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The Climate Footprint of Iowa's Factory Farms

Factory farming is accelerating the climate crisis. Rather than make necessary changes to our agricultural system, agribusinesses that benefit from the status quo are finding new ways to cash in with schemes like capturing the methane gas and carbon from factory farms. Industrial agriculture corporations cannot be trusted to fix the very system they designed — policy fixes are necessary to move us to a climate-friendly food and farming system.

In Iowa, agriculture is both a leading source of climate-warming emissions and deeply threatened by climate chaos that jeopardizes livestock and crops. Iowans are already experiencing the consequences of a warming planet, with conditions predicted to get much worse in the coming years. Communities and farmers are battling extreme temperatures, intense storms, devastating floods, reduced crop yields, and threats to livestock. Big Ag is responsible for a growing share of the climate crisis. Transforming our food system to reduce agriculture's greenhouse gas emissions will benefit communities now and for years to come.

The Climate Crisis and Factory Farming

Livestock production is responsible for 14.5 percent of all human sources of greenhouse gases globally.¹ As the largest pork producer in the United States,² Iowa contributes to those emissions. Global livestock emissions come from three primary sources:

- The greatest contribution comes from producing and processing animal feed.³ Iowa ranks first and second in the country for corn and soybean acreage, with fields for these two crops covering a combined 64 percent of the state.⁴

- About one third of global livestock emissions come from enteric fermentation (the digestive process in cattle), which releases climate-warming gases like methane.⁵ Iowa factory farms raise more than 1.7 million beef cattle every year.⁶
- Another significant source of livestock emissions (roughly 10 percent) is manure management. In Iowa, emissions from manure management increased by 53 percent between 1990 and 2019.⁷

Factory farms are high emitters by design. In comparison, pasture-based farms generate fewer greenhouse gas emissions, largely because of the way they handle manure.⁸ On these farms, manure is applied to land as animals graze. In factory farms, manure is concentrated and stored in massive quantities, often in liquid form in tanks, pits, or lagoons,⁹ which generally produce more emissions.¹⁰

In many regions of the U.S., including Iowa, factory farms produce more manure than can be safely applied to crops in the surrounding area. This problem, compounded in regions with high densities of factory farms, leads to the over-application of waste on croplands. This causes runoff that poses significant threats to ecosystems and to the health and quality of life of surrounding communities.¹¹ The resulting pollution threatens drinking water in Iowa communities and contributes to “dead zones” that destroy aquatic life more than a thousand miles away in the Gulf of Mexico. Additionally, Iowa’s agricultural sector has an outsized impact on the Missouri River watershed, contributing 55 percent of the nitrate pollution while supplying only 12 percent of the water to the river system.¹²

Iowa’s Agricultural Climate Footprint

Despite urgent calls to rapidly reduce heat-trapping emissions, Iowa’s total agricultural emissions increased by 20 percent between 2000 and 2020.¹³ Agriculture contributes **38 percent** of overall

greenhouse gas emissions in Iowa¹⁴ and is the state’s dominant emitter of the highly potent greenhouse gases methane and nitrous oxide, contributing 78 and 94 percent of statewide emissions, respectively.¹⁵

Hogs and cows on Iowa factory farms^a account for **34 percent** of the state’s methane emissions.¹⁶ They emit 240 million kilograms of methane every year (see Table 1) — the carbon dioxide (CO₂) equivalent of more than **4.4 million gas-powered cars** driven for one year.¹⁷ This is significant because some greenhouse gases contribute more to global warming than others. Over 20 years, methane is 86 times more powerful than CO₂, and nitrous oxide is 289 times more potent.¹⁸

Table 1. Cattle and Hogs on Iowa’s Factory Farms, 2022

Livestock	Total Animals	Estimated Methane Emissions IN KILOGRAMS
Beef Cattle	1,772,700	168,585,400
Dairy Cattle	248,900	34,776,900
Hogs	25,193,900	37,790,900

DATA SOURCE: Food & Water Watch (FWW) analysis of Iowa Department of Natural Resources.

Climate Chaos in Iowa

The U.S. Midwest is already experiencing the effects of the climate crisis. In 2019, devastating flooding caused more than \$1.6 billion in damages,¹⁹ with 80 counties receiving Presidential Major Disaster Declarations.²⁰ Flooding events like these are predicted to worsen. Over the past 50 years, the Midwest has seen the amount of rain that falls during the four most extreme storms each year increase by 35 percent.²¹ In August 2020, a derecho damaged nearly 43 percent of Iowa’s corn and soybean acreage, with estimated costs in the billions of dollars. The storm also caused extensive damage to homes, businesses, and roads.²²

Yet even with increased rainfall during more frequent extreme events, summers in Iowa will become drier

a This includes operations that the Iowa Department of Natural Resources flagged as confinement or open feedlot and that met the following size categories: 500 or more beef/dairy cattle and/or 1,000 or more hogs. This matches inventory categories used by the U.S. Department of Agriculture’s Census of Agriculture and roughly aligns with the U.S. EPA’s definition of a medium-sized concentrated animal feeding operation (CAFO). Iowa is also a major producer of layer and broiler chickens, which also contribute to greenhouse gas emissions through fossil fuel use and manure management. However, the Iowa Department of Natural Resources does not calculate an emission factor for chickens.

as temperatures continue to increase.²³ The Midwest is predicted to bear the brunt of increased summer heat wave temperatures in the U.S.²⁴ People who work outside, those with pre-existing health conditions, children, and the elderly are especially vulnerable to extreme heat.²⁵

The agricultural sector will be significantly affected by extreme weather and climate chaos.²⁶ Even with moderate emission reductions, the Central and Eastern U.S. will still experience an estimated 10.8 degrees Fahrenheit increase in average daily temperatures by 2100.²⁷ Researchers predict that for every 1.8-degree Fahrenheit of warming, global wheat yields will decrease by 6 percent, corn/maize yields by 7.4 percent, and soybeans by 3.1 percent.²⁸ One study predicts that the climate of the U.S. Midwest will be unsuitable for corn farming as soon as 2100 without technological innovation and the political will to shift farm policy.²⁹ Climate change will pose even more challenges for agriculture, with increased humidity, heavier spring precipitation, and warmer temperatures expected to increase mold, fungal, and bacterial growth on field crops and stored grains.³⁰

While Iowa's soils and climate conditions have made it a hub for agricultural production, the industrial corn and soybean monocropping that dominates the state's landscape has come at a cost for Iowa's soil. Tilling prairie grasses to make room for these crops has resulted in the loss of nearly 50 percent of the carbon in the state's soil over the past 160 years.³¹ Climate change-driven extreme rainfall is also speeding up soil erosion, sending more soil and organic matter into the Mississippi and Missouri rivers.³²



Iowa's livestock factory farm system is particularly vulnerable to a changing climate — it will not be able to cope with climate chaos.³³ Animals require more water when it is hot, and livestock heat stress will become more common by the end of the century. Livestock confined in factory farms are particularly susceptible to heat stress, which can cause foaming around the mouth, difficulty breathing, increased risk of disease, and even death.³⁴ It will be costly and energy intensive to adapt these industrial operations to rising temperatures.³⁵

Industry's False Solutions

Factory farm gas

Agribusiness corporations are poised to profit from their climate pollution by producing and selling factory farm gas, or "biogas." Factory farms use "digesters" that use bacteria to break down constituents of manure, creating a gas byproduct composed primarily of methane.³⁶ This gas can then be treated, compressed, and mixed with fracked gas to be pumped through leak-prone pipelines.³⁷

Despite being touted as a solution to factory farm greenhouse gas emissions,³⁸ this method only addresses the methane from manure, and not the emissions from the digestive process of cows. According to estimates from the U.S. Environmental Protection Agency, potential factory farm gas generated from hogs and dairies nationwide would amount to less than 1 percent of the natural gas used in the country in 2019.³⁹ Digesters are also prone to spills, leaks, and even explosions, and are prohibitively expensive for all but the largest factory farms.⁴⁰ Even for these facilities, many developers rely on taxpayer subsidies.⁴¹

Factory farm gas can intensify factory farm pollution. For example, digesters produce ammonia, a respiratory irritant that creates dangerous particulate pollution. Ammonia from U.S. livestock operations contributes to more than 12,000 premature deaths annually.⁴² And after the waste digestion process, pollutant-laden factory farm waste still remains. When disposing of the digested manure, or "digestate," operators often employ the same risky methods used

by other factory farms, including over-spreading manure on fields where it can lead to runoff, polluting nearby waterways with nitrate and phosphorus.⁴³ In fact, applying digestate to land may carry a higher risk of water contamination compared to applying traditional manure.⁴⁴

Factory farm gas is a false solution that threatens to entrench not only factory farms, but also our reliance on fossil fuels by repurposing old pipelines and compressor stations or building out new ones.⁴⁵ These dangerous facilities and pipelines harm nearby residents by polluting the air and water. People who live near industrial agriculture face serious threats to their physical and mental health — and now factory farm gas exacerbates these risks.⁴⁶

Iowa is easing restrictions on new factory farm gas digesters, which could incentivize larger factory farms. In June 2021, Iowa Governor Kim Reynolds signed House File 522 into law, allowing the largest factory farms to install factory farm gas digesters as an alternative to aerobic manure management systems. As of December 2021, nine dairies had received permits for digesters, with more dairies predicted to follow their lead.⁴⁷

One of the first factory farm gas operations in Iowa has already caused serious pollution. A company in northwest Iowa filled a manure tank that operators knew was leaking, dumping 376,000 gallons of manure mixture into nearby waterways, contaminating the water and local ecosystems. The digester is managed by Colorado-based energy company Gevo, which sells credits from factory farm gas (generated from manure by 20,000 dairy cows on three Iowa factory farms) on California's Low Carbon Fuel Standard program.⁴⁸ The digester is also one of the first factory farm gas operations to start up in Iowa after the legislature passed three bills incentivizing them.⁴⁹

Carbon capture and storage/sequestration (CCS)

Carbon capture is another industry scheme to profit off its pollution at the expense of our climate. Despite the billions in government handouts, power plant CCS technology remains prohibitively expensive and has not lived up to optimistic projections over the past



The Ethanol Connection

Corporate agribusinesses profit from a steady supply of artificially cheap grains, which they manufacture into ethanol, feed for factory farms, and additives for ultra-processed food.⁵⁰ This system not only is driving climate change, but it does a poor job of feeding people, with half of all North American crop calories fed to livestock⁵¹ and 34 percent of U.S. corn going into ethanol production.⁵² Iowa is the nation's top corn-producing state — 57 percent of which is used to produce ethanol.⁵³

Ethanol is a byproduct of U.S. farm policies that encourage the overproduction of commodity crops like corn.⁵⁴ For example, the 2005 federal Renewable Fuel Standard requires the use of biofuels like ethanol in the U.S. This has resulted in more land being converted to grow corn for fuel.⁵⁵ This, in turn, has increased fertilizer use, negatively impacting water quality and harming ecosystems.⁵⁶ Programs such as federal crop insurance subsidize farm income rather than address the overproduction that actually drives low crop prices.⁵⁷

Ethanol production is also a significant source of greenhouse gas emissions, with lifecycle emissions that are an estimated 24 percent higher than gasoline.⁵⁸ Even so, lawmakers continue to propose legislation to increase the availability of ethanol-blended gasoline (E15) despite public health and climate concerns.⁵⁹

two decades.⁶⁰ No commercial-scale gas-fired power plant has successfully adopted carbon capture technology, yet companies and governments continue to support new projects and pipelines.⁶¹

Carbon pipelines pose significant health and safety risks to the people who live in their paths. Some Iowans are concerned that rural fire departments will not be equipped to deal with a leak or explosion from a CO₂ pipeline.⁶² In 2020, a CO₂ pipeline burst in Satartia, Mississippi, and unleashed a nightmarish scene on the small, rural town. Concentrated CO₂ is denser than air, and exposure to concentrations higher than 10 percent is potentially fatal.⁶³ The Satartia CO₂ cloud covered the town and sickened hundreds of people. It also caused vehicle engines to stall, making it difficult for first responders to evacuate people from their homes and get them to the hospital.⁶⁴

Not only is CCS dangerous, but the process itself is incredibly energy intensive, requiring large amounts of electricity.⁶⁵ Adding CCS technology to dirty power plants will not only keep these plants open, but if all fossil fuel power plants used CCS, they would burn 39 percent more natural gas and 43 percent more coal.⁶⁶ Once the carbon is captured, it still poses climate and health risks as carbon is prone to leakage during transport, injection, and long-term storage.⁶⁷ To make matters worse, captured carbon has been almost exclusively used for enhanced oil recovery (EOR),⁶⁸ where CO₂ is injected into oil reservoirs to force crude oil up to the surface. The primary goal of EOR is to maximize oil production, not to store carbon.⁶⁹ Using captured carbon to produce more oil, more emissions, and more climate chaos is not a climate solution.

Several carbon pipeline proposals are pending in Iowa and are collectively eligible for \$3.3 billion a year at taxpayer expense through the 45Q carbon capture tax credit.⁷⁰ Originally created in 2008, this policy has doled out hundreds of millions of dollars

to CCS companies over the past 14 years.⁷¹ The 2022 Inflation Reduction Act raised the 45Q credit from \$50 per metric ton of sequestered carbon to \$85 per metric ton.⁷²

At the same time, residents in these projects' paths face threats to their livelihoods from dangerous pipelines.⁷³ Pipeline construction damages cropland, and researchers recently found that the construction of the Dakota Access Pipeline under Iowa farms reduced crop yields by 25 and 15 percent for soybeans and corn, respectively.⁷⁴ Given the risks, it is no surprise that recent polling demonstrated that Iowans do not want CO₂ pipelines crisscrossing their state — yet companies are pressuring the state to let them seize land using eminent domain to complete their projects.⁷⁵

Actual Solutions

Factory farms cause myriad harms. They produce immense amounts of waste, pollute the air and water, exploit workers, harm animal welfare, fuel antibiotic resistance, destroy the economic vitality of our rural communities, and accelerate climate chaos.

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ties, and accelerate climate chaos.⁷⁶ Climate-resilient farming will mean transforming our farm policy.⁷⁷

This starts by stopping the expansion of factory farms and helping farmers transition to more sustainable farming operations. In contrast to massive-scale factory farms, smaller operations have the potential to reduce their carbon footprints if they adopt more sustainable practices, such as keeping livestock on pasture.⁷⁸ Integrated crop and livestock systems in particular hold promise for reducing emissions, as they use manageable amounts of manure as crop fertilizer (thereby reducing their reliance on synthetic/chemical fertilizers) while also producing their own feed.⁷⁹ We could also raise more food with fewer emissions if we devoted more fields to growing crops for direct human consumption — and fewer to crops that feed livestock and cars.⁸⁰

We must transform our food system into one that produces fewer emissions and is resilient to a changing climate. To achieve this, we must redesign farm policies to put farmers and the environment at the center and stop subsidizing climate-polluting factory farms and false climate solutions.

Food & Water Watch recommends:

- The Iowa Legislature must pass a moratorium on new and expanding factory farms.
- The Iowa Legislature and governor must say no to dangerous false solutions and industry scams like carbon capture pipelines and factory farm gas, and state agencies like the Iowa Utilities Board and Department of Natural Resources must follow suit.
- Congress must pass the Farm System Reform Act, which will allocate funding to transition to smaller, pasture-based farming systems. Congress must also pass the Agribusiness Merger Moratorium and Antitrust Review Act, to put an end to agribusiness mega-mergers.
- Congress must eliminate public subsidies that support carbon capture and storage development, including the 45Q tax credit and billions in new subsidies for CCS authorized in the Infrastructure Investment and Jobs Act.
- The U.S. Environmental Protection Agency must begin regulating factory farm greenhouse gas emissions under the federal Clean Air Act and must reject false solutions like factory farm gas digesters that will entrench factory farms and worsen environmental injustice.
- The U.S. Department of Agriculture must reject factory farm gas when funding climate-smart agricultural practices, instead promoting real climate solutions that will benefit family farms, not factory farms.

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