxics-assessment-results-by-county-20142

Maria reflected on the devastating toxic pollution in her community:

"When someone passes away, I go to pray for them. I would ask why they were sick, and I saw a pattern: lung problems, respiratory illnesses, seeing people connected to oxygen tanks...that's when I realized there is something directly impacting our community."

Between the abundance of toxic air pollutants and putrid odors from the CAFOs nearby, residents are left without refuge. Despite these extensive environmental and public health concerns, little has been done to reign in the growth of CAFOs in Tulare County.

"My 40-year-old son also sleeps with a CPAP machine, and my 11-year-old grandson also has these [respiratory] issues...I am fearful for my grandson because he is a kid. It's [like] seeing your grandkid dying slowly every day."

The Dairy Industry's Role in Climate Change

Animal agriculture is a major driver of the climate crisis, accounting for nearly 60% of greenhouse gas emissions from the global food system.[77] Animal agriculture is also the largest source of U.S. methane emissions, accounting for 36% of total U.S. methane emissions, which primarily stem from the large amounts of animal waste as well as the digestive system of the animals themselves (known as "enteric fermentation").[78] According to a U.N. report, the dairy sector's greenhouse gas emissions rose 18% between 2005 and 2015.[79] In California, over half the state's methane emissions come from dairy and livestock.[80]

The extreme weather due to climate change is impacting agriculture within the Central Valley: Record-setting droughts have impacted the area from 2020 to 2022, affecting irrigation demands and decreasing crop yields. More recently, California experienced historical flooding: In 2023, flooding in Tulare County caused over $120 million in damages.[81]

Yet even when it comes to climate change, the dairy industry remains insulated from increased regulation. For example, despite a state law requiring California to reduce its methane emissions by 40% of its 2013 levels by 2030, the state is not regulating climate emissions from dairy operations.[82] Instead, California is promoting manure biogas production.

As of January 1, 2024, state law permits CARB to directly regulate methane emissions from livestock operations, however, the California legislature requires the agency to make significant findings of "economic feasibility" before implementing any regulations.[83]

In California, over half the state's methane emissions come from dairy and livestock. Yet even when it comes to climate change, the dairy industry remains insulated from increased regulation. Despite a state law requiring California to reduce its methane emissions by 40% of its 2013 levels by 2030, the state is not regulating climate emissions from dairy operations.

Tulare County Residents Demand More Oversight of Factory Farms — to No Avail

Despite persistent advocacy efforts and abundant evidence demonstrating public health and environmental damage from industrial dairy operations, Tulare's political figures regularly dismiss community concerns and the pleas of advocacy groups. This is no surprise considering CAFOs are often intentionally sited in areas where marginalized communities lack the political or economic power to adequately address the negative impacts of these industrial facilities.[84] They also often lack the ability to leave the toxic conditions behind, not least of all because CAFOs can negatively impact property values, making it difficult to sell.[85]

Community groups, such as the Central Valley Defenders of Clean Air and Water, and non-profit organizations, like Leadership Counsel for Justice and Accountability, have consistently voiced their concerns about the lack of regulation of CAFOs and the subsidization of the industry with public dollars. In recent years, residents and advocacy organizations have heightened their focus on the flow of incentives for factory farm gas production. Maria told us many community members engage in this work, trying to *"contact the government, so they stop giving incentives to the owners of these dairies because they just keep buying more and more cows...it's basically an exploitation of animals and it's affecting human lives."*

The establishment of regulations to hold the industrial dairy sector accountable for its pollution and public health harm is long overdue. For example, in 2018, an accident at the Tulare Saputo Cheese Plant led to the release of 5,690 pounds of anhydrous ammonia,[87] resulting in a $170,000 fine for violating the Clean Air Act. However, in 2019, when EPA returned for inspection, the plant failed to meet safety standards, while also providing inaccurate reports regarding stored ammonia.[88] Other operations in Tulare County have similarly been found in violation of state regulations: Both Jacobi Dairy and Alcaraz Dairy have faced repercussions for non-compliance and failing to adequately fulfill groundwater monitoring and reporting requirements.[89]

Political Influence of California's Dairy Industry

Over time, voters have increasingly recognized the harms of industrial agriculture and supported commonsense oversight. According to a 2021 report by the Family Farm Action Alliance, "57% of voters [nationwide] want more oversight of industrial agriculture, and 51% of voters support a national moratorium on CAFOs."[90] Despite this, industrial animal agriculture continues to thrive with extensive subsidies and minimal regulation and oversight. The power of this sector in Tulare County is enhanced by public officials who directly benefit from the industry.

Tulare County is part of California's 21st and 22nd congressional districts,[91] represented by Jim Costa (D) and David Valadao (R), respectively. Rep. Costa has been a staunch supporter of industrial livestock interests, particularly dairy. Throughout the 2023–2024 election season, Costa received $36,250 from the dairy industry to support his reelection,[92] making his campaign the third highest recipient of financial support from the industry.[93]

Similarly, Rep. Valadao is a dairy owner himself and previously held leadership roles with the California Milk Advisory Board and Western States Dairy Trade Association.[94] His deep ties to the industry have led him to continuously favor policies that support dairy operators and agricultural interests. Even with the overuse of water in the region, Valadao recently advocated[95] for increased water allocations for South-of-Delta[96,*] agriculture.

* South-of-Delta refers to all water bodies south of Highway 12 (disregarding the Sacramento River and the San Joaquin River south of Stockton). Delta, Central and South. (2022, November 16). California Office of Environmental Health Hazard Assessment. https://oehha.ca.gov/fish/advisories/delta-central-and-south-0#HABs

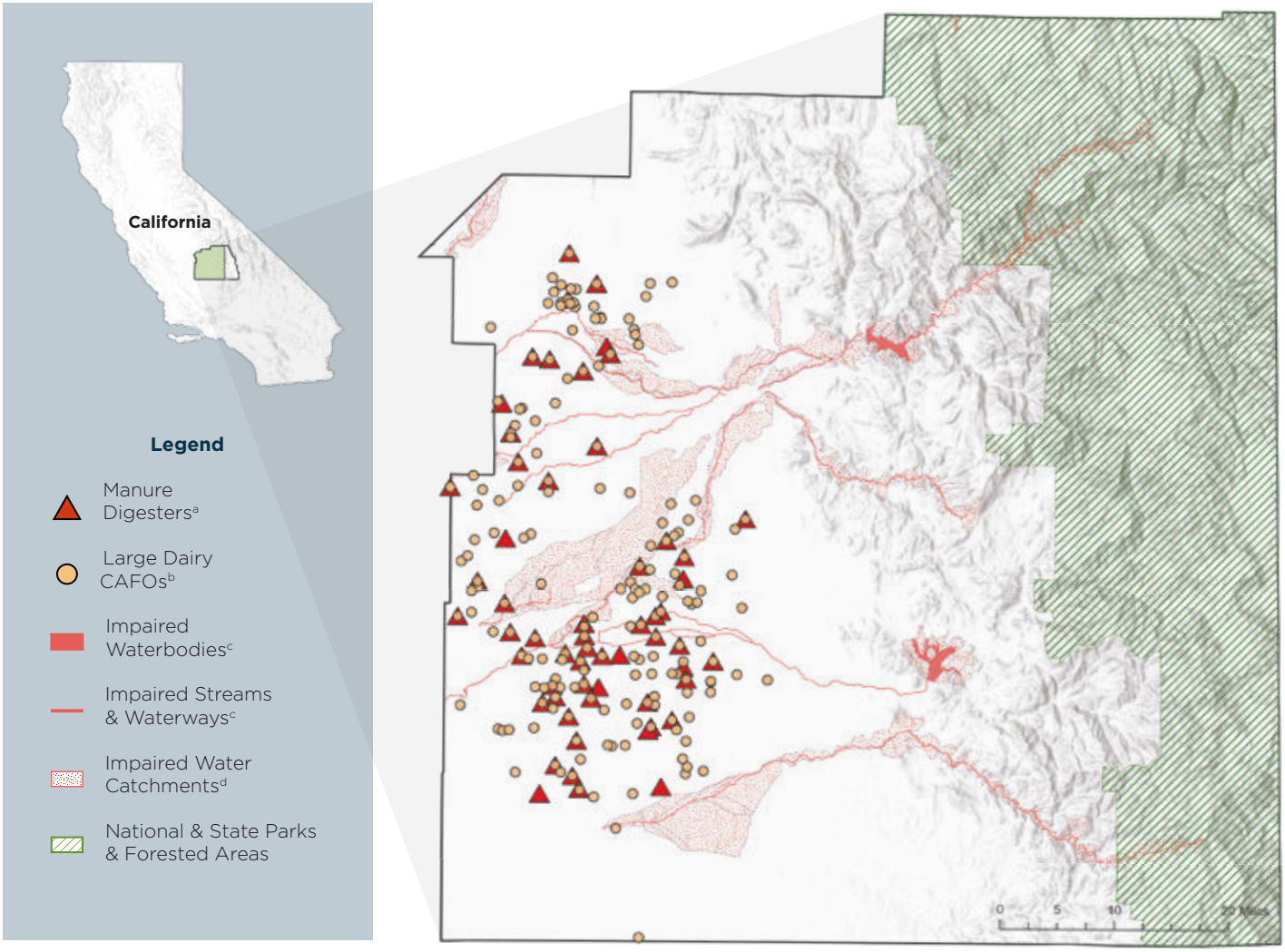
The influence of the dairy industry pervades the local level as well. For instance, Pete Vander Poel III, who grew up on dairy farms in Tulare County, serves as county supervisor for District 2 and holds positions on both the Water Commission and Groundwater Sustainability Agency.[97] Throughout his time on the Board, Supervisor Poel has continuously lobbied for funding for dairy digester projects in Tulare, noting that the county's primary economic engine "has been and will hopefully continue to be in agriculture," leading him to augment water resources for the agricultural industry.[98]

Daizy sees politicians' deep connections to the dairy industry as a big part of the problem: *"The owners of dairies all receive money but don't do anything to better the surrounding area. They want more cows, more money, but they don't care about how they affect us. We are not getting any benefits."* She continued, *"Dairy farmers and elected officials are working together to continue the profits all while harming the community."* Indeed, Tulare County politicians at all levels have failed to curb the negative effects of the dairy industry by failing to support regulation and increased oversight. Instead, Tulare County's political leadership at all levels of government have been working to create a new profit stream for dairies and the fossil fuel industry: Factory farm gas.

III. The Growth and Cumulative Impacts of Factory Farm Gas in Tulare County

California has gone all-in on factory farm gas, aiming to capture and sell methane emissions from dairy manure under the greenwashed guise of "renewable natural gas," further entrenching industrial dairies and worsening the environmental and public health harms that come with this sector.

Figure 4. Large Dairy CAFOs and Manure Digesters in Tulare County, California



Map Layer Sources:

a Tulare County Resource Management Agency. (2023). Annual Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2022. https://tularecounty.ca.gov/rma/permits/dairy/

b California Water Boards. (2024). Tulare County Regulated CAFO Facility Report https://www.waterboards.ca.gov/water_issues/programs/ciwqs/publicreports.html#:~:text=amount%20and%20status.-,Facilities%20Reports,-Facility%2DAt%2DA

c California Water Boards. (2024). 2024 California Integrated Report. https://www.waterboards.ca.gov/water_issues/programs/water_quality_assessment/2024-integrated-report.html

d U.S. EPA. (2024). ATTAINS Assessment Unit Catchments. https://www.epa.gov/waterdata/attains

Factory Farm Gas 101

An anaerobic digester is a closed, oxygen-free environment that captures the methane released from livestock manure and turns it into biogas. During anaerobic digestion, bacteria break down organic material (in this case, animal waste) in the digester.[99] What is left behind from bacteria "eating" the waste is a combination of gases, primarily methane and carbon dioxide, as well as solid and liquid material (also called "digestate" or "effluent").[100] The digestate, commonly used as fertilizer, is a highly concentrated, nutrient-rich byproduct that must be carefully managed to prevent increased nutrient pollution.[101] The gas can be used to generate heat or electricity on-site or electricity sold to the electric grid. It can also be processed into so-called "Renewable Natural Gas" (RNG), or it can be converted to Compressed Natural Gas (CNG) or Liquefied Natural Gas (LNG) and used as vehicle fuel.

In Tulare County, there are 49 dairy digesters,[g] roughly 11% of all digesters in the entire U.S.[102] Of those, 47 belong to a few distinct digester clusters.[103]

A digester cluster consists of a centrally located operation that receives raw biogas from surrounding digesters, also referred to as a "hub and spoke" model.[104] The centrally located operation can clean and, if needed, upgrade the biogas before distribution or injection into a pipeline.[105] California has 15 clusters, a quarter of which are located in Tulare County, including Calgren Dairy Fuels (also known as Maas Calgren), CalBio West Visalia, CalBio South Tulare, and CalBio North Visalia.[106] The largest cluster in the county (by digester number) is Calgren Dairy Fuels with 20 digesters (though this number is expected to increase).[h,107]

In Tulare County, there are 49 dairy digesters, roughly 11% of all digesters in the entire U.S.

Like the CAFOs themselves, the digesters in Tulare County are embedded in a place where people live and experience the negative externalities of factory farms and manure biogas production.[108] As Josefa told us, the pollution is pervasive but, "you cannot become accustomed to it."

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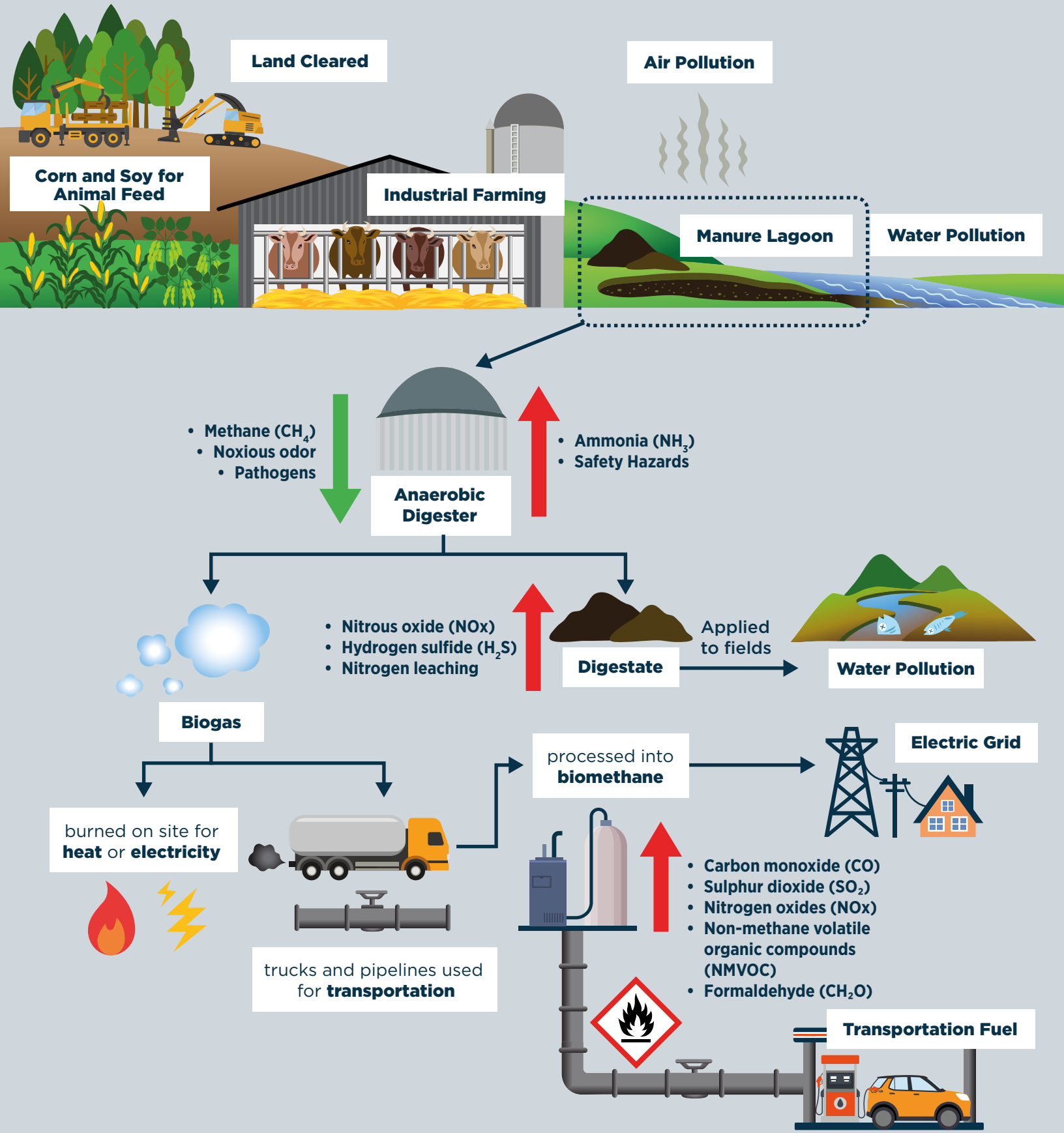
[g] According to county data, 49 digesters in Tulare County are currently operational. Five more are expected to be completed by the end of 2024, and three are expected to be completed by 2026.
Tulare County Resources Management Agency Economic Development & Planning Branch. (2024, April 4). 2023 Annual Report of Total Greenhouse Gas Emissions from Dairies and Feedlots for 2022. Tulare County Resource Management Agency, 80–81; 89–91. https://tularecounty.ca.gov/rma/permits/dairy/bos-agenda-item-for-2023-annual-report-of-ghg-emissions-for-dairies-feedlots-for-2022/
There is a slight difference between Environmental Protection Agency's AgSTAR Database and Tulare County's Annual Report of Dairy and Feedlot GHG Emissions in 2022 (referred to as "Annual GHG Report," which the county is required to prepare and publish as part of a 2019 lawsuit settlement) for total digesters. EPA lists 42 as operational while the Annual GHG Report lists 49. Since EPA acknowledges it cannot guarantee the accuracy of its data, and it did not always have accurate facility names, we chose to rely on the county's data. We do use the AgSTAR database for nationwide digester numbers because it is the only data source available that attempts to catalogue anaerobic digesters across the U.S. CARB's California Dairy and Livestock Database (CADD) lists 58 digesters, though it is relying on both AgSTAR and the California Dairy Digester Research & Development Program (DDRDP), so it is likely including digesters that are not yet operational. It also lists two digesters in Tulare County that are actually in Kings County. DDRDP's data only lists 47 operational digesters in Tulare County, but it only includes digesters funded by DDRDP.

[h] This relies on the county's Annual GHG Report (which lists by Calgren's developer, Maas Energy Works). There were a variety of numbers for the cluster: EPA's AgSTAR Database only listed 15 as operational whereas Dairy Cares lists 18. We relied on the Annual GHG Report because it appeared to have the most comprehensive information, listing facility names and addresses.

Manure Biogas Life Cycle



Manure Biogas Production Entrenches Factory Farms

Anaerobic digesters are typically only feasible at the largest CAFOs and rely on the operations using the most hazardous—and methane-generating—manure management practices, like liquid or slurry manure maintained in lagoons or ponds. This is the case in Tulare County as well. All of the livestock operations supplying the digester clusters in Tulare County are large, ranging from 1,200 to over 15,000 cows.[i,109] As explored further below, data on herd sizes and their changes at each CAFO are difficult to obtain in California due to inconsistent and unreliable data reports. We estimate that CAFOs with digesters in Tulare County collectively produce over seven million tons of manure per year.[j,110] That's 3.5 times the amount of human waste produced annually by all of California.[111] Maria is skeptical of digesters as a sustainable solution. She said, *"Pools of cow manure and cow pee smell up the community. I don't understand how we can trust that these pools are clean and creating a green gas."*

As explored in greater detail below, federal and state programs encourage construction of anaerobic digesters and reward production of biogas with lucrative subsidies and incentives. There is no reason for dairy companies, CAFO operators, and biogas companies to change the existing system of factory farms to a more sustainable method of raising livestock because to maximize their payouts, they need to maximize methane production—which means more animal waste stored using the most methane-generating manure management practices. As a result, the communities closest to dairy CAFOs in Tulare County not only continue to suffer from the harms caused by industrial livestock operations, but they also suffer from novel forms of pollution from digesters and other factory farm gas infrastructure, as well as from the burning of biogas.

We estimate that CAFOs with digesters in Tulare County collectively produce over seven million tons of manure per year—that's 3.5 times the amount of human waste produced annually by all of California.

[i] For herd size numbers, we relied on Tulare County's Annual GHG Report and its Annual Compliance Report Data as they were the most complete data sets we had at the time this report was drafted. EPA's AgSTAR database provides herd size numbers as well, but it does not share its sources or the year for the herd size. Facility names also varied in each source.

[j] Again, we relied on Tulare County's Annual GHG Report to identify the dairies with digesters and then cross-referenced with the county's Annual Compliance Report Data to obtain herd size numbers. Some facilities were missing data, but we were able to use state air permits to estimate herd sizes, which in turn enabled us to estimate manure production using the formula specified in Endnote 121.

Factory Farm Gas Production Worsens Air and Water Quality Problems

Factory farm gas production adds to existing environmental and public health concerns for communities living near CAFOs. Studies have shown that anaerobic digestion increases emissions of ammonia, an air pollutant associated with respiratory illness and irritation of the eyes, nose, and throat.[112] One study published in the journal *"Agriculture, Ecosystems & Environment"* estimates that digestion increases cumulative ammonia emissions from manure by 81%.[113] This is primarily due to the digestate, a highly concentrated, nutrient-rich byproduct of anaerobic digestion that is regularly maintained in open-air lagoons and land applied as fertilizer.[114] Nitrogen and phosphorus are more concentrated in digestate compared to fresh or composted manure, causing increased nitrous oxide emissions, residual methane, ammonia, hydrogen sulfide emissions, and odorous gasses.[115] Several other studies substantiate the finding that facilities with digesters emit more ammonia than conventional hog or dairy operations, creating risks for those living and working nearby.[116,117]

The production and combustion of manure biogas also creates additional harm to nearby communities and environmental damage. When biogas is used to power internal-combustion engines that generate electricity on-site, these pollutants add to the pollution from CAFOs themselves. For example, as petitioners point out in their Petition for Rulemaking to Exclude all Fuels Derived from Biomethane from Dairy and Swine Manure from the Low Carbon Fuel Standard, the Lakeview Dairy Biogas project in nearby Kern County, California, uses two internal-combustion engines to produce over 1,000 kW of electricity on-site.[118]

Even with the required pollution control technology, this project emits 4.58 tons/year of NOx, 1.98 tons/year of PM10 (fine particulate matter), and 3.18 tons/year of VOCs.[119] Compared to a natural gas combined-cycle plant in a nearby town, the Lakeview digester produces much higher levels of NOx, SOx, and VOC emissions per unit of electricity generated.[120] A 2020 paper in *Applied Sciences* found that biogas is, on average, 10 times more toxic to human health than natural gas.[121] The final report on the Pixley Biogas Anaerobic Digester similarly acknowledges that the digester project, "does not reduce criteria pollutants" since the Pixley Cogen Partners cogeneration turbine, which combusts the biogas, "will burn the same amount of fuel as before, emitting substantially the same quantity of criteria pollutants." [122]

A 2020 paper in* Applied Sciences *found that biogas is, on average, 10 times more toxic to human health than natural gas.

Worsening air quality is a devastating consequence of manure biogas production for a community like Tulare County that is already grappling with serious air quality problems due to excessive CAFO pollution. Gloria, a 50-year resident of Tulare County, told us she only found out about the Maas Calgren cluster of digesters near her home in Pixley because she has asthma and *"it effects the quality of the air…they don't have good air."* Daizy told us, *"I can't make it clear enough that digesters do not benefit the community. There is nothing that it does to help our community."* She continued, *"For me personally, with three people in my house who are asthmatic and my son who is now resistant to antibiotics, steroids and is consistently sick…I have to miss work and drive all over the valley for my kids. So, the dairies and digesters directly harm me and my family."*

A common industry talking point is that anaerobic digesters help reduce odors from CAFOs.[123] However, in speaking with community members, that is not the case in Tulare County. When asked whether the odors from the dairies decreased due to the installation of digesters, Gloria, a 50-year resident, told us no and that *"it is the same smells."* Josefa added, *"There hasn't been a huge change. The smell issue is the same...in summer it is more for sure, it is really bad."*

Digestate also puts water quality at risk.[124] Compounds such as nitrogen, phosphorus, and other elements are more soluble in digestate than in fresh manure, and therefore have higher potential to move with water.[125] Because anaerobic digestion concentrates nutrients, effluent that does end up in a body of water is more damaging than fresh or composted manure and requires careful management.[126] Water quality remains a major problem in Tulare County due to agriculture. It has not been resolved with the installation of digesters, and the prospect of mismanaged application of a byproduct like digestate presents a heightened danger, particularly as the application of digestate remains largely unregulated. Daizy told us, *"The water here still smells so bad you don't even want to boil chilies or tomatoes in it."*

In addition to exacerbating current pollution conditions, anaerobic digesters do nothing to address the majority of problems caused by industrial livestock operations. They do nothing to reduce the tremendous volume of waste produced at these facilities. They also fail to curb the nontherapeutic use of antibiotics administered to livestock, a driver of antibiotic resistance in humans, or prevent the risk of the next pandemic from originating in a factory farm and spreading.[127] Anaerobic digesters do not help farmers locked in unfair contracts or protect workers on farms and in slaughterhouses. They also fail to minimize the suffering of the more than nine billion animals raised for food in intolerably cruel conditions.

Unsurprisingly, the quality of life in Tulare County has not improved with the proliferation of digesters. Residents are consistently overshadowed and treated as part of a sacrifice zone[128] for financial gain and economic interests. Maria said, *"When they see these projects, they see the money, and they see their own, specific progress; what progress they want to see. They do not see our health problems as hindering that progress."*

"When they see these projects, they see the money, and they see their own, specific progress; what progress they want to see. They do not see our health problems as hindering that progress."

Lack of Transparency Clouds True Impact of Digesters

The integrity of data and record transparency around both CAFOs and digesters within the county has been called into question on multiple occasions. In one instance, investigative reporting done by Capital and Main reported the Pixley Digester may have been constructed under false pretenses.[129] Maas Energy Works and Calgren contracted with a professor to conduct research on the facility's emissions—information that directly contributed to the California Energy Commission's (CEC) grant awarding process. The same professor had a history of data fabrications, including information regarding the environmental impact of Pixley's wastewater system.[130] The CEC eventually awarded the project $4.6 million in grant funding.[131]

Lack of transparency on animal herd sizes is another alarming issue. Multiple CAFOs in the county report varying herd sizes across county data, federal data, state permits, and as part of LCFS pathway applications. Data from all of these sources is self-reported, and in some cases, dairy operators are incentivized to report higher herd sizes (e.g., to capitalize on LCFS subsidies), while in other cases they are incentivized to report lower herd size numbers (e.g., to comply with permits capping allowable herd sizes).

For example, according to Tulare County's Individual Dairy Annual Compliance Report Data (compiled from the county's required Annual Compliance Reports), Hilarides Dairy had a herd size of 15,743 dairy cows in 2022. However, its county permit limits the facility to 7,701 cows[k] while its air permit states a limit of 16,200 cows.[132] Moreover, in 2021, Hilarides Dairy reported a population of "about 15,000" cattle to CARB as part of its LCFS pathway application.[133] Yet in the county's Annual Compliance Report Data, its herd size is listed as 13,815 in 2021, a 1,185-cow difference.[134] Similarly, Moonlight Dairy has multiple dairy herd sizes associated with it for 2022: The Tulare County Compliance Report Data reports its herd size as 6,843 cows, its current air permit limits its herd size to 6,195 cows, and its county permitted head is limited to 4,851.[135] Another facility, Dairyland, also reflects inconsistency, with the county Annual Compliance Report Data reporting its 2022 herd size as 6,478 cows, its air permit limiting its herd size to 5,970, and its county permit limiting the facility to 4,047.[136] Dairyland states that it has a livestock population of 4,700 in its LCFS pathway application (submitted in 2023).[137] Tulare County's Individual Dairy Annual Compliance Report Data also includes numerous livestock facilities reporting zero as their herd size, year after year, despite continuing to operate.

Additionally, name changes (or similar names between facilities) are not uncommon across the data sources, making tracking difficult and confusing. For instance, Circle A Dairy is listed as having a digester in the county's Annual GHG Report.[138] However, in the Annual Compliance Report Data, there is no Circle A Dairy, but the same address is associated with Airoso Dairy.[139] Vander Poel Dairy Digester is a particularly confusing example for Tulare County: In the Annual GHG Report, Vander Poel Dairy Digester is associated with an address listed in the Annual Compliance Report Data for Pete Vanderpoel Dairy.[140] There is no record of an LCFS pathway application for Pete Vanderpoel Dairy, but there is an application for John Vanderpoel Dairy (using the name "J&J Vanderpoel Dairy"). John/J&J Vanderpoel Dairy reported its herd size in 2019 as 3,395, but its LCFS pathway application reported that it had 11,000 dairy cows during the same time period.[141]

[k] According to Tulare County's Animal Confinement Facilities Plan, the county-permitted herd size is based on the maximum number of mature animals under the Regional Water Board's waste discharge requirements and the maximum herd under the San Joaquin Valley Air Pollution Control District permit to operate.

CARB recently compiled statewide herd size data, creating the California Dairy & Livestock Database (CADD). It uses a variety of data sources, including Regional Waterboard annual reports, inspection reports, and regional air permits.[142] Using the example above of Hilarides Dairy, CARB's CADD lists the facility's herd size in 2021 as 14,655. That's an 840-cow difference between the county's data and CARB's.[143] Hettinga Farms is another example highlighting inconsistency: Tulare County's Annual Compliance Report Data lists its herd size as 6,671 cows in 2022 whereas CADD lists its herd size as 5,942, a 729-cow difference.[144] Again, for nearly all of these data sources, herd sizes are reported by dairies themselves and lack third-party verification. In light of the gaps and inconsistencies in herd sizes reported by the hundreds of dairies in Tulare County, CARB's reliance on CADD is questionable.

Table 1. Sources of Herd Size Data: Tulare County, California

Data Report Title	Agency	Source(s)
Census of Agriculture	U.S. Department of Agriculture	U.S. ag producers' questionnaire/survey responses[L]
AgSTAR Livestock Anaerobic Digester Database	Environmental Protection Agency	"Data are compiled from a variety of voluntary sources"
Individual Dairy Annual Compliance Report Data	Tulare County Resource Management Agency	Annual Compliance Reports submitted by dairies and feedlots in the county
Annual Report of Dairy and Feedlot GHG Emissions in 2022	Tulare County Resource Management Agency	• Annual Compliance Reports • California Department of Food and Agriculture's Dairy Digester Research and Development Program • Tulare County Dairy and Feedlot Climate Action Plan • Tulare County Animal Confinement Facilities Plan
Certified Fuel Pathway Table	California Air Resources Board	Application materials are submitted by the fuel producers and dairies providing the feedstock
California Dairy and Livestock Database	California Air Resources Board	• Annual Reports from dairies and feedlots to Regional Waterboards • Inspection reports (conducted by Regional Waterboards) • Air Permits (states maximum permitted herd size) • Google Earth Images • Regulatory information from California Integrated Water Quality System Project • Waste management plans, nutrient management plans, notices of intent

[L] Ag producers are required to respond by Federal law. 7 U.S.C. § 2204g.

With respect to oversight, while California does require CAFOs to adhere to air and water regulations, enforcement is delegated to the regional government and is seemingly lax.[145] The California Water Board reported that just 10% of the 1,609 facilities in the Central Valley were inspected in fiscal year 2022–2023.[146] Moreover, substantive consequences for water violations are rare. Since 2010, 95% of violations at dairy operations in Tulare County have been linked to informal enforcement actions[m] (1,253) versus formal enforcement actions[n] (56).[147] This is despite the fact that over 70% of the violations were identified as class 2, which are defined as "violations that pose a moderate, indirect, or cumulative threat to water quality."[148]

The lack of accurate, consistent data, reporting, and oversight leaves residents in the dark about the true impact of the factory farms and digesters in their community. Moreover, in light of the significant tax dollars being spent on anaerobic digesters, third-party verification of herd sizes is clearly needed to accurately assess the impacts of manure biogas policies on methane emissions, industry consolidation, and nearby communities.

[m] Informal enforcement actions are typically done by staff and included staff enforcement letters, expedited payment letters, notices of violation, and oral/verbal communication. https://www.waterboards.ca.gov/water_issues/programs/ciwqs/glossary.html#I

[n] Formal enforcement actions are typically issued by the Water Board or Executive Officer and include Cleanup and Abatement Orders, Cease and Desist Orders, Administrative Civil Liabilities, etc. https://www.waterboards.ca.gov/water_issues/programs/ciwqs/glossary.html#I

An Ineffective Approach to the Climate Crisis

California has seen such a boom in anaerobic digesters because they are portrayed as a technology that can substantially reduce methane emissions, a powerful greenhouse gas. However, evidence shows that anaerobic digesters yield much lower methane emissions reductions than estimated by both the federal government and California, and that these reductions are highly variable and uncertain due to a lack of monitoring.[149]

For example, anaerobic digestion and storage of leftover digestate releases additional greenhouse gases, such as nitrous oxide, undercutting a portion of the methane emission reductions.[150] Research has shown that biogas supply chains leak more than EPA estimates, releasing additional methane into the atmosphere[151] and since CARB does not monitor emissions at the facility level, it would not be aware of any fugitive emissions.[152] In fact, a 2023 paper estimated methane emissions from dairies in California using mobile optical remote sensing and found that facilities presumed to have digesters did not emit significantly less methane than facilities without digesters.[153] Across all CAFOs in the study, measured methane emissions were 60% higher than the rates reported in the CARB inventory.[154]

As explored in greater detail below, federal and state programs encourage construction of anaerobic digesters and reward production of biogas with lucrative subsidies and incentives. To receive these payouts, CAFOs and biogas companies are incentivized to produce more factory farm gas.

An analysis of EPA data from Friends of the Earth and Socially Responsible Agriculture Project found that the staggering state and federal government incentives and subsidies supporting the manure biogas production, perversely, may be encouraging livestock operations to maximize methane production by employing inferior manure management practices that generate more methane and by increasing animal herd sizes, either by displacing animals from smaller farms, adding new animals, or both.[155] The new research indicates that CAFOs with digesters are more likely to increase their herd sizes relative to statewide populations: Herd sizes at dairies with digesters grew 3.7% year-over-year, which is 24 times the growth rate for overall dairy herd sizes in the states covered by the data set.[156] This results in more air and water pollution from the larger amounts of manure and more enteric methane from the additional cows.[157]

CARB's claims of methane emission reductions from digesters sit on a flawed foundation. As mentioned previously, the agency does not monitor emissions once digesters are installed, so any reductions are merely assumptions that every biogas system is working perfectly.[158] Additionally, CARB is not tracking whether or not there are herd size increases at facilities with digesters, which could increase enteric and other emissions connected to dairy operations, impacting actual methane reductions. Finally, CARB is relying on an assumption that the baseline from which methane reductions are measured is the most methane-generating manure management practice—liquid manure maintained in an open lagoon—even though there are alternative manure management practices, such as composting manure, that have lower methane-emissions and can be employed by dairies of all sizes.

Thus, factory farm gas production not only further entrenches toxic factory farms and exacerbates existing pollution, but it is also an ineffective approach to addressing the climate crisis.

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IV. Factory Farm Gas Is Flourishing Thanks to Government Policies

In most cases, constructing an anaerobic digester is not viable without public subsidies. This is acknowledged by the dairy industry itself: The executive director of Dairy Cares, a lobbying group for the California dairy industry said, *"Dairy biogas is way too expensive...It doesn't pencil out and it doesn't make all that much sense from an environmental standpoint. It's a pipe dream."*[159]

Government Support for Anaerobic Digesters

The federal government provides significant subsidies for digester installation through U.S. Department of Agriculture (USDA) grant and loan programs, such as the Environmental Quality Incentives Program (EQIP) and the Rural Energy for America Program (REAP).[160] In Tulare County, for example, both the Pixley Biogas LLC Digester, which is supplied by Four J Farms, and the Van Beek Brothers Dairy Digester received federal funding for their digesters.[161] The Inflation Reduction Act and Bipartisan Infrastructure Act directed additional money to programs like these, in addition to creating new tax breaks for producing manure biogas.[162] Broadly however, the lack of transparency in federal-level digester funding makes it challenging to identify all of their funding sources. While the EPA AgSTAR database is the main federal source for tracking digesters, it only provides a "yes/no" column for USDA funding, does not report more granular funding or profit sources, does not include all digesters, and does not independently verify any of the information it publishes.[163] On the whole, there is a shocking lack of mandated disclosure and reporting at the federal level, despite the provision of significant public tax dollars.

No state has offered more support for factory farm gas than California, which is home to a third of all digesters in the U.S.

No state has offered more support for factory farm gas than California, which is home to a third of all digesters in the U.S.[164] Millions of taxpayer dollars are being spent through multiple programs in California to build methane digesters and related infrastructure. For instance, the Dairy Digester Research and Development program (DDRDP) provides significant "financial incentives for the design and construction of new digester systems," covering up to 50% of the total digester project cost.[165]

As of April 2024, the program had spent $226 million on 140 digester projects.[166] Nearly every digester in Tulare County received state dollars through the DDRDP.[167] In total, dairy digesters in Tulare County have received over $81 million in funding, nearly a third of the total funding from DDRDP for anaerobic digesters.[168] Just under $17 million has gone towards funding alternative manure management strategies at dairies in the county.[169] The California Energy Commission (CEC) similarly provides grants for dairies to build and operate anaerobic digesters through its Clean Transportation Program.[170] For example, the Pixley Biogas LLC Digester, which is part of the Maas Calgren cluster, received nearly $4.6 million from CEC, and Maas Calgren specifically noted that the "project would not have been done without the state grant" due to the otherwise unreasonably high capital investment needed.[171] The California Public Utilities Commission (CPUC) provided $319 million in public funds to support the development of dairy digesters as well.[172]

Local Policies Leveraged for Manure Biogas

Land use regulations have also enabled extensive digester construction and the intensification of the dairy industry in Tulare County. Zoning governance is county based and land use decisions, permitting, and ordinances are granted by the Board of Supervisors.[173]

In 2017, the Board of Supervisors adopted an Animal Confinement Facilities Plan (ACFP) and a Dairy Feedlot and Dairy Climate Action Plan (CAP). The intent of these local policies is, in part, to "update and simplify the permitting processes" for both the expansion of existing and establishment of new bovine operations.[174] As a result, dairy operations can expand without an individual environmental analysis under the California Environmental Quality Act (CEQA) as long as the project has greenhouse gas (GHG) emissions "below a certain level" and it incorporates "available feasible GHG reductions approaches consistent with the Dairy CAP."[175] Installation and use of a digester is considered a GHG reduction approach that would permit an expanding dairy to sidestep an individual CEQA analysis.[176]

Thus, Tulare County is allowing dairies to quickly expand—and strongly encouraging the installation of digesters—despite legitimate environmental concerns from the nearby community. Moreover, the county's baseline assumptions with respect to GHG emissions in the dairy sector are dubious, primarily because it relied on animal head counts from 2013 while simultaneously admitting that the ACFP was updated because the county was struggling to keep track of all existing bovine operations.[177]

Digesters are required to obtain multiple special permits before and during construction,[178] which means the county must engage in a public hearing process that requires written and posted notice.[178] When discussing the rapid expansion of anaerobic digesters, residents such as Daizy expressed the *"expectation that I would receive something in the mail that told me what was happening and to notify me of any changes."* However, merely posting the hearing information in a newspaper is considered sufficient public notice.[180]

Practical barriers block public engagement in the zoning process, and vulnerable or marginalized communities can easily be overlooked. For example, local government meetings are routinely held in Visalia, California, a community over 30 miles away from Pixley, where many digesters are clustered.[181] Even more inconvenient, since at least 2011, board meetings have been held weekly at 9 a.m. on Tuesdays. For the public who can attend meetings, the board must allow time for a public comment period, but the minimum duration for this agenda item is only 15 minutes.[182] Even when a designated public hearing is held on an issue, the presiding officer may limit the time an individual can speak to "avoid repetition."[183] Further, board bylaws require agendas for meetings to be posted a minimum of 72 hours in advance, constraining individuals' ability to strategically engage with agenda items.[184] Moreover, the board's decisions are final; there is no appeal process or motion to reconsider outlined in the zoning ordinance.[185]

The county also has an egregious lack of language access provided during the public process. The county website, resources, and meetings are held in English without clear transcription or interpretation services advertised. The same goes for local papers used to give notice of board meetings and agenda items.[186] The barriers become remarkably clear if one puts themselves in the shoes of the average concerned Tulare County resident: Consider the difficulty of engaging in a public process that occurs in an unfamiliar place, in a foreign language, in the middle of the workday and without childcare.

Maria best captured the cascading effects of being left out of the process when she said, "I've heard people talking about the digester program…farmers who are so happy and proud and want more. But we're still here. The people who live in the community are still here, and we're the ones that have to live with the consequences of these facilities. We're literally dying, we continue to get sick, and that doesn't seem to be a part of their plan for progress." Ultimately, the public process in Tulare County has been a failure as it is inaccessible to the majority of people it serves.

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Policies Incentivize Methane Production

In addition to subsidizing the costs of building digesters, government programs incentivize the sale of biogas, creating perverse incentives for CAFOs to produce as much methane as possible in order to receive lucrative payouts for manure biogas. On the federal level, the Renewable Fuel Standard (RFS) requires that a certain volume of renewable fuels, including biomass-based diesel like factory farm gas, is mixed in with traditional petroleum-based fuel, creating a guaranteed market for the biofuel industry.[187]

On the state level, California is the largest national demand-side driver of the factory farm gas market through its Low Carbon Fuel Standard (LCFS), a program to decrease the carbon intensity of the state's transportation fuels.[188] Each year, the California Air Resources Board (CARB) sets carbon intensity (CI) standards for transportation fuels. Fuels below the CI standard receive credits while fuels above the CI benchmark receive deficits.[189] Deficit holders (transportation fuel producers who use fossil fuels) must meet LCFS CI standards and can do so by purchasing credits to offset their deficits.[190] CAFOs throughout the U.S. can earn credits by installing and operating digesters to produce manure biogas. Currently, manure biogas has an extremely large negative CI score because CARB gives participating CAFOs credit for both reducing methane emissions from manure, and for replacing fossil fuels with higher CI scores.[191] This is flawed for a number of reasons.

First, CARB completely disregards the greenhouse gas emissions from the underlying factory farming operations as well as the increased greenhouse gas emissions when operators use and dispose of the digester waste. Second, maintaining massive quantities of liquid manure is not a given; it is a choice—one that the LCFS rewards and reinforces. As noted above, there are alternative manure management practices that have lower methane emissions and are more sustainable.[o] Finally, the LCFS does not prohibit participants in the program from double counting the emissions reductions attributable to anaerobic digesters, with the same purported emissions reductions being counted toward multiple programs, inflating climate progress. Research has shown that the LCFS takes credit for the same emissions reductions as the DDRDP.[192]

[o] It's worth noting that the most effective approach to mitigating animal agriculture's impact on the climate is for methane emissions from industrial livestock facilities to be monitored, publicly disclosed, and regulated by the state.

Due to factory farm gas's flawed CI score, the LCFS distorts the market for transportation fuels, boosting fuels derived from manure above truly renewable sources. As noted above, CAFO operators and energy companies are perversely incentivized to produce more manure biogas, in the most methane-emission-intensive manner, to receive lucrative rewards from this manufactured market. Dairies that do not aggregate manure in lagoons are fundamentally excluded from market opportunities to produce manure biogas, giving the CAFOs that they compete with a further competitive advantage. Even among farms that do collect waste in lagoons, economies of scale for biogas production disproportionately benefit the very largest producers.

In a 2022 paper commissioned by the Union of Concerned Scientists, Amin Younes, and Dr. Kevin Fingerman find that dairies are incentivized to consolidate to take advantage of the economies of scale created by the LCFS program. Modeling profits from LCFS for various-sized farms, they find that dairies with 100 or fewer cows cannot make any profits, dairies with 1,000 cows can make 24 cents per gallon of milk, and dairies with 15,000 cows can make 39 cents per gallon of milk. They conclude, *"This creates clear market distortions in favor of large, confined operations, which could exacerbate the already-present trend of market consolidation."* They also affirm in their analysis that under the LCFS program, dairies are incentivized to purchase more cows, independent of consolidation. According to an analysis of the most recent Agriculture Census by Professor Aaron Smith of U.C. Davis, while the number of dairy cows across California dropped, the number of cows on farms with 500 or more head remained relatively consistent. In fact, in the Central Valley, where mega-dairies dominate, dairy cow numbers have held steady since 2017.[p,196] Thus, he notes, the decline likely came from small farms, reinforcing the notion that dairies are facing a get-big-or-get-out reality. As Maria told us, *"This is a state-funded problem. The state is funding these projects, allowing these dairies to get more cows."*

Modeling profits from the Low Carbon Fuel Standard for various-sized farms, Amin Younes and Dr. Kevin Fingerman find that dairies with 100 or fewer cows cannot make any profits, dairies with 1,000 cows can make 24 cents per gallon of milk, and dairies with 15,000 cows can make 39 cents per gallon of milk.

California further drives the sale of factory farm gas through its Renewable Portfolio Standard (RPS), a state program that requires or encourages electricity providers to provide a minimum share of electricity from renewable sources. California's RPS requires 60% of electricity retail sales to be served by renewable resources by 2030. Biomass is typically defined as a renewable source option, and several states, including California, consider gas from anaerobic digestion as an eligible renewable source. Around 2.6% of the state's renewable energy comes from biomass sources.[201]

Close to half (43%) of the dairy digester operations are benefiting from both RFS and LCFS. Calgren Dairy Fuels LLC is affiliated with 20 of the 49 digesters (40%) in Tulare County and is registered with RFS as a renewable fuel producer as well as LCFS.[202] CleanFuture Inc. and the Hilarides Dairy digester are also registered with both RFS and LCFS.[203]

[p] The Central Valley includes Kern, Tulare, Kings, Fresno, Madera, Merced, Stanislaus, and San Joaquin Counties. This was calculated using the Census of Agriculture as it was a public document that had total milk cow population numbers available over the same time period.

Far more of the digesters in Tulare County are solely registered with LCFS. California Bioenergy is registered as a fuel producer with LCFS and lists 24 dairy digesters (47%) from Tulare County as part of their pathway applications.[204] As registered renewable fuel producers, the biogas companies and Tulare County dairy operators receive payments for biogas they provide. As of April 2024, a registrant can earn $3.09 per gallon of factory farm gas through RFS[205] and between $65 and $67 per metric ton through LCFS.[206]

There have been multiple efforts to reform LCFS. In 2022, CARB flatly rejected a petition request from a coalition of environmental justice, animal protection, and community groups to amend LCFS to either completely eliminate factory farm gas as a renewable fuel source or to properly account for the climate impact of generating manure biogas.[207] CARB continues to ignore the extensive concerns Central Valley residents have shared about the incentives provided to CAFOs.[208] In January 2024, over 25 advocacy groups wrote a letter in support of Senate Bill 709, which would improve the LCFS by increasing transparency and preventing herd size expansion of registered dairy operations.[209] Opponents to this bill, including organizations representing the dairy sector, agricultural interests, and renewable fuel producers, claimed that it will "eliminate the dairy sector's ability to continue reducing methane emissions...undermin[ing] the state's short-lived climate pollutant reduction strategy."[210] These arguments are unsubstantiated, as agriculture in California continues to be the top emitter of methane emissions.[211] According to Inside Climate News' 2022 assessment, cows nationwide emitted more than twice as much methane in 2020 as all oil and gas wells.[212] Unfortunately, Senate Bill 709 was killed early in California's 2024 legislative session.[213]

A subsequent bill, Assembly Bill 2870, was introduced in February 2024, and would have reformed LCFS by eliminating the avoided methane emissions from livestock manure in CARB's carbon intensity calculation.[214] A hearing on the bill was blocked by the agriculture committee chair in April 2024, effectively killing the bill.[215]

According to Inside Climate News' 2022 assessment, cows nationwide emitted more than twice as much methane in 2020 as all oil and gas wells

V. Policy Recommendations

Rather than investing in anaerobic digesters, public resources supporting manure biogas should be redirected to more cost-effective methane reduction solutions that do not exacerbate pollution and environmental injustice. Instead, policies should support a just transition away from factory farming to ecologically regenerative agriculture, and away from fossil fuels to truly renewable energy. California should halt its subsidies and incentives for factory farm gas and more effectively regulate air and water pollution from CAFOs and digesters. Specific recommendations for Tulare County and California policymakers include:

- **Reform California's Low Carbon Fuel Standard (LCFS) to eliminate the "avoided methane crediting;" fix the inaccurate Life Cycle Assessment that ignores upstream and downstream greenhouse gas emissions associated with factory farm gas production.**

- **Prevent double-dipping between subsidies, tax incentives, and programs like the Renewable Fuel Standard (RFS) and California's LCFS. Related, ensure GHG reductions attributed to manure biogas are not double counted among California climate programs.**

- **Do not fund or incentivize manure biogas. Sunset the Dairy Digester Research and Development Program.**

- **Prohibit construction of new large CAFOs and expansion of those currently operating in California, particularly those facilities sited in the Central Valley.**

- **Regulate waste from CAFOs and digesters, including treatment and application of digestate.**

- **Regulate air emissions from CAFOs, including ammonia and volatile organic compounds.**

- **Require and improve methane monitoring and reporting from livestock operations.**

- **Pursue methane reduction strategies that support environmental justice and fair markets for producers, including regulating methane emissions from industrial dairies, leveraging statewide food procurement toward plant-forward menus, reducing food waste, and prioritizing conservation funding for pasture-based livestock production.**

- **Require publicly available reporting of basic data from CAFOs and digester operators, including herd sizes and methane emissions. Fund and conduct research to assess the impact of manure biogas policies on methane emissions, industry consolidation, and rural communities.**

The residents we spoke with had a variety of opinions on what the government should support instead of manure biogas production. Everyone agreed the dairy industry in California needs increased oversight and proper enforcement of current laws. Everyone also agreed that large-scale industrial dairies need to become a thing of the past. Maria told us, ***"The government needs to start thinking about what the dairies should be doing. They owe the community compensation for the problems they've caused. They've contaminated the water because of how they chose to manage their manure. It's their turn to make a change. They've extracted enough."*** Daizy, Josefa and Maria all also noted that the government should be investing more in the community itself: The state should improve the county's infrastructure, invest in better job opportunities, and increase the amount of safe, affordable housing. Daizy told us, *"**Our homes are very old...they are really bad. People don't have air conditioners and have broken windows. We need weatherization programs to improve health inside the home."*** None felt that anaerobic digesters were a worthwhile investment.

VI. Conclusion

Tulare County is a community in crisis with its residents suffering from factory farm and digester pollution and the chronic health conditions linked to each. Manure biogas has not only failed to solve the county's issues stemming from the dairy CAFOs, but biogas production is creating new toxic pollution. As residents have observed, the proliferation of anaerobic digesters in their community has exacerbated already poor water and air quality. Yet, they are watching millions of taxpayer dollars be funneled into factory farm gas production, rewarding the very same industrial polluters who are actively destroying their community's environment and health. To accept manure biogas as the best approach to managing methane emissions means accepting and expanding the current, toxic polluting factory farm system that hurts communities like Tulare County, fuels the climate crisis with emissions from animal feed and enteric fermentation, and raises billions of animals in intolerably cruel conditions that risk public health year after year. That is not something we can accept.

Instead, policymakers must prioritize solutions that effectively reduce emissions while centering the communities harmed by factory farm pollution and supporting a just transition to the healthy, equitable, and ecologically regenerative food system we desperately need.

Appendix A. Individual Dairy Annual Compliance Report Data (Year 2011–2022)

This table was provided by Tulare County. It is compiled and maintained by the county, and it is based on Tulare County Annual Compliance Reports, which dairies and feedlots are required to submit to Tulare County as part of its Animal Facilities Confinement Plan. Herd sizes are self-reported by the facilities:

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