HARD TO DIGEST:
GREENWASHING MANURE INTO RENEWABLE ENERGY

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Most food animals in the United States are grown on highly concentrated factory farms, and the vast amounts of waste those animals produce poses a huge environmental and public health problem. Historically, farmers used animal manure as fertilizer, but factory farms produce far more manure than can be used responsibly on local fields. The over-application of manure leads to runoff from agricultural fields into waterways. The runoff dramatically alters the ecosystem, contributing to algae blooms and "dead zones" as well as impacting fishing and recreation economies and public health.[1]

Manure digesters have been offered up by agribusiness and policy makers as a way to turn factory farm manure into "renewable" energy. When animal waste is stored in pits and lagoons on factory farms, it releases methane, a potent greenhouse gas, and other air pollutants.[2] Manure digesters capture the methane released by decomposing waste and burn it for energy. Promoted as a "'win-win' for farmers, communities and the nation," these taxpayer-funded operations purport not only to reduce greenhouse gases but also to reduce environmental impacts associated with excess manure.[3]

In reality, these technologies have negligible impacts on the deep environmental problems caused by factory farms, and, if anything, serve to further entrench this disastrous method of food production. Indeed, the biggest and most obvious potential of taxpayer-subsidized manure digesters is to help sustain factory farms with new revenue streams from energy production. Policy makers, instead of using taxpayer dollars to prop up factory farms, should be implementing and enforcing environmental and public health regulations for factory farms.

Digesting Waste

Factory farm production of cows, pigs and poultry generated 13 times more waste than the entire human population in the United States in 2012. The problem is often intensified in certain regions of the country where specific types of factory farms have proliferated, such as dairy operations in California. For example, in 2012, the factory-farmed dairy cows in Tulare County alone produced five times as much waste as the human population of metropolitan New York City.[4]

Many factory farms store their vast quantities of manure in pits or lagoons, where microorganisms digest the waste

More Than Just Manure: Other Feedstocks for Digesters

Digesters can produce energy from a variety of biomass material, and animal manure is one of the least productive source materials — largely because farm animals have extracted much of the available energy from the feedstock. Cow manure yields just over one-tenth as much biogas as food scraps, for example.10 One private consultant for biogas projects noted that the "manure-only" digesters will not attract investors because of inefficiencies.[11]

Promoters of digesters, like the USDA, are considering ways to mix manure with better source material to improve fuel production, including building "community" digesters that accept a variety of biomass materials from multiple sources.[12] The food waste from Disney World, for example, is fed with a mix of other biomass materials into a $30 million facility in Orlando, Florida.[13]

Trucking all of these materials to and from the digesters incurs significant fossil fuel use and presents risks of spills and accidents. And given the marginal energy potential of manure in digesters, it is not clear that this will be financially feasible — unless taxpayers subsidize the process. Creating a large, centralized facility that depends on a steady supply of animal manure to operate could also incentivize the construction of new factory farms in the area surrounding the digester, similar to the way a new slaughterhouse can drive the growth of factory farms in a region.

Just like manure lagoons without any methane capture system, digesters may accidentally spill or leak liquid manure and also present environmental risks from explosions associated with methane production. A 1.25 million gallon manure digester in Wisconsin, constructed in part with public funds, spilled 380,000 gallons of manure into nearby waterways in 2013, then another 22,000 gallons in 2014. The digester then experienced a major methane explosion.[14] Faced with the reality of such dangerous accidents at digesters, along with other concerns, some rural residents have opposed the construction of digesters.[15]

through a chemical process called "anaerobic digestion." The digestion produces "biogas," mostly a mixture of methane and carbon dioxide. The methane, the main component of natural gas, can then be burned to generate electricity or heat.

The most common manure-to-energy approach in the United States are manure digesters, designed to capture methane gas from these manure lagoons, which can be burned to produce energy. This approach is promoted as a good fit for many types of factory farms, which are already producing large volumes of manure and emitting methane, a powerful greenhouse gas.[5]

Manure digesters require a great deal of manure to generate energy, compared to other feedstocks, as the animal's own digestion has already broken down the food.[6] That is why, according to an economic analysis by the U.S. Department of Agriculture (USDA), anaerobic digester systems that generate and sell electricity are not economically viable, as opposed to those that use the biogas as a replacement for natural gas for on-farm heating needs.[7]

As of the fall of 2016, there were nearly 250 manure digesters in the United States, almost all of them located on dairy and swine operations.[8] The U.S. Environmental Protection Agency (EPA) has noted that there are enough factory farms to potentially support the operation of more than 8,000 digesters.[9] Such ambitious forecasting ignores the environmental and economic realities associated with this failed technology — and the inherent unsustainability of the factory farm model.

Manure Remains

Even factory farms that safely manage manure during methane capture still have to manage the huge volume of waste that remains following the digestion process.[16] Digesters do not make the nutrient loads (nitrogen and phosphorous) in the manure evaporate or disappear; they merely extract methane gas from the manure. In fact, if digesters add water to manure during the digestion process, the total volume of waste may actually increase.[17]

Factory farms with digesters then resort to the same problematic waste disposal efforts that they have always used — spreading the digested manure as fertilizer, leading to runoff from over-application. In fact, the process of digestion makes certain nutrients, such as nitrogen and phosphorus, more water soluble, meaning that rainwater is more likely to wash those nutrients from fields into nearby streams.[18]

Additionally, trucking tons of digested manure to surrounding farms incurs significant environmental costs associated with fossil fuel use and presents risks associated with spills. There are also economic costs involved in trucking tons of manure and digestate to and from digesters, and because of high transport costs, industry sources note that it is not always financially viable to utilize digested manure as fertilizer.[19]

Desperate to find a way to dispose of these mountains of manure, digester promoters are even exploring disturbing, new

applications, such as using digested manure as a nutrition source for animals.[20] In all, the USDA has committed $10 million for research into manure digesters.[21]

Greenhouse Gases

Animal agriculture is a major contributor to climate change, with some studies estimating that livestock account for nearly 15 percent of human-caused greenhouse gas emissions globally.[22] Much of this is in the form of methane, a greenhouse gas that is 25 times more powerful than carbon dioxide, emitted from factory farms that use anaerobic (oxygen-deprived) manure management approaches such as lagoons and pits.[23] The EPA indicates that manure management on U.S. farms accounts for almost 10 percent of all human-caused methane releases in the United States.[24]

Even more troubling, these emissions grew 65 percent between 1990 and 2013, which the EPA notes is related to larger and more concentrated dairy and swine farms using liquid manure management, such as lagoons.[25] The total number of livestock on the largest factory farms rose by 20 percent between 2002 and 2012. The number of dairy cows on factory farms doubled, and the average-sized dairy factory farm increased by half between 1997 and 2012. The number of hogs on factory farms increased by more than one-third, and the average factory farm size swelled nearly 70 percent from 1997 to 2012.[26]

Anaerobic manure management practices chemically convert organic compounds found in waste into methane. By capturing and burning this methane, digesters purportedly offer a potential environmental benefit over traditional manure lagoons, both by decreasing greenhouse gas emissions and by producing energy that would offset fossil fuel consumption.[27]

However, digesters do not offer clear environmental benefits over sustainable manure management practices, such as lower-density pasture-based animal production where manure decomposes aerobically (in the presence of oxygen) and becomes a natural fertilizer, releasing very little methane in the process.[28] This process involves no expensive machinery and no transportation of manure off the farm.

Given the various manure management practices available, digesters would appear to be the most expensive, most complicated way to reduce greenhouse gases produced from animal agriculture. And it is not clear that digesters actually reduce greenhouse gases.

Manure digesters do not capture all of the methane they produce, and some amount of methane that these facilities generate escapes as emissions. This "fugitive methane," as scientists call it, can offset a portion of the greenhouse gas reductions that digesters offer.[29] And when digesters burn methane, they release greenhouse gases like carbon dioxide and nitrogen oxide, which contributes to smog.[30]

Factory farms using digesters have balked at even modest efforts by regulators to reduce this pollution. After regulators in California started requiring manure digesters to install catalytic converters to reduce emissions of nitrogen oxide as a public health measure, factory farms loudly protested that such upgrades are too costly.[31]

Subsidizing Factory Farms

Manure digesters are an extremely inefficient method of energy production and likely would not exist in the United States were it not for taxpayer subsidies. Start-up, maintenance and operating costs are often in the millions of dollars, and digesters often do not generate enough energy or revenue to be economically feasible.[32]

The USDA is a major proponent of both the factory farm model and manure digesters and has spent tens of millions of dollars helping factory farms purchase and install digesters.[33] Other federal agencies and state government programs fund the construction of digesters as well.[34] Yet, the USDA notes that low energy prices in the United States mean that digesters, in most cases, do not make economic sense as sources of electricity alone.[35]

The USDA and other promoters of digesters often present manure-based biogas alongside wind and solar as a source of green, renewable energy that can help the United States reach its goal of increased energy independence.[36] But this campaign to rebrand factory farms as being part of the green economy ignores the economic failures of this technology.

Digesters require significant energy to collect, pump and truck manure to and from the digester and to heat the manure once it is in the digester. As much as half of the energy produced from digesters may be needed to operate the digester itself.[37] Sometimes factory farms do not even generate energy from all the available gas but simply "flare off" the biogas they produce, to reduce either odors or emissions.[38]

Because the manure is free and construction costs can be subsidized, factory farms have the potential to reap a major economic benefit, and some factory farms no doubt have

Digesters for Odor Reductions?

One widely cited benefit associated with digesters is their ability to reduce the noxious odors associated with factory farms.[48] USDA economists, noting the limited economic potential of digesters as energy producers, have observed that the odor reductions provided by digesters may create the necessary economic justification for constructing these very expensive machines.[49]

However, it is not clear that digesters are effective at reducing odors. One government study from Wisconsin examined a variety of manure management practices and determined that "anaerobic digesters do not predictably reduce odors or ambient [ammonia] concentrations near manure storage lagoons. . . ."[50]

seen revenues increase with digesters. Overall, however, methane digesters have high failure rates.[39]

For example, even though over a third of the funding for a $900,000 digester on a dairy farm in San Diego County, California came from taxpayers, the EPA indicated that it was no longer in operation only a few years later.[40] It is perhaps unsurprising, as an independent analysis of start-up and maintenance costs indicated that, even accounting for grant funding, it would have taken 71 years for the digester to pay for itself.[41] As of spring 2016, the EPA indicated that 13 of 26 digesters that had been constructed in California, the nation's largest dairy state, had been shuttered.[42]

One especially controversial funding mechanism that the USDA uses to subsidize digesters is the Environmental Quality Incentives Program (EQIP). Designed to improve the environmental performance of American agriculture, this program has been used increasingly to subsidize factory farms. An estimated $750 million in EQIP funds was spent on manure management between 1997 and 2010, including helping factory farms construct manure pits and digesters.[43] The USDA also funds manure digesters through the Rural Energy for America Program (REAP), which has spent hundreds of millions of dollars to support biofuel projects.[44]

Finally, promoters of poultry manure-to-energy technologies have distorted state and national energy policy to include this environmentally damaging technology as a source of renewable energy. And the construction of these expensive facilities almost guarantees the expansion of factory farms in the area, to produce the steady supply of waste to feed them.

For example, North Carolina, a leading poultry-producing state, passed an energy bill mandating that utility companies obtain at least 900,000 megawatt-hours of electricity from poultry waste by 2014, creating a major incentive for the construction of manure-to-energy technologies such as digesters or incinerators — and the expansion of factory farms to feed these expensive facilities.[45]

Likewise, the state assembly in Maryland has designated energy produced from poultry litter facilities as a "Tier 1" source of renewable energy, on par with solar and wind. The implications of this decision are great because the state also has a mandate for electricity suppliers to generate 20 percent of electricity retail sales from renewable sources by 2022.[46] As in North Carolina, poultry litter incinerators are being explored in Maryland, along with anaerobic digesters, to fix the problem of excess manure from locating too many animals in one area.[47]

Conclusion

The political support for manure digesters and other manure-to-energy projects makes the excess manure associated with factory farms seem like less of a problem, but manure digesters in fact do not address most of the problems that the manure causes. Seldom in the public policy debate is it acknowledged that if factory farms were not concentrating

Carbon Markets

Manure-to-energy technologies like manure digesters claim to reduce emissions of greenhouse gases such as methane and carbon dioxide. Some policy makers believe that farmers should be financially rewarded for providing this environmental benefit. One such mechanism exists in carbon cap-and-trade programs such as California's.

The program allows factory farms that use manure digesters to generate "carbon offsets," referring to the greenhouse gases that would have been emitted by the factory farm without the digester in place. Other highly polluting facilities, such as power plants, can then purchase the offsets so the facilities can emit more greenhouse gases themselves, rather than cleaning up their own facilities.[51]

These so-called "carbon markets" are rife with fraud, and it is difficult to verify that emissions actually are reduced. Moreover, offsets allow polluters to avoid the urgent need to stop polluting by allowing them instead to pay to continue harmful activities with impunity, while claiming that emissions have been reduced elsewhere.[52]

The Brubaker Farm in Pennsylvania, for example, raises 30,000 pigs a year. Using taxpayer funds, the farmers built a manure digester to provide electricity for the farming operation and to sell back to the grid.[53] In 2015, the California Air Resources Board certified the Brubaker digester as a greenhouse gas offset generator.[54] The approval allowed a California energy company to claim offsets for the greenhouse gas reductions of the manure digester from the prior two years — so the energy company could keep polluting as normal, and the farm gets paid for environmental benefits it made already.[55] The government provides grants for manure digesters in order to provide an environmental benefit, but when those environmental benefits are used as offsets that allow another facility to keep polluting, that purpose is defeated.

huge amounts of waste in one place, we would not need this expensive "solution."

The most common-sense improvement we can make to the environmental problems facing animal agriculture is to stop building new factory farms. We need policies that help smaller, independent and diversified farmers to thrive in a way that does not harm communities, the environment and public health. Until a shift to a more sustainable food system happens:

- The EPA and states should establish a moratorium on the construction of new factory farms and on the expansion of existing facilities. We will never solve the existing excess manure problem — and we will make it worse — if we do not stop the increased consolidation of the factory farm industry.
- States should strip animal manure out of State Renewable Portfolio Standards. Manure is a dirty source of energy that does not address the root of the problem: we need to diversify our highly concentrated milk and meat production system so that it is not producing unsustainable mountains of manure. Instead of allowing states to meet their renewable energy mandates with dirty technologies that rely on the excess production of manure and enable continued concentration of too many factory-farmed animals in the same region, we need to incentivize clean energy production while creating a food economy that is good for everyone.
- Congress should eliminate other financial incentives for manure-to-energy technologies by making sure that the Environmental Quality Incentives Program no longer serves as a subsidy for factory farms by capping the size of payments that can be made to any one operation.
- The EPA and states should establish better and enforce existing air and water pollution laws, and not stand in the way of local government efforts to impose strict health and zoning regulations for factory farms.
- The federal government and states should not replace enforceable regulations to reduce factory farm pollution with market-based efforts that create pay-to-pollute schemes.

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