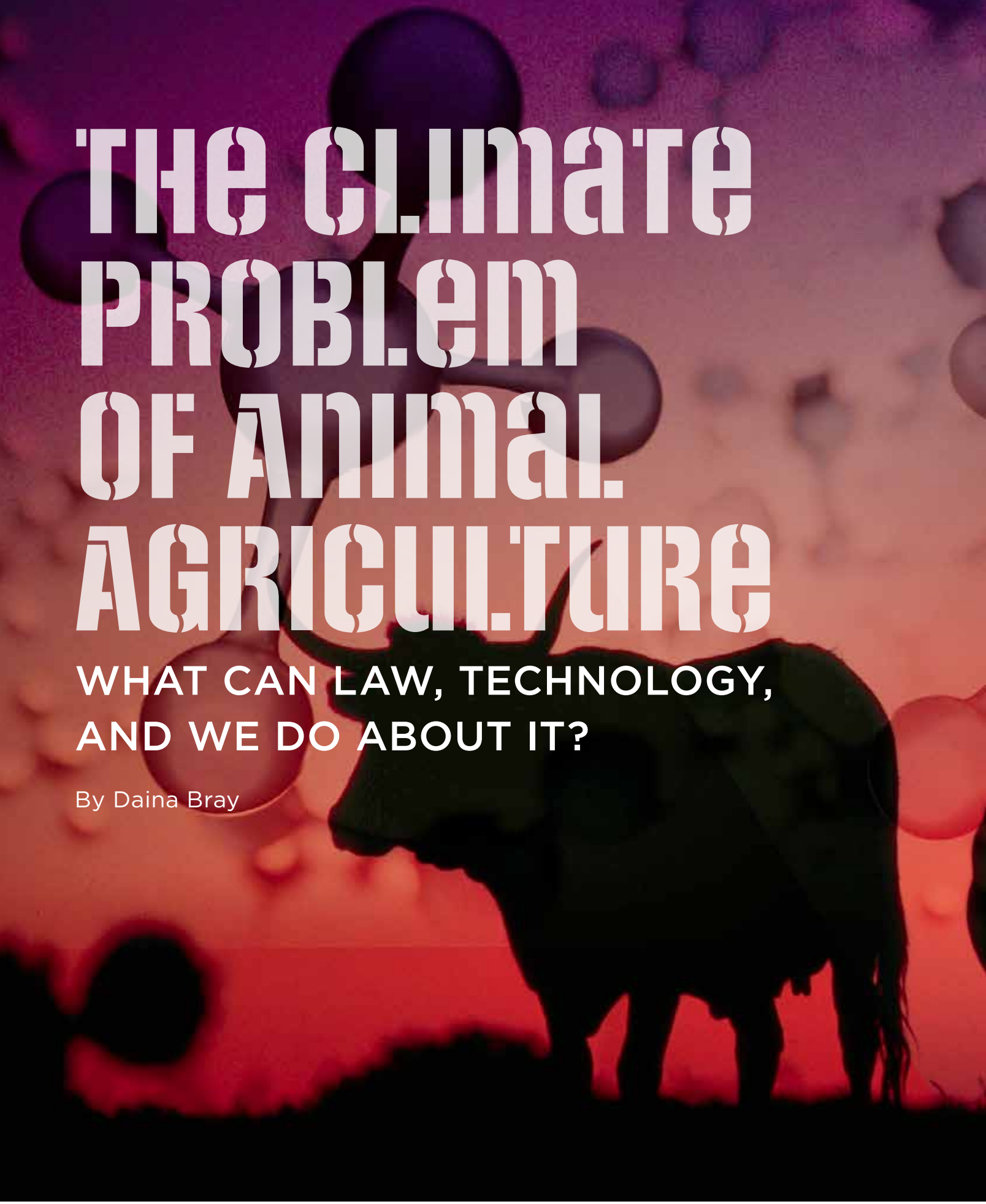

THE CLIMATE PROBLEM OF ANIMAL AGRICULTURE

WHAT CAN LAW, TECHNOLOGY, AND WE DO ABOUT IT?

By Daina Bray

As an undergraduate student at the University of North Carolina in the mid-1990s, I found two of my courses to be especially engaging but also unnerving: global environmental problems and sustainable agriculture. The first focused on three then-current issues: acid rain, the depletion of the ozone layer, and global warming. The second asked hard questions about how we would continue to feed our growing population without destroying the ecosystems that sustain us and left me with a lasting impression of complexity and risk.

Happily, as I write nearly 30 years later, two of the global environmental problems that we studied in the first course have been addressed. Through determined research to understand its causes, regulation of the responsible air pollutants, and transboundary cooperation, the acid rain crisis has been largely resolved.[1] The Montreal Protocol on Substances That Deplete the Ozone Layer, which was finalized in 1987 and was the first treaty in the history of the United Nations to be universally ratified,[2] was successful in putting the ozone layer on a path to recovery.[3]

But the planet is still very much warming. This summer saw record temperatures in the northern hemisphere, devastating fires in Canada and Hawaii, and flooding in Asia.[4] While the Paris Agreement sets a goal of 1.5°Celsius (C) warming above pre-industrial levels to avoid the worst consequences of climate change, the average temperature of the planet in 2022 was already 1.26°C greater than the pre-industrial average.[5] With 2023 expected to be the warmest year on record and likely in the last two thousand years, some scientists are starting to use words like "staggering" and "mind-boggling" to describe what may be an accelerating warming trend.[6]

The unsustainability of our industrial agriculture systems has also not been corrected since I was in college. According to a 2021 report from the UN Food & Agriculture Organization (FAO), almost one in ten of the world's nearly 8 billion people were undernourished, and 3 billion people did not have healthy diets. With the population set to reach 9.7 billion by 2050, the FAO described the water and land resources used for farming as already at "breaking point."[7]

Animal agriculture is at the fulcrum of these two thorny and persistent problems. On the (un)sustainability front, it is a massive consumer of resources. Animal agriculture (incorporating land used both for grazing and to grow animal feed) uses 77 percent of all global farming land, but produces only 18 percent of the calories and 37 percent of the protein that we consume.[8] Animal agriculture also has an outsized water footprint. For example, in the United States, cattle feed crops alone are the single largest user of water, accounting for 23 percent of all national water usage.[9] It takes 1,850 gallons of water to produce a pound of beef, 720 gallons for a pound of pork, 520 gallons for a pound of chicken, and substantially less for plants like soybeans, wheat, and corn, which use 256, 220, and 148 gallons respectively.[10] Much of the environmental discrepancy between farming plants and animals comes down to the caloric inefficiency of feeding plants to animals, instead of eating plants.[11] And animal agriculture has a fundamental climate problem.

ANIMAL AGRICULTURE AND THE CLIMATE

Animal agriculture produces greenhouse gases (GHGs) in a number of ways, including via feed production, land use change, manure management, processing, transportation, and enteric fermentation (i.e., the natural process by which ruminant animals such as cattle and sheep digest carbohydrates and produce methane).[12] Depending on assumptions and calculation methodology, animal agriculture has been estimated to be responsible for anywhere between 11 percent and 20 percent of all anthropogenic greenhouse gases.[13] At either end of that range, animal agriculture's emissions are massive and significant.

Animal agriculture's impact is even greater in terms of the climate superpollutants methane and nitrous oxide. Nitrous oxide—more than half of

which comes from livestock, according to a UN estimate[14]—is around 280 times more powerful than carbon dioxide as a warming agent over its first 20 years in the atmosphere.[15]

Critically, animal agriculture is responsible for about a third of all global anthropogenic methane emissions,[16] and it is the largest U.S. source of methane at 35.9 percent.[17] Methane is about 80 times more potent than carbon dioxide during its first twenty years in the atmosphere.[18] But, whereas carbon dioxide persists for hundreds of years, the average methane molecule persists in the atmosphere for only about a decade.[19] This creates a substantial opportunity: reductions in methane in the coming years can play an important role in curbing warming. One of the lead reviewers of a 2021 Intergovernmental Panel on Climate Change report observed: "Cutting methane is the biggest opportunity to slow warming between now and 2040. We need to face this emergency."[20] Moreover, cutting carbon without action on super-pollutants including methane will preclude achievement of the Paris Agreement goals.[21] To stabilize the climate in the near- and longer-term, we must do both things at once: decarbonize and reduce other climate super-pollutants.[22]

For these reasons, in this critical decade for climate action, many policy makers have turned their attention in earnest to methane mitigation. At COP26 in Glasgow in 2021, representatives of more than one hundred countries signed the "Global Methane Pledge," undertaking to reduce methane emissions by 30 percent by 2030.[23] But resulting policies have largely focused on regulating and reducing other sources of methane, such as landfills and leaky oil and gas pipelines, without seeking to limit livestock emissions. For example, in the United States, both the Biden administration's Methane Action Plan and the Inflation Reduction Act imposed hard limits on methane emissions from other sources, but only voluntary and incentive-based approaches for methane from animal agriculture.[24]

LEGAL SOLUTIONS?

Despite animal agriculture's substantial GHG contributions, the industry's emissions remain largely unregulated around the world. In the United States, animal agriculture has been repeatedly exempted from air pollution rules.[25] But policy action is beginning to move forward in some places, including countries and cities that have adopted policies for procurement of plant-based foods to reduce government emissions. Earlier this year, Taiwan passed a groundbreaking law requiring the government to promote and encourage climate-friendly diets, including plant-based foods.[26] A climate law in France has required school cafeterias to provide vegetarian options in schools once a week since 2021.[27] By joining the Good

Food Cities Accelerator, sixteen cities around the world have undertaken to develop climate action plans that, among other steps, call for increased reliance on plant-based foods.[28]

Significantly, several European countries have proposed or taken steps to reduce herd sizes. The most prominent example is the Netherlands. The Court of Justice of the European Union (CJEU) ruled that nitrogen pollution from agriculture, including animal agriculture, in the Netherlands was violating the state's obligation to protect wild areas, and ordered the government to reduce nitrogen emissions.[29] Although the focus of the court judgment was on nitrogen pollution, subsequent Dutch government announcements emphasized the climate connection.[30] The CJEU subsequently issued a similar decision as to Ireland's failure to control nitrogen pollution,[31] and experts say that the Irish government's commitment to reducing GHG emissions by 25 percent by 2030 cannot be achieved without reducing the number of cattle in the country.[32] In 2023 the European Commission approved €200 million in aid to buy out pig farmers in the Flanders region of Belgium to reduce nitrogen pollution.[33]

Two countries are also considering taxes relating to animal agriculture's climate harms. In 2022, the government of New Zealand proposed the world's first emissions tax on cattle,[34] and the Danish Minister of Taxation recently shared that the government there is considering a beef tax after an advisory report called for a shift to plant-based foods to meet climate goals.[35]

These early efforts at direct regulation of animal agriculture's emissions have faced significant pushback, including that the emissions tax proposal in New Zealand has been delayed.[36] In the Netherlands, dramatic farmer protests featuring tractors in the streets and a significant political shake-up drew international attention.[37]

Where regulation is lacking, advocates may turn to litigation to influence public policy, hold companies accountable, and—as an ancillary effect—increase public awareness. There has been an explosion of climate litigation around the world, with nearly 2,200 cases filed by the end of 2022.[38] A recent survey found that more than half of all decisions in climate-related lawsuits have been favorable to climate action.[39] While most climate litigation to date has understandably focused on fossil fuel emissions, litigation activity is expanding to reach other heavy-emitting industries, including agriculture.[40]

Early lawsuits relating to animal agriculture's climate responsibility have been filed. Leading cases include a consumer protection case in Denmark against the EU's largest pork producer that had marketed a "climate-controlled pig,"[41] a tort case in New Zealand brought by the climate change spokesperson for a Māori advocacy coalition against the

country's largest dairy producer (and others) seeking a declaration of liability and an injunction to limit GHG emissions,[42] and a lawsuit in France alleging systemic environmental and human rights violations (including climate harms) in the supply chain of a large supermarket caused by livestock operations in Brazil and Colombia.[43] A number of lawsuits in the United States have challenged government failures to consider the climate impacts of animal agriculture in regulatory decisions.[44]

There are good reasons to be skeptical about the ability of litigation to bring about the systemic and radical changes needed to avoid the worst effects of climate change.[45] But, particularly because policy solutions are currently not sufficiently addressing the challenge and political obstacles abound, litigation can be a useful tool to increase the urgency and ambition of public and private actors and to increase awareness.[46]

TECHNOLOGY SOLUTIONS?

Rather than inviting regulation or acquiescing to climate liability (which perhaps no industry would be expected to do), many actors in the animal agriculture industry have instead looked to technological innovation to seek to respond to the climate problem of animal agriculture. Possible approaches include adjusting methods of growing animal feed, changing animal feed (including the use of feed additives), and improving manure management systems.[47]

Many of these approaches remain largely untested and their feasibility—including due to economic and cultural factors—uncertain.[48] Because enteric fermentation in cattle is such a large part of livestock's GHG emissions, there has been significant investment in that area. For example, using seaweed as a feed additive is being explored as a way to reduce methane emissions. But production of seaweed would need to be scaled up dramatically to support this approach and, anyway, it is only practical to feed additives to cattle when they are on feedlots rather than grazing, and U.S. beef cattle produce 89 percent of their methane while grazing.[49] In one striking example of a proposed technological fix, the beef processing company Cargill has invested in a mask for cows to capture and oxidize methane as it is exhaled.[50] It is unclear whether this approach would be scalable or effective. A recent study found (predictably) that the mask had negative welfare outcomes for cows, including skin abrasions and reduced social grooming.[51]

Other approaches may have unintended consequences. For example, some proposed mitigation strategies may reduce one type of emission but increase another—having a "pollution swapping" effect.[52] Where mitigation approaches incentivize increasing productivity or keeping larger numbers of animals, they can have the effect of increasing absolute emissions.[53] One prominent mitigation approach, already of growing prominence in the United States, is the use of biogas digesters.[54] These systems capture methane from manure collected in large containers (euphemistically referred to as manure "lagoons") to be used as fuel.[55] While promoted by many in the industry as a sustainable improvement,[56] biogas has been heavily criticized on a number of bases.[57] Biogas is expensive, costing about four times more to produce than extracted gas, and the high up-front capital costs (including building the digester infrastructure and tying it in with existing gas pipelines) mean that it relies heavily on government subsidies and supports.[58] The combination of subsidies, grants, and carbon trading have made biogas operations profitable[59] and can incentivize growth and entrenchment of concentrated animal feeding operations (CAFOs).[60] In addition, any suggestion that biogas could replace other sources of natural gas is misplaced: a 2019 study from the American Gas Foundation found that biogas from animal manure could, under the most aggressive scenario, meet only about 10 percent of U.S. residential demand for natural gas by 2040, and about 3 percent of total demand.[61]

An overarching concern with technological approaches to reducing GHG emissions from animal agriculture is that even a per-animal reduction in emissions (i.e., an improvement of emissions efficiency) can still result in increases in absolute emissions given current trends of increasing consumption of animal products.[62] In other words, even a less climate-damaging individual animal may not be an improvement if the herd is growing.

An area of technological solutions that holds promise in relation to absolute emissions is the development of plant-based alternatives to animal products, such as improvements to taste and texture of alternatives, precision fermentation, and cultivated meat (i.e., meat produced directly from cells).[63] Plant-based sales, while fluctuating in recent years, are growing.[64] In June 2023, two companies received the first-ever approvals from the U.S. Department of Agriculture to produce and commercially market cultivated meat in the United States.[65] Industry and government investment in such technologies, rather than further subsidization and growth of industrial animal agriculture, holds great promise.

PERSONAL RESPONSIBILITY?

Beyond legal and technological progress to tame animal agriculture's climate harms, personal choice is central to dietary GHG emissions. For individuals with access to food choices, it is possible to dramatically reduce the climate footprint of our diets by consuming less or no animal products.[66] Many experts say that making such choices is one of the most impactful things an individual can do to diminish their climate impact.[67] This is one of the critical distinctions between fossil fuels and animal agriculture. As observed by Professor Jennifer Jacquet of New York University: "[There's] a key difference between these industries: consumer preferences. Americans may not have much choice about the source of the electricity that lights their homes, but they do choose what to eat three times a day."[68]

Such choices are particularly important in countries like the United States, which has one of the highest per capita levels of meat consumption in the

world[69] and bears huge responsibility for historical GHG emissions.[70] For these reasons, in my view it is ethically sound for Americans with access to options to consider reducing their consumption of animal products.

Food choices are personal, influenced by our familial and cultural backgrounds as well as our values.[71] I have made the decision not to consume animal products not only because of their climate impacts, but because of the array of externalized harms of the industrialized animal agriculture system (which produces the vast majority of animal food products in this country).[72] A fulsome description of these harms is too long and grim a story for this article,[73] but see the endnotes for resources to learn more about how industrial animal agriculture concentrates wealth and influence in the hands of a few[74] while harming workers,[75] environmental justice communities,[76] animals,[77] biodiversity,[78] the environment,[79] and the public health.[80]

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Like so many complex challenges of our own making, the climate problem of animal agriculture does not have a single solution. Given the urgency of our planetary situation, it is imperative that we move forward on as many fronts as possible. Lawyers can work on policy and litigation. Scientists can develop technologies to help with a transition to a just and sustainable food system. At our kitchen tables and in our favorite restaurants, each of us makes several decisions a day that can help untangle the climate problem of animal agriculture. If we do these things, perhaps college students who are studying climate change today can look back—as I do on progress on acid rain and the ozone layer—and see that we made a difference. If we do not, I fear that widespread instability and suffering, visited most powerfully on the most vulnerable among us, will be the result.

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