NOTES

LESSONS FROM LAND TO SEA: AN INFORMED APPROACH TO OFFSHORE AQUACULTURE REGULATION

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ABSTRACT

As traditional capture fisheries run into sustainability issues, including those brought on by climate change and overfishing, and the demand for seafood continues to increase, aquaculture operations and policymakers in the United States are looking toward the potentially lucrative frontier that is offshore aquaculture. Aquaculture operations do not currently operate in federal waters off the coast of the United States due to insurmountable permitting obstacles, including a slew of statutes to abide by and no central agency to point the way.

Many policymakers agree that legislation is required to clarify the permitting structure in order to allow operations to enter the offshore arena. However, the creation of what is essentially a new food industry in the United States deserves a more in-depth analysis of the impacts the industry will have on local communities, public health, workers, and the environment. Recent proposals have not given much more than a cursory glance to these impacts.

In particular, offshore aquaculture should look to the industry from which Americans currently receive a large amount of their protein: large-scale animal agriculture, or "factory farming." Factory farming contributes to a myriad of problems, including human health issues associated with eating meat, such as obesity, cardiovascular disease, and exposure to pathogens and antibiotic resistance; animal welfare issues, including physical and psychological distress; worker safety issues, which have been exacerbated by COVID-19; environmental issues, including pollution and the industry's contribution to climate change; and environmental justice issues around the disproportional effects of air and water pollution on rural communities. This Note focuses on environmental issues around water pollution, antibiotic use, the externalization

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of costs, federal subsidization, and the lobbying power of large companies. The failure of factory farming in these areas serves as a giant warning to offshore aquaculture, an industry vulnerable to many of the same problems. A new offshore aquaculture industry must consider its place in the overall U.S. food system. It must learn from the things that have failed in that system, and it must implement solutions based on research. Only then can offshore aquaculture be not only a profitable but also a truly sustainable part of the domestic food supply.

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The sea is the vast reservoir of Nature. The globe began with sea, so to speak; and who knows if it will not end with it?

—Jules Verne[1]

INTRODUCTION

The United States is suffering from a food crisis. Americans have disparate access to healthy foods,[2] diet-related disease is rampant,[3] and animal agriculture, on which many Americans depend,[4] is damaging the environment and contributing to climate change.[5] Large-scale animal agriculture has been a significant source of the United States' domestic food supply for many years.[6] But from its small family-farm roots, it has grown into a giant industry, with more animals crammed into what are aptly called "factory farms,"[7] and operations consolidated in the hands of a few companies.[8] These companies,

[1] JULES VERNE, TWENTY THOUSAND LEAGUES UNDER THE SEA 63 (Chi. & N.Y., M.A. Donohue & Co. 1895) (1870).

[2] *See generally* Paolo D'Odorico, Joel A. Carr, Kyle F. Davis, Jampel Dell'Angelo & David A. Seekell, *Food Inequality, Injustice, and Rights*, 69 BIOSCIENCE 180 (2019) (discussing food inequality from human rights perspective).

[3] Press Release, Brigham & Women's Hosp., Healthy Diet Could Save $50B in Health Care Costs (Dec. 17, 2019), https://www.brighamandwomens.org/about-bwh/newsroom/press-releases-detail?id=3517 [https://perma.cc/8MRR-EE4D] (announcing findings of study showing that "[t]hree dietary factors contributed most to [diet-related disease healthcare] costs: consumption of processed meats, low consumption of nuts/seeds, and low consumption of seafoods containing omega-3 fats").

[4] *See, e.g.*, Kate Taylor, *Americans' Red Meat Obsession Is Growing Stronger, with Beef Sales Skyrocketing to $30 Billion as a 'Meat War' Looms*, BUS. INSIDER (May 3, 2021, 12:23 PM), https://www.businessinsider.com/americans-more-beef-as-a-meat-war-looms-2021-5 (showing that despite climate change arguments against meat production, demand is still strong).

[5] Daisy Dunne, Tom Prater & Joe Goodman, *Interactive: What Is the Climate Impact of Eating Meat and Dairy?*, CARBON BRIEF (Sept. 14, 2020), https://interactive.carbonbrief.org/what-is-the-climate-impact-of-eating-meat-and-dairy/ [https://perma.cc/8YZN-7VAL] (breaking down climate change impacts of different foods and finding that "[m]eat and dairy specifically accounts for around 14.5% of global greenhouse gas emissions").

[6] U.S. DEP'T OF AGRIC., AMERICA'S DIVERSE FAMILY FARMS 4 (2020), https://www.ers.usda.gov/webdocs/publications/100012/eib-220.pdf?v=7527.7 [https://perma.cc/TD6U-YY3H] ("Large-scale family farms accounted for the largest share of production, at 44 percent.").

[7] Lindsay Walton & Kristen King Jaiven, *Regulating CAFOs for the Well-Being of Farm Animals, Consumers, and the Environment*, 50 ENV'T L. REP. 10,485, 10,486 (2020) (examining U.S. animal agriculture system, economic advantage of Confined Animal Feeding Operations ("CAFOs"), applicable federal, state, and local laws, and offering potential solutions to protect farm animals and environment).

[8] Amelia Pollard, *'Big Four' Meatpackers Are Crushing Small Ranchers*, AM. PROSPECT (June 9, 2021), https://prospect.org/power/big-four-meatpackers-crushing-small-ranchers/

with their control and influence over the industry, enacted practices that allowed them to grow larger while externalizing the costs they imposed, putting these costs on the environment and consumers.[9] Factory farming is able to profit due to massive federal subsidies despite the harm done to the environment and human health.[10] The detrimental effects of this system on the environment and human health put U.S. reliance on meat in an unsustainable position.[11] The reliance on animal agriculture, in particular factory farms, cannot continue if the United States is to provide healthy food for all individuals, while mitigating environmental damage and adapting the food system to climate change.

Aquaculture, more commonly known as *fish farming*, where fish are cultivated in a controlled, enclosed environment rather than caught, poses a potential solution to replace at least some of the domestic food supply currently sourced from land-based animal agriculture. Domestic demand for seafood is rising as people look to healthier options.[12] The United States currently produces fish through capture fisheries (where naturally occurring fish are caught or simply, *fished*) and nearshore aquaculture operations, which are located within

[https://perma.cc/3ALP-JM23] ("Tyson, JBS, Cargill, and National Beef purchase and process 85 percent of beef in the United States, giving them immense economic control.").

[9] DOUG GURIAN-SHERMAN, UNION OF CONCERNED SCIENTISTS, CAFOS UNCOVERED: THE UNTOLD COSTS OF CONFINED ANIMAL FEEDING OPERATIONS 1 (2008), https://www.ucsusa.org/sites/default/files/2019-10/cafos-uncovered-full-report.pdf [https://perma.cc/9U6S-SU5B].

[10] *Id.* at 10 ("[The CAFO] trend is facilitated by a wide array of subsidies—both direct and indirect—paid for by the public.").

[11] Aside from the detrimental environmental effects of animal agriculture, discussed *infra* Section II.A, and the industry's contribution to climate change, animal agriculture is "unsustainable" in that it is an inefficient nutrition source. Growing feed to give to an animal, to raise the animal for humans to consume, is less efficient than growing food for humans to directly consume, cutting out the middleman. "The world's population is expected to reach 10 billion by 2050. Feeding this many people will require an increase in global food production of 70%," and will require production to be more efficient than traditional animal agriculture. Michael Dent, *The Meat Industry Is Unsustainable*, IDTECHEX (Mar. 25, 2020), https://www.idtechex.com/en/research-article/the-meat-industry-is-unsustainable/20231 [https://perma.cc/M4S6-VMY8] (summarizing how and why global meat industry became so large and proposing solution of substitute meat products). Feeding more people will require more land and water, where "livestock production is a major factor in deforestation" and a "major contributor to water stress." *Id.*; *see also* Betty Hallock, *To Make a Burger, First You Need 660 Gallons of Water…*, L.A. TIMES (Jan. 27, 2014, 2:35 PM), https://www.latimes.com/food/dailydish/la-dd-gallons-of-water-to-make-a-burger-20140124-story.html (explaining how diet contributes to individual water footprints and showing how much water goes into producing foods like beef, potatoes, milk, and more).

[12] *See* FOOD AND AGRIC. ORG. OF THE U.N., THE STATE OF WORLD FISHERIES AND AQUACULTURE: SUSTAINABILITY IN ACTION 65, 68 (2020) [hereinafter FAO, STATE OF THE WORLD FISHERIES] (explaining that "increased awareness of the health benefits of fish among consumers" is reason for expanding fish consumption).

three nautical miles of the shore and governed by state law.[13] However, domestic production via these modes cannot satisfy demand, and the United States currently imports most of its seafood.[14] Thus, the United States has set its sights on cultivating the offshore aquaculture industry, which would take place in federal waters, up to 200 nautical miles from the shore.[15] Current permitting obstacles and the lack of a clear regulatory structure make entry into the U.S. offshore industry prohibitive, however, especially for small players.[16] Aquaculture also faces environmental impact problems, some of which are eerily similar to those that animal agriculture exacerbates.[17] A permitting scheme and regulatory structure that clarifies entry into the offshore market is also required to avoid these environmental issues.

Legislation aimed at creating a cohesive structure for regulation and permitting, with the goal of creating a profitable offshore aquaculture industry that would stabilize the U.S. food supply, has been introduced in Congress many times in the last decade, but none of these bills have passed.[18] Operations that have sought to locate offshore have been discouraged by the complexity of permitting requirements with no central agency to guide the process, at times moving overseas instead.[19] And every year without legislation to clarify a permitting regime, the United States forfeits the opportunity to expand the

[13] EUGENE H. BUCK & HAROLD F. UPTON, CONG. RSCH. SERV., R41613, FISHERY, AQUACULTURE, AND MARINE MAMMAL ISSUES IN THE 112TH CONGRESS (2011) (explaining that states have jurisdiction within three miles of the coast; beyond that fishing is managed by the federal government).

[14] *See* HAROLD F. UPTON, CONG. RSCH. SERV., R45952, U.S. OFFSHORE AQUACULTURE REGULATION AND DEVELOPMENT 3 (2019).

[15] *See id.* at 1, 11 ("Some aquaculture advocates contend that developing such offshore aquaculture facilities could increase U.S. seafood production and provide economic opportunities for coastal communities; opponents counter that doing so could harm the environment and have negative impacts on other coastal activities, such as fishing.").

[16] *See, e.g.*, Kristen L. Johns, Note, *Farm Fishing Holes: Gaps in Federal Regulation of Offshore Aquaculture*, 86 S. CAL. L. REV. 681, 690-92 (2013).

[17] *See infra* Section II.B (explaining environmental issues that offshore aquaculture industry faces, including water and species pollution, antibiotic use, and effects of climate change).

[18] Bills that were introduced but not passed include Advancing the Quality and Understanding of American Aquaculture Act, H.R. 6191, 116th Cong. (2020); Advancing the Quality and Understanding of American Aquaculture Act, S. 4723, 116th Cong. (2020); Commercial Fishing and Aquaculture Protection Act of 2019, S. 2209, 116th Cong. (2019); Advancing the Quality and Understanding of American Aquaculture Act, H.R. 6966, 115th Cong. (2018); Advancing the Quality and Understanding of American Aquaculture Act, S. 3138, 115th Cong. (2018); National Sustainable Offshore Aquaculture Act of 2011, H.R. 2373, 112th Cong. (2011); National Sustainable Offshore Aquaculture Act of 2009, H.R. 4363, 111th Cong. (2009); National Offshore Aquaculture Act of 2007, H.R. 2010, 110th Cong. (2007); National Offshore Aquaculture Act of 2007, S. 1609, 110th Cong. (2007); and National Offshore Aquaculture Act of 2005, S. 1195, 109th Cong. (2005).

[19] *See, e.g.*, Johns, *supra* note 16, at 690-94.

industry, increase profits, and move some of our food supply away from the harmful animal agriculture industry.

Offshore aquaculture is very much still on the minds of policymakers, however, as evidenced by a 2019 Congressional Research Service report that outlines the status of the industry and considerations for policymakers.[20] In 2020, the Fifth Circuit ruled that the National Marine Fisheries Service ("NMFS") does not have the authority to regulate aquaculture, taking away the power of the only agency that was taking a leading role,[21] and making the need for Congressional legislation even more dire.[22] Also in 2020, President Trump issued an executive order with an eye toward reducing regulatory burdens for offshore aquaculture development.[23] Finally, the 116th Congress saw the introduction of the Advancing the Quality and Understanding of American Aquaculture Act, which provided a regulatory framework for offshore aquaculture.[24] While the 116th session ended without the bill passing, legislation of this type (and perhaps this bill itself) seems certain to be introduced again in the future. All eyes are looking offshore, and U.S. entry into the field seems inevitable.

Previous literature has discussed the United States' desire to expand aquaculture offshore but has not universally agreed on how to get there.[25]

[20] *See generally* UPTON, s*upra* note 14 (examining, in addition, issues and challenges that hinder development of offshore aquaculture).

[21] Gulf Fishermens Ass'n v. Nat'l Marine Fisheries Serv., 968 F.3d 454, 456 (5th Cir. 2020) (holding federal agency may not create aquaculture or fish farming regime in Gulf of Mexico under the Magnuson-Stevens Fishery and Conservation and Management Act ("MSA"), which is administered by NMFS). The decision addressed NMFS's plan to regulate offshore aquaculture in the lucrative Gulf of Mexico. *Id.* (holding that to confer power of regulating offshore aquaculture in the Gulf of Mexico to NMFS, Congress must amend the MSA).

[22] *See infra* note 93 and accompanying text (explaining that definition of "fishing" under the MSA is "the catching, taking, or harvesting of fish" and how NMFS unsuccessfully made argument that aquaculture was "harvesting" of fish).

[23] Exec. Order No. 13,921, 85 Fed. Reg. 28,471 (May 12, 2020) (aiming to protect aquatic environments in United States by "removing outdated and unnecessarily burdensome regulations; strengthening efforts to combat illegal, unreported, and unregulated fishing; improving the transparency and efficiency of environmental reviews; and renewing our focus on long-term strategic planning to facilitate aquaculture projects").

[24] H.R. 6191, 116th Cong. (2020) (aiming to develop sustainable aquaculture industry in United States by simplifying federal regulations, supporting research and technology in industry, and creating new jobs); S. 4723, 116th Cong. (2020) (mirroring H.R. 6191).

[25] *See, e.g.*, Alison Rieser, *Defining the Federal Role in Offshore Aquaculture: Should It Feature Delegation to the States?*, 2 OCEAN & COASTAL L.J. 209, 210 (1997) (suggesting state-based management system); Thomas R. Head III, *Fishy Business—Regulating Aquaculture Operations in the United States*, NAT. RES. & ENV'T, Summer 2003, at 21, 55 (suggesting that any regulatory framework needs to work to minimize environmental impact of aquaculture); Lynne D. Davies, Comment, *Revising the National Offshore Aquaculture Act of 2007: Using State of Maine Aquaculture Laws, Regulations, and Policy Recommendations*

Policymakers in Washington have generally agreed that the National Oceanic and Atmospheric Administration ("NOAA"), the parent agency of NMFS, is best situated to be the central agency in an offshore aquaculture regulatory framework and to formulate the requirements operations need to meet to move offshore.[26] Policymakers have also acknowledged the need for agencies, such as the Department of Agriculture ("USDA"), Food and Drug Administration ("FDA"), and Environmental Protection Agency ("EPA"), to have some involvement but only to the extent necessary to ensure that operations comply with current regulations.[27] This Note agrees that NOAA is the intuitive choice to be the central agency but argues that the USDA, FDA, and EPA should play much more significant roles in the creation of regulatory requirements for offshore aquaculture operations.

The reason for that involvement is the element that has been lacking from the discussion: a consideration of the lessons aquaculture needs to take from the failures of animal agriculture, which is the main gap this Note fills. Before heading offshore to realize the potential of a new food supply, it makes sense to look at the industry where we get a large part of our *current* food supply and ask whether there are lessons that may apply to the new industry. In this case, there

as a Prototype for the Proposed Framework, 13 OCEAN & COASTAL L.J. 95, 109-17 (2007) (suggesting framework based on Maine's management of its nearshore aquaculture industry, with National Oceanic and Atmospheric Administration ("NOAA") seeking "compliance with other federal agencies"); Brandee Ketchum, Comment, *Splitting Scales: Conflicting National and Regional Attempts to Manage Commercial Aquaculture in the Exclusive Economic Zone*, 6 J. FOOD L. & POL'Y 1, 5, 25-29 (2010) (arguing that United States should not enter into offshore aquaculture but that National Offshore Aquaculture Act of 2007, with NOAA as central agency, was best, albeit flawed, proposal (citing H.R. 2010, 110th Cong. (2007))); Johns, *supra* note 16, at 719-20 (advocating for National Sustainable Offshore Aquaculture Act of 2011, which designated NOAA as lead agency and provided that it should "consult" with the Environmental Protection Agency ("EPA") (citing H.R. 2373, 112th Cong. (2011))); Garrett Wheeler, Comment, *A Feasible Alternative: The Legal Implications of Aquaculture in the United States and the Promise of Sustainable Urban Aquaculture Systems*, 6 GOLDEN GATE U. ENV'T L.J. 295, 299-302, 315-17 (2013) (acknowledging United States' desire to move offshore but warning of environmental dangers and suggesting development of "urban aquaculture" instead); Read Porter & Rebecca Kihslinger, *Federal Environmental Permitting of Offshore Aquaculture: Coverage and Challenges*, 45 ENV'T L. REP. 10,875, 10,893 (2015) (concluding that comprehensive legislation to coordinate permitting of offshore aquaculture is unnecessary); Elan Lowenstein, *Regulating the Blue Revolution: A Sea of Change for the United States' Offshore Aquaculture Industry or a Missed Opportunity for Increased Sustainability*, 26 U. MIA. INT'L & COMPAR. L. REV. 473, 497-98 (2019) (suggesting comprehensive legislation is needed and NOAA should be central regulating agency).

[26] *See* H.R. 6191 (naming NOAA as main office to oversee proposed initiatives related to offshore aquaculture); S. 4723 (same); Exec. Order No. 13,921, 85 Fed. Reg. 28,471, 28,473 (designating NOAA as "lead agency for aquaculture projects located . . . within the exclusive economic zone").

[27] *See* Johns, *supra* note 16, at 719-20 (discussing National Sustainable Offshore Aquaculture Act of 2007); H.R. 6191 (mentioning EPA involvement); S. 4723 (mentioning FDA and EPA involvement).

are many. If offshore aquaculture is to be a viable alternative to animal agriculture and sustainably contribute to the domestic food supply, legislation needs to create an interagency approach to regulation that is directly informed by the harmful practices of animal agriculture. These include water pollution, antibiotic use, externalization of costs, and industry capture of regulatory agencies. In addition, subsidies to aquaculture operations should be conditioned on certain sustainability criteria. To ignorantly barrel into a potentially profitable industry without learning from the havoc that a directly correlative industry has wreaked would only set the United States on a further path of destruction and unsustainability, for both the environment and the domestic food supply.

This Note proceeds in three Parts. Part I discusses the background of animal agriculture, namely Concentrated Animal Feeding Operations ("CAFOs"), and aquaculture, or Concentrated Aquatic Animal Production Facilities ("CAAPs"), as they are regulated by the EPA. Part I also lays out a brief history of aquaculture in the United States. Part II delves into the environmental problems caused by factory farming and the harmful ways in which the industry is able to remain artificially profitable, as well as the environmental problems faced by aquaculture and the extent to which they are similar to harms caused by factory farming. Part II also discusses the failed legislative attempts to create a cohesive regulatory scheme for offshore aquaculture, the problems of market entry, and the potential exacerbation of environmental problems this causes. Part III proposes as a solution an interagency approach to offshore aquaculture regulation with NOAA as the central authority, and the USDA, FDA, and EPA as heavily influential, as well as a conditional subsidization plan for offshore aquaculture. A cohesive regulatory structure informed by failures of factory farming will provide a clear path for operations to enter the industry, thereby creating jobs and profitability while shifting away from the unstable and environmentally detrimental animal agriculture industry and avoiding similar environmental and stability issues in offshore aquaculture.

I. CURRENT REGULATION OF ANIMAL AGRICULTURE AND AQUACULTURE OPERATIONS

This Part first discusses the background of animal agriculture and its growth as an industry before introducing the effect of animal agriculture on environmental pollution and the current environmental laws it is subject to. It then introduces aquaculture and its regulation under the same environmental laws and discusses current nearshore operations and the United States' desire to move offshore. It also traces the history of legislative attempts to provide a regulatory framework for offshore aquaculture.

A. *The Growth of CAFOs and Regulation Under the CWA*

Animal agriculture refers to the production of cows, pigs, and chickens for meat, eggs, and dairy, and makes up a large part of the United States' food economy. While oftentimes the industry portrays itself as a collection of local

farms where cows feed in pristine green pastures, that picture is simply not the reality.[28] Industrial animal agriculture production has expanded greatly and has grown to be the dominant form of meat and dairy production.[29] At the same time, production has become concentrated in the hands of only a few companies, creating an industry that is a far cry from the family farms that provided most of America's meat and dairy fifty years ago.[30]

The percentage of animals raised on factory farms[31] has increased significantly in recent decades. Some estimates are that as much as 99% of animal products come from factory farms.[32] The "factory" in "factory farming" refers to the feeding facilities where the animals spend most of their lives before they go to slaughter. This is often a large operation, legally defined under the Clean Water Act ("CWA") as a CAFO.[33] To be classified as a CAFO, a facility first must be an Animal Feeding Operation ("AFO").[34] An AFO is an "agricultural operation[] where animals are kept and raised in confined situations . . . for a total of 45 days or more in any 12-month period,"[35] effectively, where they are *grown*. Another hallmark of an AFO is the lack of

[28] *See* Walton & King Jaiven, *supra* note 7, at 10,485 (noting that "idyllic American images of open fields, green pastures, and cows grazing under the warm sun" are a thing of the past). For a discussion of the misleading marketing campaigns factory farms employ and animal welfare groups' attempts to bring false advertising lawsuits, see *How False Advertising Lawsuits Help Animals*, ANIMAL LEGAL DEF. FUND, https://aldf.org/article/how-false-advertising-lawsuits-help-animals/ [https://perma.cc/D45C-6QGQ] (last visited Mar. 21, 2022).

[29] *See* GURIAN-SHERMAN, *supra* note 9, at 9-10 ("Overall, the number of animals on small to medium-sized farms decreased substantially between 1982 and 1997, while animals on CAFOs increased by 88 percent.").

[30] *See id.* at 10 (summarizing rise of CAFOs and poultry industry over past fifty years and attributing rise to modernization and "processor-driven vertical integration and coordination"); Kelsea Kenzy Sutton, Comment, *The Beef with Big Meat: Meatpacking and Antitrust in America's Heartland*, 58 S.D. L. REV. 611, 612 (2013) ("Today, four companies, in varying combinations, control more than eighty-three percent of the beef industry, sixty-six percent of the pork industry, and approximately fifty-five percent of the poultry industry.").

[31] The term "factory farm" is often used interchangeably with CAFO, but it is not likely that all factory farms meet the legal definition of CAFO for purposes of National Pollution Discharge Elimination System ("NPDES") permitting. This Note uses both terms, but not interchangeably.

[32] *See* Walton & King Jaiven, *supra* note 7, at 10,486.

[33] 33 U.S.C. §§ 1251-1388 (governing water pollution in United States).

[34] *National Pollutant Discharge Elimination System (NPDES): Animal Feeding Operations (AFO*s), EPA, https://www.epa.gov/npdes/animal-feeding-operations-afos [https://perma.cc/B2Y4-GCCS] (last visited Mar. 21, 2022).

[35] *Id.*

"crops, vegetation, [or] forage growth."[36] These are not lush fields where cows roam freely.

An AFO can be further designated as a small, medium, or large CAFO based on the number of animals confined.[37] Using beef and dairy CAFOs as an example,[38] dairy operations with at least 700 cattle or beef operations with at least 1,000 cattle will be designated as large CAFOs.[39] Medium CAFOs contain between 200-699 dairy cattle or 300-999 beef cattle.[40] Small CAFOs contain fewer than 200 dairy cattle or 300 beef cattle.[41]

The number of CAFOs in the United States increased by 1,400 between 2011 and 2017 to approximately 20,000.[42] This growth is partly a response to increased demand,[43] and it would be logical to infer that CAFOs were simply a more efficient way of profitably meeting that demand.[44] However, these operations owe much of their profitability to direct and indirect government subsidies and the industry's externalization of costs imposed on the environment, human health, and rural communities.[45]

In addition to the growth of the industry, the majority of production (and thus the majority of pollution) is concentrated in the hands of only a few companies.[46] In the face of competition, many smaller operations "have become contract

[36] *Id.* (outlining that to qualify as AFO, lot or facility may not have "crops, vegetation, forage growth, or post-harvest residues . . . in the normal growing season" anywhere in the lot or facility).

[37] EPA, REGULATORY DEFINITIONS OF LARGE CAFOS, MEDIUM CAFO, AND SMALL CAFOS [hereinafter CAFO SIZE DEFINITIONS], https://www.epa.gov/sites/production/files/2015-08/documents/sector_table.pdf [https://perma.cc/95PB-YUY9] (last visited Mar. 21, 2022) (providing thresholds for large, medium, and small CAFOs).

[38] CAFOs can also be designated based on the number of veal calves, swine, horses, sheep or lambs, turkeys, chickens, and ducks. *Id.*

[39] *Id.*; GURIAN-SHERMAN, *supra* note 9, at 13.

[40] CAFO SIZE DEFINITIONS, *supra* note 37.

[41] *Id.*

[42] Walton & King Jaiven, *supra* note 7, at 10,486 n.9.

[43] *Meat Consumption*, OECD DATA, https://data.oecd.org/agroutput/meat-consumption.htm [https://perma.cc/RF5U-TBCD] (last visited Mar. 21, 2022) (showing that while per capita meat consumption in United States has risen since 1990, it has remained relatively flat for last ten years).

[44] *But see* GURIAN-SHERMAN, *supra* note 9, at 17-19 (explaining that, in fact, smaller operations may be more economically efficient than large CAFOs).

[45] *See id.* at 10. Indirect subsidies are those given to other industries with which CAFOs do business. The prime example is grain subsidies. Grain is priced lower because of the subsidy the grain industry receives and CAFOs reap the benefit in the form of lowered production cost. *See id.* at 10.

[46] *See* Natasha Geiling, *5 Big Meat Companies Produce a Combined 162 Million Tons of Manure Each Year*, THINKPROGRESS (June 30, 2016, 6:58 PM), https://archive.thinkprogress.org/5-big-meat-companies-produce-a-combined-162-million-tons-of-manure-each-year-c3acced8f51e/ [https://perma.cc/4JBV-Y4JE]; Sutton, *supra* note 30, at 612 (noting that concentration has only increased since 1919 when FTC found just five companies controlled majority of meat market).

farmers for huge animal-product processors,"[47] the result being that in the last decade, a small number of companies have consolidated production of most of the meat and dairy products sold in the United States.[48] These companies have powerful lobbying groups (commonly referred to as the *meat lobby*) and have been successful in shaping governmental policies that benefit themselves for decades.[49] The increase in concentration—both in the physical structure of the operations themselves and in the hands of several large companies—and the decrease in regulations and enforcement has contributed to growth in air and water pollution to the detriment of the environment, the consumer, and the surrounding communities.

While cow burps gain much attention as contributors to climate change due to the methane they expel,[50] CAFOs arguably have a more significant impact on water pollution.[51] This is due to the large amount of waste that "come[s] into contact with the water supply . . . . through a pipe that carries manure or wastewater to surface water, or by animal contact with surface water that runs through their confined area."[52] The waste that is discharged contains a number of pollutants that are extremely harmful to the waters and ultimately human health, including nitrogen and phosphorus, pathogens (such as E. coli), as well as numerous other chemicals.[53]

Correspondingly, the CWA is the main source of EPA regulation of CAFOs. CAFOs are subject to the EPA's National Pollution Discharge Elimination

[47] GURIAN-SHERMAN, *supra* note 9, at 10 (identifying animal farmers who become contract farmers for large animal-product processors as one way poultry industry has become concentrated in CAFOs in past fifty years).

[48] *See id.* at 15.

[49] *See* Zephyr Teachout & Lina Khan, *Market Structure and Political Law: A Taxonomy of Power*, 9 DUKE J. CONST. L. & PUB. POL'Y 37, 47 (2014); Steve Johnson, *The Politics of Meat*, PBS: FRONTLINE, https://www.pbs.org/wgbh/pages/frontline/shows/meat/politics/ [https://perma.cc/BD2Y-NHWY] (last visited Mar. 21, 2022) (explaining that most meat companies in United States are represented by one or more trade and lobbying organizations). A recent example of the power of the meat lobby is the 2020 Trump Executive Order that labeled meat plants as "critical infrastructure" and gave the federal government the power to decide when to reopen production facilities during the COVID-19 pandemic, instead of local authorities who were more likely to close plants to protect workers' health. *See* Michael Corkery, David Yaffe-Bellany & Ana Swanson, *Saving Their Bacon*, N.Y. TIMES, Apr. 30, 2020, at B1.

[50] As fun as it is to talk about cow farts, cows actually contribute much more methane from their burps. *See* Calvin Woodward & Seth Borenstein, *AP Fact Check: Unraveling the Mystery of Whether Cows Fart*, AP NEWS (Apr. 28, 2019), https://apnews.com/article/9791f1f85808409e93a1abc8b98531d5.

[51] *See* CARRIE HRIBAR, UNDERSTANDING CONCENTRATED ANIMAL FEEDING OPERATIONS AND THEIR IMPACT ON COMMUNITIES 1 (Mark Schultz ed., 2010), https://www.cdc.gov/nceh/ehs/docs/understanding_cafos_nalboh.pdf [https://perma.cc/MQY4-UHP2].

[52] *Id.*

[53] *See* EPA, RISK ASSESSMENT EVALUATION FOR CONCENTRATED ANIMAL FEEDING OPERATIONS 24 (2004).

System ("NPDES") as "point sources."[54] The hallmark of the CWA, NPDES is a permitting scheme set up in 1972 to reduce "pollution by regulating point sources that discharge pollutants to waters of the United States," by issuing permits to facilities to "discharge a specified amount of a pollutant into a receiving water under certain conditions."[55] AFOs that do not meet the size thresholds of CAFOs—as well as some medium CAFOs (those that do not meet certain water pollution requirements) and small CAFOs (those that are not designated as "significant contributor[s] of pollutants")—are exempt from NPDES permitting requirements.[56] Further, as discussed below, many facilities that would qualify as CAFOs simply haven't been designated as such, and so escape NPDES permitting.[57]

Animal agriculture is a large part of the United States' food supply chain, a system that, as a whole, is struggling to maintain sustainability and provide equitable nourishment across racial, class, and geographic lines.[58] The domestic food system faces problems related to public health,[59] food insecurity,[60]

[54] 33 U.S.C. § 1362(14) ("The term 'point source' means any discernible, confined and discrete conveyance, including . . . concentrated animal feeding operation[s] . . . from which pollutants are or may be discharged."); 40 C.F.R. § 122.2 (2021) ("National Pollutant Discharge Elimination System (NPDES) means the national program for issuing, modifying, revoking and reissuing, terminating, monitoring and enforcing permits, and imposing and enforcing pretreatment requirements, under sections 307, 402, 318, and 405 of CWA.").

[55] *National Pollutant Discharge Elimination System (NPDES): About NPDES*, EPA, https://www.epa.gov/npdes/about-npdes [https://perma.cc/J48L-GVZ3] (last visited Mar. 21, 2022).

[56] *See* CAFO SIZE DEFINITIONS, *supra* note 37 (categorizing medium AFOs as CAFOs if they have "a manmade ditch or pipe that carries manure or wastewater to surface water; or the animals come into contact with surface water that passes through the area where they're confined," and small AFOs as CAFOs if they are designated as significant contributors of pollutants); Walton & King Jaiven, *supra* note 7, at 10,493 (criticizing NPDES for holding CAFOs to too low standards and excepting many small and medium CAFOs).

[57] *See infra* notes 114-20 (discussing pollutive effects of small and medium AFOs that are exempt from NPDES and number of AFOs that avoid regulation).

[58] *See* EMILY M. BROAD LEIB & LAURIE BEYRANEVAND, THE URGENT CALL FOR A U.S. NATIONAL FOOD STRATEGY 7-8 (2020), https://foodstrategyblueprint.org/wp-content/uploads/2020/10/food-strategy-report-update-2020.pdf [https://perma.cc/3CKT-BH9W].

[59] *Id.* at 7 (pointing to rising rates of obesity, diabetes, and heart disease over past "few decades"); *see also* Press Release, Brigham & Women's Hosp., *supra* note 3 (announcing results of study finding "that suboptimal diet costs approximately $300 per person, or $50 billion nationally, accounting for 18 percent of all heart disease, stroke and type 2 diabetes costs in the country").

[60] BROAD LEIB & BEYRANEVAND, *supra* note 58, at 7 (highlighting rise in food insecurity during COVID-19 pandemic and pointing to data showing that food insecurity "disproportionately increased for Black and Latinx households" between 2019 and 2020); *see also* D'Odorico et al., *supra* note 2, at 180-81 (analyzing international food inequality and discussing human right to food).

disparate economic impacts,[61] harsh labor conditions for farm and food system workers,[62] and detrimental environmental practices. So as not to be novel-length, this Note focuses only on a portion of the problems destabilizing the food system: environmental harm stemming from animal agriculture (and potentially offshore aquaculture). But addressing the environmental impacts of animal agriculture and carrying those lessons forth to aquaculture have to be an integral part of stabilizing our food system as a whole.

B. *Aquaculture Under the CWA and Attempts to Regulate Offshore*

More commonly known as *fish farming*, aquaculture is "the culture, or husbandry, of marine or freshwater plants or animals."[63] The apparatuses for this include "fish hatcheries," "raceways, ponds, or recirculating systems," "floating or submersible net pens or cages," and "bag, rack, or suspended shellfish culture."[64] Because of aquaculture's obvious connection to the water, it is also regulated under the CWA.[65]

The corollary of the CAFO, a CAAP is defined under CWA as a "hatchery, fish farm, or other facility" that discharges a certain amount of pollutants "at least 30 days per year."[66] Similar to CAFOs, CAAPs are defined by the amount

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[61] Broad Leib and Beyranevand explain some of the disparities in the U.S. farming system:

> Fifty-one percent of all farm production value comes from large-scale farms making over $1 million annually . . . . By contrast, small-scale family farms account for only 26 percent of total farm production in the United States, despite representing 89 percent of all farms. . . . Regarding racial disparities, according to the 2017 USDA Census of Agriculture, white farmers received 98.9 percent of government farm payments. . . . These disparities are the products of an agricultural system that thrived on enslaving human beings and the government's history of engaging in discriminatory practices, developing policies that sanctioned involuntary land loss, inhibited the accumulation of wealth, and continues to exploit BIPOC and under-represented communities.

BROAD LEIB & BEYRANEVAND, *supra* note 58, at 8 (footnotes omitted).

[62] *Id.* (noting that farm and food system workers are unprotected by most labor laws, paid below minimum wage, and at significant risk for injury and disease); *see also* Lena Brook & Juanita Constible, *Treat Farmworkers as Essential, Not Sacrificial*, NRDC: BLOG (Sept. 14, 2020), https://www.nrdc.org/experts/lena-brook/treat-farmworkers-essential-not-sacrificial [https://perma.cc/E9D3-XGQT] (discussing dangerous farm worker conditions during 2020 California wildfires); *Agricultural Safety*, CDC, https://www.cdc.gov/niosh/topics/aginjury/default.html [https://perma.cc/TJA4-G5KG] (last updated Sept. 21, 2021) (acknowledging that "[a]griculture ranks among the most hazardous industries").

[63] *National Pollutant Discharge Elimination System (NPDES): NPDES Aquaculture Permitting*, EPA [hereinafter *NPDES Aquaculture Permitting*], https://www.epa.gov/npdes/npdes-aquaculture-permitting [https://perma.cc/LF9Y-3889] (last visited Mar. 21, 2022).

[64] *Id.* For some excellent visuals of these different apparatuses, see Joel K. Bourne, Jr. & Brian Skerry, *How to Farm a Better Fish*, NAT'L GEOGRAPHIC MAG., https://www.nationalgeographic.com/foodfeatures/aquaculture/ (last visited Mar. 21, 2022).

[65] *NPDES Aquaculture Permitting*, *supra* note 63.

[66] *Id.*

of fish produced.[67] Facilities that produce less than a certain amount of aquatic animals (by weight) do not meet the regulatory definition of a CAAP and thus are not subject to NPDES permitting requirements. However, as with a small CAFO, an aquaculture operation is subject to a case-by-case designation as a CAAP based on whether it is a "significant contributor of pollution to waters of the United States."[68]

1. United States' Desire to Extend Aquaculture Operations Offshore

Most current U.S. aquaculture facilities operate in inland areas (which typically grow freshwater fish) or in nearshore state waters.[69] But in order to meet domestic demand, the United States has turned its eye toward *offshore aquaculture*,[70] meaning operations that take place beyond state waters, in the exclusive economic zone ("EEZ"), which extends 200 nautical miles out from the shore.[71] Currently, there are no commercial aquaculture facilities operating in the EEZ.[72] The most likely areas for offshore expansion are those that currently have nearshore operations, such as Washington, Maine, Hawai'i, California, the Gulf of Mexico region, and Puerto Rico.[73]

Worldwide aquaculture production currently equals worldwide seafood production from capture fisheries and is increasing due to the unsustainability of capture fisheries and their inability to meet demand.[74] With most of U.S. capture fisheries currently operating at "maximum sustainable levels," only small aquaculture facilities available, and increasing domestic demand for seafood, the

[67] 40 C.F.R. pt. 122 app. C (2021).

[68] 40 C.F.R. § 122.24(c) (leaving permitting requirements up to discretion of EPA director, subject to four criteria).

[69] Johns, *supra* note 16, at 684 (noting that this is likely to change soon as demand for saltwater seafood goes up and nearshore area becomes overcrowded).

[70] *See* H.R. 6191, 116th Cong. (2020) (proposing legislative framework for offshore aquaculture); S. 4723, 116th Cong. (2020) (same); Exec. Order No. 13,921, 85 Fed. Reg. 28,471, 28,471 (May 12, 2020) (encouraging development of offshore aquaculture, in part by removing regulatory barriers to production); *see also* Johns, *supra* note 16, at 684 ("[A]s competition for space near the coast increases, the industry will inevitably move offshore.").

[71] The EEZ is the area in which the United States has "jurisdiction over natural resources." Beyond 200 nautical miles lie international waters. *What Is the EEZ?*, NAT'L OCEAN SERV., https://oceanservice.noaa.gov/facts/eez.html [https://perma.cc/95TS-5L8Y] (last updated Feb. 15, 2022).

[72] *See* UPTON, *supra* note 14, at 1 (noting that there are research-focused facilities and proposed facilities but no existing production facilities as of 2019).

[73] See *id.* at 7 (predicting that early offshore aquaculture will build off of established inshore and nearshore production, employing similar species and practices, and that aquaculturalists in Maine, Washington state, Hawai'i, and Puerto Rico are currently operating inshore and nearshore facilities); Press Release, NOAA Fisheries, NOAA Expands Opportunities for U.S. Aquaculture (Jan. 11, 2016), https://www.noaa.gov/media-release/noaa-expands-opportunities-for-us-aquaculture [https://perma.cc/G7NC-THTH].

[74] UPTON, *supra* note 14, at 2 (noting that aquaculture has grown steadily and represented 47% of global fish production as of 2019).

United States has to import 80-90% of its seafood supply, most of which is produced by aquaculture in places such as Southeast Asia, Chile, and Norway.[75]

Demand for seafood is expected to continue, and currently outpaces growth of meat consumption (with the exception of chicken) worldwide, partially because of the awareness of the health benefits of eating fish, including "beneficial effects . . . on mental health and prevention of cardiovascular diseases, stroke and age-related macular degeneration."[76] The total worldwide export value of all caught and farmed fish in 2018 was $164 billion.[77] In the same year, the United States accounted for 4% of exports and 14% of imports.[78] It is no wonder then, why proponents of U.S. offshore aquaculture see development as a profitable opportunity to meet domestic demand. There is also the potential for U.S. job creation and "economic opportunities for coastal communities."[79] It seems there is a lucrative frontier just beyond state waters waiting to be tapped to lower the seafood trade deficit, enrich communities, and satisfy appetites. So why hasn't it happened?

2. Past Attempts to Regulate Offshore Aquaculture

"Currently, no single federal agency is authorized to approve or permit offshore aquaculture facilities in federal waters . . . ."[80] In order to conduct an offshore aquaculture operation, a facility must gather permits from a host of agencies and comply with a multitude of statutes, including the Rivers and Harbors Act, CWA, Magnuson-Stevens Fishery Conservation and Management Act ("MSA"),[81] Coastal Zone Management Act, National Environmental Policy Act, Endangered Species and Marine Mammal Protection Act, National Marine Sanctuary Act, and National Historic Preservation Act, not to mention coordination with the USDA and FDA.[82] Understandably, some operations have

[75] *Id.* at 3 (noting that half of those imports come from foreign inshore or nearshore aquaculture). The United States has not been able to meet demand with its own nearshore operations. *Id.* The lack of international offshore operations to study furthers the need for extensive research, discussed *infra*, note 105 and accompanying text.

[76] FAO, STATE OF THE WORLD FISHERIES, *supra* note 12, at 65, 68.

[77] *Id.* at 73.

[78] *Id.* at 76 (presenting infographic of primary exporters and importers of fish products by value).

[79] UPTON, *supra* note 14, at 6-7.

[80] *Id.* at 12.

[81] *But see infra* note 93 (noting that NMFS unsuccessfully argued that aquaculture fell under definition of "fishing" under MSA in *Gulf Fishermens Ass'n v. National Marine Fisheries Service*, 968 F.3d 454, 456 (5th Cir. 2020)).

[82] *See* UPTON, *supra* note 14, at 13-19 (surveying regulatory and permitting landscape governing aquaculture).

found it too difficult to navigate the permitting requirements without more guidance from a central governing body and have moved operations overseas.[83]

In 1980, Congress passed the National Aquaculture Act ("NAA") in an effort to avoid depletion of U.S. capture fisheries by creating a national plan to develop aquaculture.[84] It made the USDA the central responsible agency but focused more on research than on regulation and enforcement and did not make entry into the market easier for potential operations.[85]

Offshore aquaculture bills attempting to clarify a regulatory scheme are no stranger to Congress. Bills have been introduced in seven out of the last nine Congresses, including the 116th.[86] Most of the bills have focused on creating a comprehensive regulatory framework. Some have focused more on environmental protections than others, and some have even aimed to constrain the permitting of offshore aquaculture.[87] While representatives continue to introduce legislation, no bill has yet satisfied all stakeholders.[88] Bills face opposition from the fishing industry over concerns that aquaculture will take away from their business,[89] and some environmental organizations are concerned that legislation will not go far enough to protect the marine ecosystem.[90]

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[83] *See* Johns, *supra* note 16, at 690-94 (citing lack of clear regulatory framework as greatest barrier to offshore aquaculture and presenting case study of offshore operation in Hawai'i that struggled due to lack of comprehensive regulations); *see also infra* Section II.C.

[84] UPTON, *supra* note 14, at 8 (discussing origins of federal involvement in aquaculture and NAA).

[85] Wheeler, *supra* note 25, at 305-06 ("Although the NAA aimed to create a comprehensive aquaculture strategy, it did little in the way of regulation or enforcement and instead acted merely as an impetus for further study of industry growth potential.").

[86] UPTON, *supra* note 14, at 43-45 (summarizing recent congressional actions regarding aquaculture).

[87] *Id.* An example is the Keep Finfish Free Act of 2019, which "would prohibit the issuance of permits to conduct finfish aquaculture in the EEZ until a law is enacted that allows such action." *Id.* at 43.

[88] *See id.* at 43 (noting difficulty finding "common vision").

[89] Matthew Wein, *Senate Re-introduction of AQUAA Act Could Be a Cause for Concern*, FOOD TANK (Jan. 2021), https://foodtank.com/news/2021/01/senate-re-introduction-of-aquaa-act-could-be-a-cause-for-concern/ [https://perma.cc/XGA9-4HGS] ("Fearful that it will destroy local fishing industries, Maine and Alaska are blocking attempts to establish new aquaculture operations . . . ."); Letter from Owners/Operators of Am. Com. Fishing Vessels & Reps. of Am. Fishing Orgs. & Cmtys. to U.S. Cong. (Dec. 4, 2018) [hereinafter Letter to U.S. Congress], https://1bps6437gg8c169i0y1drtgz-wpengine.netdna-ssl.com/wp-content/uploads/2018/12/2018-12-3-Aqua-fishing-industry-letter_final_signed-by-139.pdf [https://perma.cc/9CXG-5J6E] (arguing against expansion of aquaculture on behalf of members of fishing industry).

[90] *See* Erik Stokstad, *White House Effort to Boost Marine Aquaculture Raises Environmental Concerns*, SCIENCE (May 11, 2020), https://www.sciencemag.org/news/2020/05/white-house-effort-boost-marine-aquaculture-raises-environmental-concerns [https://perma.cc/DNN8-3GPY]. Environmental organizations have not unanimously opposed legislation and some have supported bills such as AQUAA. *See infra* note 225.

In the meantime, NMFS, a division of NOAA, took the lead on regulation and enforcement of aquaculture, asserting it had the authority to do so under the MSA.[91] Recently, however, the Fifth Circuit ruled in *Gulf Fishermens Ass'n v. National Marine Fisheries Service*[92] that NMFS does not have this authority as the definition of "fishing" in the MSA does not include aquaculture.[93] This case piles onto many years of ambiguity over which agency has the authority to regulate offshore aquaculture, confirming the need for legislation to clarify a regulatory structure before the United States can successfully develop the industry.

Before the Fifth Circuit opinion, impatient to see market growth, President Trump issued an executive order aimed in part at removing regulatory burdens for offshore aquaculture operations.[94] It placed a time limit of two years on the completion of Environmental Impact Statements and directed agencies to begin formulating a permit program for offshore aquaculture.[95] The order designated NOAA as the lead agency but (perhaps presciently) did not cite any statutory authority for doing so.[96] After *Gulf Fishermens*, that authority does not come from the MSA and an executive order does not have the power to bestow regulatory authority not granted by Congress. This likely leaves the aquaculture portion of the order defunct.

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[91] UPTON, *supra* note 14, at 14 (noting NMFS was "the only federal agency that claim[ed] explicit management authority over offshore aquaculture" prior to *Gulf Fishermens*).

[92] 968 F.3d 454 (5th Cir. 2020).

[93] *Id.* at 456. The definition of "fishing" in the MSA is "the catching, taking, or *harvesting* of fish." *Id.* (quoting 16 U.S.C. § 1802(16)). NMFS unsuccessfully made the argument that aquaculture was the "harvesting" of fish. *Id.* ("'Harvesting,' we are told, implies gathering crops, and in aquaculture the fish are the crop. That is a slippery basis for empowering an agency to create an entire industry the statute does not even mention. We will not bite.").

[94] Exec. Order No. 13,921, 85 Fed. Reg. 28,471, 28,471 (May 12, 2020) ("More effective permitting related to offshore aquaculture and additional streamlining of fishery regulations have the potential to revolutionize American seafood production, enhance rural prosperity, and improve the quality of American lives."); *see also* Leah Douglas, *Trump's Executive Order Seeks Controversial Overhaul of Seafood Industry*, FOOD & ENV'T REPORTING NETWORK (May 8, 2020), https://thefern.org/2020/05/trumps-executive-order-seeks-controversial-overhaul-of-seafood-industry/ [https://perma.cc/U64J-TGK3] ("[T]he administration laid out a pathway for the approval of ocean aquaculture in federal waters, a controversial departure from existing policy that could reshape the country's seafood production.").

[95] *See* Exec. Order No. 13,921, 85 Fed. Reg. 28,471, 28,473-74.

[96] *See id.* at 28,473 ("NOAA is designated as the lead agency for aquaculture projects located outside of the waters of any State or Territory and within the exclusive economic zone of the United States . . . ."). In another section of the order on "Removing Barriers to American Fishing," the order cited the MSA as the authority for designating NOAA as the lead agency. *See id.* at 28,472 ("Consistent with . . . the Magnuson-Stevens Fishery Conservation and Management Act . . . the Secretary of Commerce shall provide administrative and technical support to the Regional Fishery Management Councils to carry out this subsection."). The section on aquaculture contains no such authority. *See id.* at 28,473.

The most recent attempt to implement a regulatory structure (post-*Gulf Fishermens* and Trump's executive order) came in the 116th Congress, which saw bills introduced in the House and Senate, both titled "Advancing the Quality and Understanding of American Aquaculture Act" ("AQUAA").[97] Similar to Trump's executive order, these bills also give central authority to NOAA.[98] While AQUAA purported to "establish a regulatory system for *sustainable* offshore aquaculture," it did not set forth any particular environmental initiatives specific to aquaculture, only providing that operations would have to meet the requirements of existing environmental statutes.[99] The 116th Congress ended without either bill passing.[100] It remains to be seen whether President Biden will favor the expansion of offshore aquaculture and whether he will pursue legislative action or maintain Trump's executive order.[101]

The course President Biden decides to take regarding offshore aquaculture will have ramifications for many stakeholders, including the aquaculture and fishing industries, coastal communities, and environmental groups. But the environment itself is perhaps the most vulnerable stakeholder as the United States looks toward this new venture. When advocates for offshore expansion consider legislation to provide for a regulatory structure and permitting scheme, they must consider the lessons to be learned from animal agriculture and apply solutions to ensure similar issues in the aquaculture industry are not ignored and exacerbated by bad policy. The next Part looks at the faults of animal agriculture and vulnerabilities of aquaculture and pulls out the lessons to carry forth to the new industry.

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[97] H.R. 6191, 116th Cong. pmbl. (2020) ("To establish a regulatory system for sustainable offshore aquaculture in the United States exclusive economic zone, and for other purposes."); S. 4723, 116th Cong. § 2 (2020) ("The purposes of this Act are—(1) to support the development of a sustainable marine aquaculture industry in the United States . . . [and] (3) to clarify the Federal regulatory regime for sustainable offshore aquaculture. . . .").

[98] H.R. 6191 (creating Office of Offshore Aquaculture within NOAA); S. 4723 (same).

[99] S. 4723 (emphasis added) (directing NOAA to establish advisory guidelines based on existing national standards).

[100] Michael Lomtevas, *Charting a Course Toward Offshore Aquaculture*, REGUL. REV. (Sept. 23, 2021), https://www.theregreview.org/2021/09/23/lomtevas-charting-course-toward-offshore-aquaculture/ [https://perma.cc/56HU-Y348] (discussing CRS report and failed attempts to regulate aquaculture, including introduction and failure to vote on AQUAA bills).

[101] As of March 21, 2022, the executive order had not been reversed. *See also* Rachel Sapin, *PETA, Seaspiracy Producer Team up to Take Down US Order Promoting Offshore Aquaculture*, INTRAFISH (May 4, 2021, 8:49 PM), https://www.intrafish.com/aquaculture/peta-seaspiracy-producer-team-up-to-take-down-us-order-promoting-offshore-aquaculture/2-1-1004870 (discussing how President Biden's position on offshore aquaculture is unclear).

II. WEAKNESSES OF ANIMAL AGRICULTURE AND POTENTIAL VULNERABILITIES OF AQUACULTURE

A. *Environmental Harms of Factory Farming*

Factory farming contributes to a myriad of problems, including human health issues associated with eating meat, such as obesity, cardiovascular disease, and exposure to pathogens and antibiotic resistance; animal welfare issues, including physical and psychological distress; worker safety issues which have been exacerbated by COVID-19; environmental issues, including the industry's contribution to climate change; and environmental justice issues around the disproportional effects of air and water pollution from CAFOs on the rural communities in which they operate.[102] A burgeoning offshore aquaculture industry will need to address all of these issues. This Note focuses on environmental issues around water pollution, antibiotic use, the externalization of costs, federal subsidization, and the lobbying power of large companies. The environmental failures of factory farming, and CAFOs in particular, teach potential lessons that the offshore aquaculture industry must heed.

1. Water Pollution from CAFOs

Manure is likely the biggest contributor of water pollution from CAFOs, with storage and disposal "threaten[ing] water quality in the event of spills, leakage from waste storage facilities, and runoff from fields."[103] CAFOs produce an estimated one million tons of manure every day, and a large CAFO can produce more waste than a large U.S. city.[104] However, while cities have treatment plants for human waste, CAFOs have no such facilities for manure.[105] Manure can be used as fertilizer for crops and spread on fields, but feed for livestock in CAFOs is usually not grown nearby, so manure more often sits in lagoons, where it is vulnerable to spilling and leaking.[106]

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[102] *See* Walton & King Jaiven, *supra* note 7, at 10,486-87 (discussing impacts of CAFOs on environment, animal welfare, and human health); Eric Schlosser, *America's Slaughterhouses Aren't Just Killing Animals*, ATLANTIC (May 12, 2020), https://www.theatlantic.com/ideas/archive/2020/05/essentials-meatpeacking-coronavirus/611437/ (discussing COVID-19 risks to meatpacking workers). *See generally* HRIBAR, s*upra* note 51 (discussing harms to communities surrounding CAFOs).

[103] Walton & King Jaiven, *supra* note 7, at 10,486.

[104] *Id.* ("[C]onfined U.S. farm animals produce almost one million tons of manure daily, which is three times the amount generated by humans in the country."); *see* HRIBAR, s*upra* note 51, at 2 ("Large farms can produce more waste than some U.S. cities—a feeding operation with 800,000 pigs could produce over 1.6 million tons of waste a year. That amount is one and a half times more than the annual sanitary waste produced by the city of Philadelphia, Pennsylvania (GAO, 2008).").

[105] HRIBAR, s*upra* note 51, at 2.

[106] *Id.* at 2-3 (discussing struggle to store and dispose of excess manure that cannot be used as fertilizer, in part due to increased clustering and growth of CAFOs).

Manure spills and runoff from fields are problematic because of the nutrients manure contains. "[T]he two main contributors to water pollution from CAFOs are soluble nitrogen compounds (such as nitrate and ammonia) and phosphorus."[107] These nutrients can contaminate ground and surface water in the areas surrounding CAFOs.[108] When groundwater is contaminated with nitrates it can infect drinking water supplies and lead to nitrate poisoning, which is especially dangerous for infants.[109] It can also become contaminated with viral and antibiotic resistant pathogens, posing the risk of human disease.[110] More prevalent is contamination of surface water, caused by manure runoff from fields, overflow from "waste lagoons" due to storms, or contaminated groundwater that travels to the surface.[111] In lakes and rivers, nitrate and phosphorus from manure combine, causing eutrophication (excessive growth of plants and algae).[112] These algal blooms release large amounts of carbon dioxide into the water, reducing oxygen content and causing hypoxic dead zones, killing aquatic life and damaging the ecosystem.[113]

The CWA regulates these discharges through the NPDES permitting scheme, which includes CAFOs in the definition of "point source."[114] AFOs that are not large enough to be deemed CAFOs are not regulated as point sources and are exempt from NPDES permitting requirements, as are small CAFOs and some

[107] GURIAN-SHERMAN, *supra* note 9, at 52.

[108] *Id.* at 42, 51-52.

[109] HRIBAR, s*upra* note 51, at 4 (describing effects of elevated nitrates in drinking water, including blue baby syndrome, death in infants, miscarriages, and poor general health in adults).

[110] *Id.* at 4, 10 (describing how antibiotics in animal feed can encourage antibiotic resistant bacteria and how pathogens introduced from manure thrive in groundwater because of lower temperatures and protection from sun).

[111] *Id.* at 4 ("Surface discharges can be caused by heavy storms or floods that cause storage lagoons to overfill, running off into nearby bodies of water."); *see also* Charles Bethea, *Could Smithfield Foods Have Prevented the "Rivers of Hog Waste" in North Carolina After Florence?*, NEW YORKER (Sept. 30, 2018), https://www.newyorker.com/news/news-desk/could-smithfield-foods-have-prevented-the-rivers-of-hog-waste-in-north-carolina-after-florence (discussing discharge of seven million gallons of hog waste due to flooding in Hurricane Florence). Accountability for pollution due to flooding of lagoons is largely absent, as is preparation for future storms. *Id.* (discussing failure to eliminate sewage lagoons after lagoons contaminated groundwater during 1999 hurricane and politicians called for meat companies to fill in lagoons).

[112] HRIBAR, s*upra* note 51, at 4 (discussing eutrophication and algal blooms due to elevated nitrate levels from manure).

[113] *See* GURIAN-SHERMAN, *supra* note 9, at 52; *What Is Eutrophication?*, NAT'L OCEAN SERV., https://oceanservice.noaa.gov/facts/eutrophication.html [https://perma.cc/3K7Y-7XLE] (last updated Feb. 26, 2021) (discussing challenge of eutrophication in general and attempts to reduce nutrient surpluses).

[114] 40 C.F.R. § 122.2 (2021) ("Point source means any discernable, confined, and discrete conveyance, including but not limited to, any . . . concentrated animal feeding operation . . . from which pollutants are or may be discharged.").

medium CAFOs.[115] However, even small CAFOs are potentially huge contributors of water pollution.[116] These polluters are able to discharge manure without seeking permits. CAFOs are also exempt from NPDES requirements for agricultural stormwater discharges.[117]

Furthermore, many factory farms that likely should fall under NPDES permitting requirements are simply not classified as CAFOs or have neglected to seek permits. An EPA report found that, in 2019, out of 20,883 CAFO operations, only 6,711 had NPDES permits.[118] Some states have not confirmed the number of animals in their feeding operations and so have escaped permitting thus far.[119] Some "avoid the permitting process in the absence of a determination that they actually 'discharge' manure pollution."[120] The loopholes in the rules themselves, as well as a lack of enforcement, have resulted in an industry that largely lacks regulation of water pollution.

2. Antibiotic Use in CAFOs

Due to the density of CAFOs and the high-stress environment for the animals, factory farming uses a huge amount of antibiotics to keep the animals healthy and for "growth promotion" purposes.[121] Overuse of antibiotics contributes to two separate but overlapping problems: (1) when humans consume meat, they can consume the antibiotics as well, which, over time, reduces the effectiveness of antibiotics in humans;[122] and (2) overuse of antibiotics increases antibiotic resistant bacteria in animals, fostering entire strains of diseases that are antibiotic resistant, such as salmonella and E. coli, which can be transferred to humans.[123]

[115] *See supra* note 56 and accompanying text. Small CAFOs are not actually CAFOs "by regulatory definition, but may be designated as a CAFO on a case-by-case basis." CAFO SIZE DEFINITIONS, *supra* note 37, at n.2.

[116] Walton & King Jaiven, *supra* note 7, at 10,493 (noting that CAFOs are leading cause of pollution to water bodies).

[117] 40 C.F.R. § 122.23(e) (exempting discharge of manure, litter, or process wastewater when it is agricultural stormwater discharge).

[118] EPA, NPDES CAFO PERMITTING STATUS REPORT (2020), https://www.epa.gov/sites/production/files/2020-08/documents/cafo_status_report_2019.pdf [https://perma.cc/FL6Z-FK7H] (listing number of CAFO operations permitted in each state).

[119] *Id.*

[120] GURIAN-SHERMAN, *supra* note 9, at 53.

[121] *See id.* at 62 (citing estimates that antibiotic use in animal agriculture uses surpasses human use by eight times); Sidney A. Shapiro, *Overuse of Antibiotics in Concentrated Animal Feeding Operations: Regulation and Tort Law*, 47 LEWIS & CLARK ENV'T L.J. 557, 559 (2017) (stating that CAFOs use large amounts of antibiotics because they "are subject to disease outbreaks because of the unsanitary concentrated conditions in which the animals are raised").

[122] Walton & King Jaiven, *supra* note 7, at 10,488.

[123] GURIAN-SHERMAN, *supra* note 9, at 62; Shapiro, *supra* note 121, at 559 ("The prophylactic administration of low doses of antibiotics fosters the development of drug-resistant bacteria in animals."). Antibiotic resistant bacteria can be transferred to humans via worker contact with animals and human contact with contaminated food. *Id.* at 560.

When humans consume meat, they risk not only increasing their own antibiotic resistance but also consuming food-borne pathogens that are already resistant to antibiotics, making these diseases harder to treat, causing more deaths, and increasing health care costs.[124]

Antibiotic resistant bacteria are also found in ground and surface water polluted by manure, giving this problem an environmental nexus as well.[125] As with nitrates, antibiotic resistant pathogens can make their way into the drinking water supply where they can infect nearby communities.[126] This is yet another example of how rural communities near CAFOs are disproportionately harmed by their operations.

In the modern age, however, antibiotic resistant pathogens are a global problem. Meat and vegetables tainted with antibiotic resistant pathogens are sent all over the country (and the world), causing outbreaks everywhere they are sold, and making it harder to trace the source.[127] One of the most famous outbreaks came from hamburgers sold at Jack in the Box fast food restaurants in the early 1990s. Seven hundred people were sickened with E. coli and ultimately, four people died.[128] This and other outbreaks led to the passage of the Food Safety Modernization Act ("FSMA") in 2011, which instructed the FDA to pass several rules regarding safety practices and traceability schemes.[129]

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[124] *See* GURIAN-SHERMAN, *supra* note 9, at 62-63.

[125] *See id.* at 60 (describing studies which discovered antibiotic resistant bacteria in nearby groundwater).

[126] *Id.* ("Water sources near CAFOs may also act as vectors of infection for the nearby population.").

[127] *See, e.g.*, Coral Beach, *CDC Says E. coli Outbreak from Mystery Source Has Ended with Patients in 9 States*, FOOD SAFETY NEWS (Dec. 18, 2020), https://www.foodsafetynews.com/2020/12/cdc-says-e-coli-outbreak-from-mystery-source-has-ended-with-patients-in-9-states/ [https://perma.cc/US6U-Z48X] (discussing widespread outbreak with no identified source); *see also* Rachel Treisman, *Fresh Express and Dole Recall Hundreds of Salad Products over Listeria Concerns*, NPR (Dec. 23, 2021, 2:08 PM), https://www.npr.org/2021/12/23/1067345551/fresh-express-dole-recall-salad-products-listeria-concerns [https://perma.cc/56JH-68UK] (announcing recall of packaged salad over listeria concerns, tracing products "across dozens of states and two Canadian provinces," and matching particular bacterial strain to one that caused outbreaks resulting in illnesses, hospitalizations, and at least one death since 2014).

[128] *Jack in the Box E. coli Outbreak—25th Anniversary*, FOOD SAFETY NEWS (Dec. 27, 2017), https://www.foodsafetynews.com/2017/12/jack-in-the-box-e-coli-outbreak-25th-anniversary/ [https://perma.cc/UE94-SNBR] (describing outbreak twenty-five years after it occurred). *See generally* JEFF BENEDICT, POISONED (2011) (chronicling 1990 Jack in the Box E. coli outbreak and ensuing litigation).

[129] FDA Food Safety Modernization Act of 2011, Pub. L. No. 111-353, 124 Stat. 3885 (codified at 21 U.S.C. § 301) (implementing several mechanisms to prevent large-scale outbreaks of foodborne illness); *Food Safety Modernization Act (FSMA)*, FDA, https://www.fda.gov/food/guidance-regulation-food-and-dietary-supplements/food-safety-modernization-act-fsma [https://perma.cc/2C3E-7H9L] (last updated Dec. 2, 2021) (describing different components of FSMA).

The problem of antibiotic resistant pathogens making their way into the water supply and foods that people eat is far from being reigned in. Today, many E. coli outbreaks occur due to contaminated lettuce, often cultivated near CAFOs.[130] Manure from CAFOs runs off into the lettuce fields or sometimes lettuce is irrigated with contaminated water.[131] In fact, illnesses due to contaminated lettuce have not slowed down since the passage of FSMA.[132] CAFOs have a direct link to antibiotic resistant pathogens causing illness and deaths. This is a huge public health concern, yet to be rectified with real regulatory action.

3. Externalization of Costs

Water pollution and the proliferation of antibiotic resistant pathogens are two problems that impose large costs, not on the operations that cause them, but on property values, ecosystems, aquatic life, consumers, and the health care system.[133] Because the pollution effects of factory farming go largely unregulated, the industry does not have to internalize the costs of complying with regulations. The cost of production does not include the cost of the havoc the industry wreaks. Those costs are borne by everyone else.[134] Being able to externalize the environmental, as well as health costs of animal agriculture, means that the price on a package at the supermarket does not reflect the true price of meat, eggs, or dairy.[135]

As far as water pollution, one USDA report conservatively estimated that compliance with CWA provisions would cost CAFOs $534 million annually (not even accounting for the cost of compliance with Clean Air Act provisions that would increase the cost to $1.16 billion).[136] Compliance with NPDES permitting is only one cost of reducing water pollution that is commonly ignored. Disaster management and preparation is another. During Hurricane

[130] Shapiro, *supra* note 121, at 560 (noting that drug resistant bacteria can be "transferred to vegetables by the direct application of manure as fertilizer on vegetable crops or from runoff water that has been contaminated by animal waste that is subsequently used to water vegetable crops"); *see, e.g.*, Bill Marler, Marler Clark, *Is Another Yuma Romaine Lettuce E. coli 0157:H7 Inevitable?*, FOOD POISON J. (Sept. 14, 2019), https://www.foodpoisonjournal.com/foodborne-illness-outbreaks/is-another-romaine-lettuce-e-coli-o157h7-inevitable/ [https://perma.cc/87WF-B4BB] (recounting frequency of foodborne illness outbreaks from lettuce).

[131] Shapiro, *supra* note 121, at 560.

[132] *See* Marler, *supra* note 130.

[133] *See* GURIAN-SHERMAN, *supra* note 9, at 41-42, 51-52, 54-65.

[134] *See id.* at 41 ("Whether quantified or not, externalized costs are borne by society rather than the industry that caused the damage. If the costs to prevent (or remediate) the damage were instead borne by the industry, its cost of production would increase and could be reflected in the marketplace by higher prices.").

[135] People who live near CAFOs bear the brunt of the immediate costs of environmental pollution, in the form of "reduction in quality of life" and "depressed residential property values." *Id.*

[136] *See id.* at 59.

Florence in 2018, seven million gallons of hog waste overflowed from lagoons at Smithfield Foods, the largest pork producer in the country, contaminating surrounding waters, damaging property, and jeopardizing the health of those who lived in the area.[137] While Smithfield could have implemented measures to prevent the pollution, they opted not to, explaining that the measures were not "cost-effective."[138] Instead, the cost of cleanup was borne by the community.[139]

The cost of overuse of antibiotics and the contribution to pathogens and damage to human health is difficult to quantify, but one study "estimated the total annual cost of antibiotic resistance approaches $30 billion."[140] CAFOs could eliminate "non-therapeutic" (growth-promotion) use of antibiotics to the tune of about $1.5 to $3 billion per year, costs which would be passed onto the consumer.[141]

4. Federal Subsidization of CAFOs

To make matters even more unbalanced, factory farming is heavily subsidized by the federal government, both directly and indirectly, with indirect subsidies alone averaging $3.86 billion annually.[142] The most substantial indirect subsidy is in the form of crop subsidies "passed on to the CAFO industry in the form of artificially low feed grain prices."[143] Animals in CAFOs are usually fed a diet of corn or soy, rather than their more natural food source (grass), because these sources are cheaper.[144] Animal feed makes up about 50% of production costs for CAFOs.[145] Corn and soy crops have been subsidized by the federal government

[137] *See* Bethea, s*upra* note 111.

[138] *Id.* (discussing how Smithfield declined to implement Terra Blue waste management system, citing "economic feasibility" concerns, despite finding it "workable").

[139] *Id.* (stating that "[a] patchwork of entities—including FEMA, the state's taxpayer-funded Division of Soil and Water Conservation and Department of Environmental Quality, and local church and school groups—[would] contribute to recovery efforts"). The community near Smithfield Foods has brought lawsuits in the past over Smithfield's waste management system. However, the state legislature passed a law capping the amount of damages that can be awarded, stating that their "goal is to ensure that all farming operations are protected from frivolous lawsuits." Melba Newsome, *Turning Hog Waste into Biogas: Green Solution or Greenwashing?*, YALE ENV'T 360 (Sept. 9, 2021), https://e360.yale.edu/features/turning-hog-waste-into-biogas-green-solution-or-greenwashing [https://perma.cc/79FK-FGDN].

[140] GURIAN-SHERMAN, *supra* note 9, at 64 (describing costs associated with medical care and lost workdays).

[141] *Id.*

[142] *Id.* at 29-40, 33.

[143] *Id.* at 29.

[144] Walton & King Jaiven, *supra* note 7, at 10,488 ("Because animal feed accounts for over one-half of a CAFO's operating costs, using corn allows CAFOs to save significantly on production costs.").

[145] *Id.*

for the better part of the last century.[146] For a long time, the cost of production of these commodity crops has been higher than the market price, so without subsidies, farmers would have gone out of business.[147]

Subsidies for corn and soy keep the commodity crop market afloat but also ensure the continued existence of CAFOs. Producers of corn and soy are incentivized to keep producing these crops in order to feed the animal agriculture industry, even though they are only artificially profitable. In fact, they are not allowed to produce more than a low percentage of other crops and still keep their subsidy.[148] Perhaps without the subsidies, they would be incentivized to produce other, profitable crops. As things stand, crop subsidies prop up two industries that may otherwise decline and are harmful to human health and the environment: commodity crops and animal agriculture.

CAFOs also receive direct subsidies from the federal government. The largest program providing direct subsidies is, ironically, the Environmental Quality Incentives Program ("EQIP"),[149] which provided $1.87 billion in assistance in 2018.[150] Born out of the 1996 amendments to the 1985 farm bill,[151] EQIP was meant to partially subsidize projects that would reduce environmental harms caused by crop and livestock farmers.[152] Originally, CAFOs were not included, but since 2002 they are also able to apply for the subsidy.[153] In fact, the program

[146] GURIAN-SHERMAN, *supra* note 9, at 29 (noting that for past eighty years, U.S. farm policy has favored subsidies for corn and soy).

[147] *Id.* at 31 ("Without these subsidies, commodity crop farmers would not be able to stay in business indefinitely . . . .").

[148] Brian Barth, *Congress Finally Passed a New Farm Bill and It Continues to Pay Homage to the Cult of Corn and Soy*, MODERN FARMER (Jan. 7, 2019), https://modernfarmer.com/2019/01/congress-finally-passed-a-new-farm-bill-and-it-continues-to-pay-homage-to-the-cult-of-corn-and-soy/ [https://perma.cc/2FUX-WRX7].

[149] *See* GURIAN-SHERMAN, *supra* note 9, at 37 (describing subsidy program, which was intended to help small- and mid-sized farms address pollution).

[150] *Environmental Quality Incentives Program*, NAT'L SUSTAINABLE AGRIC. COAL., https://sustainableagriculture.net/publications/grassrootsguide/conservation-environment/environmental-quality-incentives-program/ [https://perma.cc/KKS9-23NC] (last updated May 2019) ("In fiscal year (FY) 2018 alone, over $1.87 billion in financial and technical assistance was obligated to support over 42,800 EQIP contracts covering more than 13.6 million acres.").

[151] *See* Federal Agriculture Improvement and Reform Act of 1996, Pub. L. No. 104-127, sec. 334, § 1240E, 110 Stat. 888, 996, 1001 (amending Food Security Act of 1985, No. 99-198, 99 Stat. 1354) (codified as amended at 16 U.S.C. § 3839aa). Congress passes a new farm bill approximately every five years, covering all manner of issues that affect farmers and agriculture in the United States. The practice began in the 1930s as part of the New Deal. The current farm bill is called the Agriculture Improvement Act of 2018 and expires in 2023. Agriculture Improvement Act of 2018, Pub. L. No. 115-334, 132 Stat. 4490 (codified in scattered sections of 7 U.S.C.); *see also What Is the Farm Bill?*, NAT'L SUSTAINABLE AGRIC. COAL., https://sustainableagriculture.net/our-work/campaigns/fbcampaign/what-is-the-farm-bill/ [https://perma.cc/U4WD-ZTFP] (last visited Mar. 21, 2022).

[152] GURIAN-SHERMAN, *supra* note 9, at 37.

[153] *Id.*

"favor[s] projects capable of achieving the greatest reduction in environmental degradation."[154] As the greatest polluters, CAFOs necessarily hold the greatest potential for reduction.

Studies show mixed results on the effectiveness of EQIP subsidies and data does not focus on pollution from CAFOs specifically.[155] More research would be required to assess the effectiveness of the program with regard to CAFOs. But one thing is certain: with a finite amount of money allotted for the program in each farm bill, giving greater subsidies to CAFOs necessarily keeps the money from going to smaller operations that pollute less, forcing them to look elsewhere for funding if they want to make their operations more sustainable and leading to further entrenchment of large companies harming their competition.[156]

5. Influence of Large Companies

Many of the CAFOs that receive subsidies are owned by only a few large companies.[157] These large companies have powerful lobbying capabilities, which further serve to solidify their profitability while passing costs off onto the environment and consumers. The meat industry is a (perhaps *the*) prime example of an industry driving the policy that governs it. Teachout and Khan posit that both size and concentration give an industry power to influence regulations through several avenues, including (1) campaign funding, (2) a "revolving door" for employees of corporations and government agencies, (3) the creation of favorable research, (4) complete control over suppliers and independent contractors that might otherwise oppose particular policies, and (5) simply being "too big to fail" because the economy as a whole would lose stability if the industry faced a setback.[158] The size and concentration of the animal agriculture industry has given it formidable power in Washington.

Several large meat organizations, such as the American Meat Institute, have lobbied members of Congress for decades to stop them from passing food safety legislation (including the legislation that followed the Jack in the Box E. coli outbreak), to prevent them from enforcing antitrust laws, and, most recently, to

[154] *Id.*

[155] *See* Pengfei Liu, Yu Wang & Wei Zhang, *The Influence of Environmental Quality Incentives Program (EQIP) on Local Water Quality* (2018) (conference paper) (on file with author) (finding slightly lower levels of nitrogen and phosphorus in downstream water bodies correlated with EQIP subsidies); Steven Wallander & Michael Hand, *Measuring the Impact of the Environmental Quality Incentives Program (EQIP) on Irrigation Efficiency and Water Conservation* (2011) (conference paper) (on file with author) (finding irrigation rates declined but overall water use increased with EQIP subsidies).

[156] *See* GURIAN-SHERMAN, *supra* note 9, at 37-38. Smaller operations are also potentially less able to implement pollution reduction measures without the subsidies. One study suggested that those applying for EQIP may be those who would implement measures anyway. *See* Wallander & Hand, *supra* note 155, at 2.

[157] *See* Pollard, s*upra* note 8 (discussing "Big Four" meatpacking corporations).

[158] *See* Teachout & Khan, *supra* note 49, at 42-53.

allow slaughterhouses to keep sending people to work during the COVID-19 pandemic.[159] The meat lobby has also successfully stopped regulations that would have protected independent farmers from abusive pricing by funding research that inflated the cost to the industry, and threatening independent farmers if they chose to speak up at the hearing.[160] This is an industry that is "used to getting what it wants" and what it wants is for lax enforcement of environmental and food safety regulations to continue.[161] The environmental abuses of factory farming, the externalization of costs, the subsidies that make the industry profitable, and the immense power of companies who operate CAFOs should serve as giant warning signals to offshore aquaculture, an industry that is vulnerable to many of the same problems.

B. *Environmental Vulnerabilities of Aquaculture*

Factory farming cannot continue on its current course for the sake of the planet, surrounding communities, and human health. Offshore aquaculture may be a viable alternative. Demand for seafood is rising and eating fish instead of meat can be a healthier alternative, but it is vulnerable to similar problems that factory farming faces. The practices that have made animal agriculture truly unsustainable are customs that aquaculture already mirrors. This Part focuses on environmental issues faced by offshore aquaculture, namely water and species pollution, antibiotic use, and the effects of climate change. A regulatory scheme that does not take into account these potential pitfalls, as well as the externalization of costs and potential subsidization of an industry that harms more than it helps, may solidify the use of these practices and ensure aquaculture is doomed to be similarly unsustainable. These factors need to be reined in as much as possible when planning a regulatory scheme for offshore aquaculture.

1. Water and Species Pollution from Aquaculture

Aquaculture has a more direct connection to surrounding waters than factory farming, for obvious reasons. Operations exist within the bodies of water where they are situated, whether in hatcheries, or in floating or submersed net pens,

[159] *See* Johnson, *supra* note 49 (describing political efforts of meatpacking corporations); Michael Corkery et al., *supra* note 49 (describing conversations these companies had with President Trump and Vice President Pence).

[160] *See* Teachout & Khan, *supra* note 49, at 47-48, 50-51.

[161] Michael Corkery et al., *supra* note 49 (describing meat lobby's actions when faced with prospect of regulations that would harm industry). Whether valid or not, the fact that meat-processing plants were kept open at the sacrifice of worker safety also evidences the fear that the meat industry is "too big to fail." *See* Rachel Potucek, *Butcher Kings: COVID-19 Exposes a Meat Industry "Too Big to Fail,"* PITCH (May 15, 2020), https://www.thepitchkc.com/butcher-kings-covid-19-exposes-a-meat-industry-too-big-to-fail/ [https://perma.cc/K4WP-M493] (describing how meatpacking plants were able to remain open during COVID-19 even when workers were getting sick).

among other apparatuses.[162] The directive of CAAPs is to grow fish in these locales, yet not disrupt the natural ecosystem. However, this disruption does occur both through discharges of nutrients and fish escapes.[163]

Aquaculture produces fish waste which, like waste from CAFOs, contains large amounts of nitrogen and phosphorus, as well as ammonia.[164] As with discharges of manure from CAFOs, the release of these nutrients can cause eutrophication in surrounding waters and can be "directly toxic to aquatic life."[165] It is possible more powerful currents will do more to dissipate these pollutants in offshore areas than in coastal aquaculture operations, but discharges could still cause eutrophication and die-offs of wild species.[166] Further, slowing currents due to climate change will slow dissipation of pollutants, ensuring eutrophication will remain a pertinent issue for offshore operations.[167]

CAAPs also discharge solids, including waste, uneaten food, and dead fish.[168] The release of these solids "can smother fish eggs and bottom-dwelling organisms."[169] The impact of solid waste is usually limited to the areas beneath pens and cages, but some studies show it can take up to two years of no operations for the seafloor to return to normal.[170] It is easy to foresee offshore aquaculture operations where solid waste could build up to levels that would take many years to reverse. Regulations will be necessary to limit discharges and encourage practices that instead turn "wastes into resources, like food or fertilizer."[171]

Under the CWA, CAAPs are regulated as point sources subject to NPDES permitting requirements, but effluent guidelines exist only for CAAPs that produce not less than 100,000 pounds of aquatic animals per year.[172] This leaves

[162] *NPDES Aquaculture Permitting*, *supra* note 63; *see* Bourne & Skerry, *supra* note 64 (exploring various forms of onshore and offshore aquaculture, with photographs and diagrams).

[163] *See* Head, *supra* note 25, at 21.

[164] *Id.* at 22-23.

[165] *Id.* at 22.

[166] *See* Sarah Ann Siedlak, Note, *How Can States Outside the Gulf of Mexico Regulate Offshore Finfish Aquaculture*, 67 CASE W. RSRV. L. REV. 1327, 1336 (2017) (noting that moving aquaculture operations further offshore can mitigate some negative environmental impacts).

[167] *See infra* Section II.B.3 (describing aquaculture's vulnerability to effects of climate change).

[168] Siedlak, *supra* note 166, at 1333-34.

[169] Head, *supra* note 25, at 22 (noting that solids also interrupt "reproduction of aquatic species" and "destroy benthic habitat").

[170] *See* Siedlak, *supra* note 166, at 1334 ("[I]t can take twenty-one to twenty-four months for the sediment chemistry and macrofauna to revert to previous unpolluted standards.").

[171] *Id.* at 1334-35 (explaining that such methods may "help reduce the amount of benthic degradation in areas surrounding aquaculture farms").

[172] *NPDES Aquaculture Permitting*, *supra* note 63.

open the potential for CAAPs to have the same regulatory loopholes as CAFOs. Smaller aquaculture operations, while producing significant numbers of fish and corresponding pollution, would be exempt from NPDES permitting requirements.

Aquaculture operations are also vulnerable to fish escapes, where the cultured species, usually not native to the waters in which they are grown, are unintentionally released.[173] These escapes usually occur during transportation or maintenance of pens and cages, but offshore operations are especially vulnerable to releases due to severe storms, rougher currents, and "damage from boats or other marine life."[174] Fish released from aquaculture operations (sometimes even genetically modified species) compete with wild populations for resources and in some cases, begin to outnumber and force depletion of wild species.[175] "[N]onnative species can alter and degrade habitat, disrupt native gene pool through interbreeding, and introduce diseases that could affect native species."[176] Aquaculture operations can be a breeding ground for fish-borne pathogens due to "high rearing densities . . . and stress on captive fish."[177] When fish infected with diseases escape, they pass those pathogens onto wild populations.[178]

2. Antibiotic Use in Aquaculture

In an effort to control pathogens among fish farm populations, as in animal agriculture, aquaculture operations use a large amount of antibiotics.[179] And as with CAFOs, some of the antibiotics leach into the surrounding environment.[180] Antibiotics are administered through fish feed thrown into the pens and enter the

[173] Head, *supra* note 25, at 22 ("[P]opulations of nonnative species can increase considerably, out-compete native stocks, and be difficult to eliminate once established.").

[174] Johns, *supra* note 16, at 695-96 (noting that almost 100,000 salmon escaped in Washington in 1996); *see also* Siedlak, *supra* note 166, at 1337 (identifying catastrophic weather, human error, predators, and boat damage as causes of escapes).

[175] Head, *supra* note 25, at 22; *see, e.g.*, Jonah van Beijnen & Gregg Yan, *Is the Aquaculture of Invasive and Non-native Species Worth the Risk?*, FISH SITE (Nov. 6, 2019, 8:00 AM), https://thefishsite.com/articles/is-the-aquaculture-of-invasive-and-non-native-species-worth-the-risk [https://perma.cc/L8Q5-X3FK] (discussing how tilapia have "decimated populations of native fish such as the desert pupfish . . . in the mainland United States").

[176] Head, *supra* note 25, at 22.

[177] *Id.* ("[W]astes and escape of infected shrimp from shrimp farms are considered major potential pathways for wild shrimp exposure to viral diseases.").

[178] *See id.* at 22-23 ("Farmed salmon have been known to contract a number of diseases . . . which can be transmitted to native populations.").

[179] *See* Graham M. Wilson, Note, *A Day on the Fish Farm: FDA and the Regulation of Aquaculture*, 23 VA. ENV'T L.J. 351, 359-60 (2004) (citing American Society of Microbiology's warning "that the use of antibiotics in aquaculture is potentially one of the primary causes of antibiotic-resistant bacteria").

[180] *See id.* at 361 ("[S]ignificant amounts of antibacterial agents . . . pass directly into open waters and settle in bacterial sediments below fish farms.").

environment through unconsumed feed and fish feces.[181] When antibiotics enter the surrounding environment, they can "create resistance in the bacterial flora found in underlying aqueous sediments."[182] These bacteria can also travel and be ingested by wild fish and other animals, proliferating antibiotic resistant pathogens.[183]

As with CAFOs, overuse of antibiotics in CAAPs, the purpose of which is to limit disease in the fish population, can further the existence of antibiotic resistance in fish.[184] While antibiotic-resistant fish-borne pathogens are a problem for the fish, human susceptibility to fish-borne diseases is rare.[185] However, when humans ultimately eat farmed fish, antibacterial resistance can transfer to human pathogens.[186] In fact, eating the fish may not even be a necessary step for transferring antibiotic resistance. "[B]acteria from aquaculture sites also could be transferred directly to humans simply by handling the fish."[187]

Antibiotic use in aquaculture is not regulated any better than in factory farming and is largely ignored in research of antibiotic resistance.[188] Some reports say that offshore aquaculture may not require the use of as many antibiotics due to the "more pristine and better oxygenated water conditions offshore as compared to many inshore areas" lowering the occurrence of disease among fish populations.[189] However, better oxygenated water requires a lack of eutrophication and for currents to remain strong, both questionable occurrences given the pollution of fish waste from aquaculture facilities and dissipating

[181] Siedlak, *supra* note 166, at 1338 ("[A]ntibiotics diffuse into the sediment and can be washed by currents to distant sites where other organisms can ingest them.").

[182] Wilson, *supra* note 179, at 361-62.

[183] *See* Siedlak, *supra* note 166, at 1338 (noting increased possibility of "passage not only of these antibiotic-resistant bacteria but also of their antibiotic resistance determinants to bacteria of terrestrial animals and human beings").

[184] *See* Wilson, *supra* note 179, at 360-61.

[185] *See id.* at 362 (stating that it may be more prevalent in tropical climates).

[186] *See id.* ("When a human eats a farmed salmon, antibiotic-resistant strains of bacteria can transfer their resistance to bacteria carried in that person.").

[187] *Id.* at 363 (discussing study that "found that the transfer of resistant genetic material between bacteria at aquaculture sites and bacteria found in humans is so fluid that 'we should consider the two environments (fish farm and hospital) one interactive compartment'" (quoting Glenn Rhodes, Geert Huys, Jean Swings, Patrick McGann, Maura Hiney, Peter Smith & Roger W. Pickup, *Distribution of Oxytetracycline Resistance Plasmids Between Aeromonads in Hospital and Aquaculture Environments: Implication of Tn*1721 *in Dissemination of the Tetracycline Resistance Determinant Tet A*, 66 APPLIED & ENV'T MICROBIOLOGY 3883, 3889 (2000))).

[188] *See id.* at 357, 359 ("Much of current scientific research and legal scholarship . . . has focused exclusively on the development of antimicrobial resistance on the traditional farm, ignoring prolific antibiotic use in aquaculture.").

[189] UPTON, *supra* note 14, at 23 (noting occurrence of fish diseases may be lower for offshore aquaculture).

currents in some areas due to climate change.[190] If offshore aquaculture is to proceed, the FDA (which regulates antibiotic use in aquaculture) will need to step up with significant research on the effects and necessity of antibiotic use in fish populations in offshore waters, as well as a strict enforcement regime to limit the further spread of antibiotic resistance in plants, fish, animals, and humans.

3. Vulnerability to the Effects of Climate Change

Not only does aquaculture contribute to environmental problems, but it is especially vulnerable to the effects of climate change, a topic that is frequently ignored in the clamor to expand operations offshore. The main climate change impacts on aquaculture are the increasing occurrence of severe storms, ocean warming, ocean acidification, changing currents, and the availability of feed from capture fisheries.[191] If the United States plans to expand aquaculture operations offshore, legislation needs to address these issues.

Increasing frequency of storms makes offshore facilities especially vulnerable. Storms are a major cause of fish escapes, "physical destruction of aquaculture facilities, loss of stock and spread of disease."[192] Fish escapes, as mentioned above, have major implications for the surrounding wild fish populations if the farmed species are not native to the area or have been genetically modified. "[E]xtreme weather events are cited as the most frequent causative factor for such escapes."[193] Aside from escapes, destruction of facilities obviously also leads to financial loss for the operators.

The planet is warming and the ocean is no exception. "[S]cientists have detected temperature increases almost two miles below the ocean's surface" and warming of surface and below-surface ocean temperatures is likely to continue.[194] Certain species need certain temperatures to thrive.[195] As temperatures rise to lethal levels for particular fish, these species naturally

[190] *See supra* Section II.B.1; *infra* Section II.B.3.

[191] *See* Sena S. De Silva & Doris Soto, *Climate Change and Aquaculture: Potential Impacts, Adaptation and Mitigation*, *in* FOOD & AGRIC. ORG. OF THE U.N., FAO DOC. 530, CLIMATE CHANGE IMPLICATIONS FOR FISHERIES AND AQUACULTURE: OVERVIEW OF CURRENT SCIENTIFIC KNOWLEDGE 151, 177, 180 (Kevern Cochrane, Cassandra De Young, Doris Soto & Tarûb Bahri eds., 2009), http://www.fao.org/fileadmin/user_upload/newsroom/docs/FTP530.pdf [https://perma.cc/9DYU-N6UG] (noting that increased frequency of storms can damage or destroy aquaculture installations); Robin Kundis Craig, *Re-Tooling Marine Food Supply Resilience in a Climate Change Era: Some Needed Reforms*, 38 SEATTLE U. L. REV. 1189, 1208 (2015) (identifying "ocean warming, changes in ocean currents, and ocean acidification" as primary risks).

[192] *See* De Silva & Soto, s*upra* note 191, at 177.

[193] *Id.*

[194] *See* Craig, *supra* note 191, at 1209 ("[R]ising ocean temperatures are significant and are already inducing a number of physical changes to ocean habitats.").

[195] De Silva & Soto, s*upra* note 191, at 169.

migrate toward the poles and to lower depths.[196] While this migration is especially hard on fisheries, the types of species that can survive in particular locations will also be an issue for offshore aquaculture operations. For farmed species in a cage or pen, no such migration to a more optimal climate is possible.[197] The entire operation needs to be relocated. The vast variation of effects of increased temperature on different species in different environments requires further research before expanding aquaculture offshore.

Changing ocean temperatures also affects ocean currents, which normally transport nutrients and dissipate contaminants through given areas, as well as regulate temperature.[198] In certain places, dissipating current has left aquatic "dead zones," where there is a lack of oxygen needed for fish to survive.[199] The currents also interact with warming temperatures as they bring cooler water to some areas. When these currents decrease, the water stays warmer. While capture fisheries are more vulnerable to these changes, the effect on aquaculture has been seen with farm-raised salmon, which cannot survive in warmer temperatures.[200] Advanced planning and predictions of the current could help, but more research is needed.[201]

Ocean acidification is another climate change problem that adversely affects fisheries and aquaculture. The ocean acts as a huge carbon sink, absorbing a lot of carbon emissions.[202] Once in the ocean, carbon undergoes a chemical process whereby it turns into carbonic acid.[203] As it absorbs more carbon, the ocean becomes more acidic, and the effects on various species are starting to show. Shellfish aquaculture is especially vulnerable to ocean acidification.[204] If acidification continues, aquaculture could "become increasingly limited, if not

[196] *See* Craig, *supra* note 191, at 1209-10 ("Scientists expect marine fish stocks to migrate 30 to 130 kilometers poleward and 3.5 meters deeper each decade that climate change continues to increase the oceans' temperatures.").

[197] De Silva & Soto, s*upra* note 191, at 169.

[198] Craig, *supra* note 191, at 1212-13 (noting that even "smaller changes to ocean current patterns could still disrupt marine ecosystems at the local or regional scale").

[199] *See id.* (identifying coasts of Chile and Peru, and east and west coasts of Africa as having such dead zones).

[200] *See id.* at 1213-14; Marie Fazio, *Time Running Out for Some Salmon Species in Northwest, Report Finds*, N.Y. TIMES, Jan. 21, 2021, at B6 (discussing dire effects of climate change on wild salmon populations).

[201] *See* Craig, *supra* note 191, at 1214.

[202] *See id.* at 1214-15 (noting oceans absorbed "about half of the anthropogenic emissions of CO_2" at beginning of twenty-first century).

[203] *See id.* at 1215-16 ("The CO2 emissions that warm the planet are also dissolving into the ocean and making it less alkaline—acid ocean syndrome. The change is chemically minuscule but historically huge.").

[204] *See id.* at 1217 (identifying drop in Puget Sound oyster larvae production from 7 billion larvae in 2006 to one third of that in 2009).

impossible."[205] This topic "has received little attention and warrants urgent research."[206]

Finally, as much as increasing storms, ocean warming, changing currents, and acidification affect aquaculture, the effect on traditional capture fisheries is arguably more profound. Even though aquaculture aims to move beyond the limits of capture fisheries, many operations still depend on fisheries for fish feed, namely fish meal and fish oil, a critical input in aquaculture development.[207] Research into alternative feed sources, especially for omnivorous fish, recommends the use of corn- and soy-derived feeds.[208] Whether changing to plant-based feed sources on a large scale is possible will depend on which species are reared and the economic viability of such inputs.[209] Again, more research is required. Of course, corn- and soy-based feeds raise the potential issues of indirect subsidies that CAFOs enjoy. The parallels between CAAPs and CAFOs are ongoing and prolific.

C. *Ramifications of the Lack of a Regulatory Structure for Aquaculture*

Players looking to enter the offshore aquaculture industry have no guidance to ensure they are in compliance with permit schemes and governing regulations. The list of statutes that apply to offshore aquaculture are enough to discourage most operations from attempting to enter the U.S. field.[210] Also, the lack of clear agency authority can translate to agency apathy (where an application for a permit will be ignored) or an agency asserting it has authority where it does not, causing overlap with other agency actions and confusion for everyone involved.[211] Understandably, operations that would locate in the EEZ look instead to other countries where permitting is simpler.[212] Further, the difficulty of compliance means that operations that do move offshore can be more easily challenged by groups that oppose aquaculture.[213] The lack of a cohesive structure makes it more likely an operation missed something, and the task of the opposition is simply to find (potentially, one of many) holes in compliance.

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[205] *Id.* (noting that "World Bank's baseline projection for world fisheries" could be thoroughly undermined, threatening "global food security well into the future").

[206] De Silva & Soto, s*upra* note 191, at 175.

[207] UPTON, *supra* note 14, at 26 ("Fish meal and oil are used to produce feed for carnivorous species such as salmon, because these ingredients provide nutritional requirements that are similar to those found in the wild.").

[208] De Silva & Soto, s*upra* note 191, at 181-83.

[209] *Id.* at 183 ("An important positive consideration is that in aquaculture feeds the agricultural ingredients used are almost always by-products.").

[210] *See supra* note 82 and accompanying text.

[211] *See* Johns, *supra* note 16, at 691-92 ("[I]f you were to submit an application for an aquaculture site in the EEZ, it's possible it would never be looked at by anyone.").

[212] *See, e.g.*, *id.* at 690-94 (outlining experience of Kona Blue, a nearshore Hawai'i aquaculture corporation that once attempted to move operations into EEZ and ultimately ended up moving to Mexico).

[213] *See, e.g.*, *id.* at 692-93 (discussing Food & Water Watch's case against Kona Blue).

Operations do not have a clear authority to point to in showing compliance but instead "are left to defend their projects on a case-by-case basis."[214] The threat of litigation serves as another disincentive to enter the industry.

Another barrier to entry is the lack of research into how the environmental effects of offshore aquaculture compare to nearshore aquaculture and capture fisheries. Any sensible operation needs to evaluate the costs of doing business before undertaking a venture of this magnitude. While many of the environmental effects of offshore aquaculture are foreseeable, precious few actual offshore operations exist around the world, leaving a dearth of examples to study.[215] A regulatory scheme for offshore aquaculture needs to place a heavy focus on research into the environmental impacts of, and effects of climate change on, offshore aquaculture specifically, not only to begin to alleviate those impacts but also to encourage operations to take the plunge knowing a bit more about what they are getting into.

Critics may wonder why we cannot just apply more stringent regulations to factory farming and close the loopholes CAFOs currently enjoy, rather than deal with the creation and regulation of an entirely new industry. The lack of a regulatory structure for aquaculture, however, means the United States will continue to lose out on the untapped profit potential of the market. Further, the problems mentioned above are only the beginning of the harm that animal agriculture causes. It is a vast, old facet of U.S. food production, and its faulty workings are deeply entrenched in the industry, aided by large companies' capture of regulatory agencies. While regulations that address animal agriculture should absolutely be scrutinized, those issues will be hard to retroactively fix (and such solutions are beyond the scope of this Note).[216] Aquaculture presents an opportunity to prospectively design an industry that can avoid many of the problems of animal agriculture, before they crop up.

A cohesive regulatory structure is necessary to streamline entry into the market and protect against the exacerbation of environmental issues. The similarities between CAFOs and CAAPs stand as a giant warning signal to offshore aquaculture, an industry which has in front of it a singular opportunity to head in a more sustainable direction. All it needs is the right legislation and administrative action.

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[214] *Id.* at 692 ("For example, Food & Water Watch, a group opposed to all aquaculture activities, has challenged individual aquaculture operations in court numerous times under various laws.").

[215] *See* UPTON, *supra* note 14, at 7, 35-36 (noting "nearly all worldwide marine aquaculture production is from relatively well-protected inshore waters" and how neither of the two largest investors in offshore development, Norway and China, have commercial offshore facilities).

[216] Discussed further *infra* Section III.A (stating fixes in animal agriculture industry will take years and be prohibitively expensive).

III. An Informed Interagency Approach to Aquaculture

As this Note has argued, the animal agriculture system is broken. Offshore aquaculture beckons as an untapped resource with the potential to close the gap between U.S. exports and imports of seafood, enrich workers and communities, and satisfy appetites. It also presents the opportunity to shift domestic food production away from factory farming to (nonfactory) fish farming, reducing the environmental harm of CAFOs simply by reducing their operations. This Part argues that the lessons of factory farming need to directly inform an interagency approach to aquaculture regulation. It also acknowledges the realities of beginning a new industry and discusses a conditional subsidization plan that could help operations get off the ground (and out to sea) while ensuring a reduced environmental impact for the new industry.

A. *Learning from the Failures of Factory Farming*

Despite the environmental issues and permitting obstacles facing aquaculture, it does have the potential to be a viable alternative to factory farming. In fact, as a new industry, offshore aquaculture has the opportunity to learn from the faults of factory farming and implement solutions without the burden of having to revamp an entire industry. In order to make aquaculture a larger part of a sustainable domestic food system and replace portions of animal agriculture, Congress needs to pass legislation with a regulatory structure for aquaculture that takes into account the things that make animal agriculture unsustainable.

Some people, especially those involved in animal agriculture, like the meat lobbies, may argue that it is possible to clean up animal agriculture. They may point to programs like EQIP that provide subsidies for this purpose.[217] Relying solely on EQIP, however, is like putting a Band-Aid on a gushing wound. The cost of cleaning up animal agriculture, especially if it is to internalize some of the costs it now imposes on the public and the environment, is prohibitive. Massive structural changes are needed and implementing them will take much legislation, cooperation from industry, and many years.

In addition, even if the unsustainability of animal agriculture could be addressed through more programs like EQIP, factory farming suffers from a myriad of problems, some having environmental roots, and some beyond the purview of environmental regulation, such as health problems associated with meat consumption, animal welfare issues, and worker safety issues, all of which are just as unsustainable as environmental degradation. Aquaculture is similarly vulnerable to these problems but has an opportunity to address them before they begin.

To be clear, no food source, including aquaculture, will wholly replace factory farming of land animals anytime soon, and policies to address the problems listed above are absolutely necessary. But these policies do not currently exist

[217] *See supra* notes 149-53 (discussing how EQIP provided $1.87 billion in assistance in 2018).

on a scale of the sort that is necessary to turn animal agriculture into a sustainable source of the domestic food supply. Further, implementing policies to clean up factory farming will face strong opposition from entrenched industry interests. Meat lobbies and large conglomerates hold a lot of influence over changes to regulations and are likely to make sustainability an uphill battle, as long as it does not also contribute to profitability.[218] Even as animal agriculture looks toward ways to reform, we should look to other, more sustainable options in the meantime. There is increasing demand for alternative sources of food, especially fish,[219] and offshore aquaculture presents an opportunity to reduce reliance on meat and the companies that produce it, while increasing profitability.

Quite simply, the problem aquaculture faces with a lack of a cohesive regulatory structure, is also its greatest opportunity. Rather than reforming a centuries-old industry, offshore aquaculture can be made sustainable from the get-go through comprehensive legislation. Further, not only does offshore aquaculture provide an option to reduce domestic reliance on meat; it poses the opportunity for job growth and profitability. Capture fisheries are understandably concerned about aquaculture taking away from their business,[220] but the reality is that capture fisheries are already facing declining yields and the challenges of climate change.[221] Hopefully, in time, aquaculture can present another avenue for traditional capture fishery workers to earn their livelihood and support coastal communities.

As this Note has shown, aquaculture faces many similar challenges that factory farming has fallen victim to. Water and species pollution, antibiotic use, the effects of climate change, and the possible externalization of costs and subsidies that produce an artificially profitable industry are all things offshore aquaculture needs to be wary of. But new legislation can address these issues. The lessons from animal agriculture are there; Congress just has to see them and decide what it can do to not only keep offshore aquaculture from becoming another unsustainable food source but ensure it can become an integral and profitable part of the domestic food supply.

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[218] *See supra* notes 159-61 (discussing how meat lobby has ferociously lobbied in the past, such as successfully lobbying against regulations that would prevent abusive pricing). One reason to think that profitability could lead to industry change (in the direction of sustainability) is the increase in meat-focused companies investing in plant-based products. *See* David Yaffe-Bellany, *Big Meat Hops on the Meatless Bandwagon*, N.Y. TIMES, Oct. 15, 2019, at B1 (discussing how major meat producers such as Tyson have begun to invest in plant-based burgers).

[219] *See* FAO, STATE OF THE WORLD FISHERIES, *supra* note 12, at 65, 68 (stating fish consumption has increased at higher rate than rate of world population growth).

[220] *See* Letter to U.S. Congress, *supra* note 89, at 1 ("American commercial fishing and marine finfish aquaculture cannot coexist.").

[221] *See* FAO, STATE OF THE WORLD FISHERIES, *supra* note 12, at 193 (stating capture fisheries need to take steps such as adopting new global target for sustainability to combat impacts of climate change); Fazio, *supra* note 200, at B6 (detailing how certain salmon species are on brink of extinction due to climate change).

Evidenced by past attempts to pass legislation, the motivation to provide for easier entry to the offshore arena is there. In fact, moving aquaculture offshore is one idea in a dwindling pile of Congressional efforts that can be labeled "bipartisan."[222] Still, the motivation for Congress to look critically at the environmental factors and pass legislation with more than a cursory glance toward sustainability (unlike AQUAA) needs to come from representatives and senators who are amenable to environmental causes. Senators such as Cory Booker and Elizabeth Warren are excellent candidates for lobbyists and constituents who care about environmental issues to reach out to. In 2020, they introduced the Farm System Reform Act, which aimed to protect small farmers and eliminate factory farming by 2040.[223] Overshadowed by the COVID-19 pandemic, the bill did not pass before the 116th Congress ended, but the Senators' enthusiasm for issues related to farming and sustainability may make them sympathetic to the environmental issues of aquaculture.[224]

The influence of environmental organizations will be crucial for developing the sustainability measures in the bill. At the moment, some environmental organizations are against expanding aquaculture offshore, while others recognize the opportunity to sustainably grow the U.S. food supply and get away

[222] AQUAA was introduced by Collin Peterson (D-MN) in the House and Marco Rubio (R-FL) in the Senate, among other congressmen. *U.S. Senators Introduce Bipartisan Legislation to Establish National Standards for Offshore Aquaculture*, AP NEWS (Sept. 25, 2020), https://apnews.com/press-release/pr-newswire/virus-outbreak-government-business-and-finance-business-industry-regulation-government-regulations-1b37662e9e7fcb7e0db6d9d41d1c1159.

[223] S. 3221, 116th Cong. (2020) ("To place a moratorium on large concentrated animal feeding operations, to strengthen the Packers and Stockyards Act, 1921, to require country of origin labeling on beef, pork, and dairy products, and for other purposes."); *see also* Aila Slisco, *Elizabeth Warren and Cory Booker Join Forces on Bill to Ban Most Factory Farming by 2040*, NEWSWEEK (May 7, 2020, 6:30 PM), https://www.newsweek.com/elizabeth-warren-cory-booker-join-forces-bill-ban-most-factory-farming-2040-1502699 (stating how bill came in response to "reports of unsafe conditions in the meatpacking industry" during pandemic).

[224] Corey Booker's exact stance on aquaculture remains elusive, but he is an ardent supporter of the environment and reforming the food system to be more sustainable and equitable. *See Environment*, CORY BOOKER, https://www.booker.senate.gov/about/issues/environment [https://perma.cc/GP3Z-YXK9] (last visited Mar. 21, 2022) ("Cory believes all Americans should have access to clean water and clean air, which is why he is a leader in developing federal policies that lift up low-income communities, indigenous communities, and communities of color, which disproportionately bear the burden of environmental pollution and exploitation."). Elizabeth Warren has spoken about the importance of making capture fisheries sustainable and discussed her plan for "regenerative ocean farming" in her "Blue New Deal" initiative. *See We Need a Blue New Deal for Our Oceans*, WARREN DEMOCRATS, https://elizabethwarren.com/plans/blue-new-deal [https://perma.cc/79H7-KUVY] (last visited Mar. 21, 2022) ("Land-based farmers have long been supported by the USDA, but in a world of rising seas, increasing ocean temperatures, and ocean acidification, we must expand that support to include ocean farming as well.").

from factory farms.[225] This Note takes the position that rather than opposing offshore expansion of aquaculture with the result that the industry moves forward in opposition to the concerns of environmentalists, environmental groups should work with legislators to ensure the inevitable expansion offshore takes into account environmental dangers particular to aquaculture, and especially those that the industry can learn from animal agriculture. Rather than "floating factory farms," this Note aims to contribute to a well-regulated, sustainable industry.[226] Congress will need input from environmentalists, and for representatives like Cory Booker and Elizabeth Warren, who know the perils of factory farming, to apply their expertise to the new regime.

B. *An Interagency Structure for Regulating Aquaculture*

As offshore aquaculture would implicate many areas of law and policy, it makes sense for Congress to set up an interagency structure to guide permitting and regulatory compliance. Having multiple agencies that can claim jurisdiction over the industry also makes it necessary for there to be a central governing agency to guide the process, bring the agencies together for the common purpose of making a clear structure, and give operators an obvious place to start when looking to get into the industry. Before *Gulf Fishermens*, many people thought the most likely candidate for this position was NOAA.[227] Within NOAA, NMFS

[225] *Compare* Kara WatkinsChow, *Senators Advance Controversial Aquaculture Bill, Threatening Coastal Economies and Ecosystems*, FRIENDS OF THE EARTH (Sept. 25, 2020), https://foe.org/news/senators-advance-aquaculture-bill/ [https://perma.cc/DF7W-3LB9] (warning about potential pollution from aquaculture and effect on capture fisheries and coastal communities), *with* Press Release, World Wildlife Fund, WWF Statement on the Introduction of the AQUAA Act (Sept. 28, 2020), https://www.worldwildlife.org/press-releases/wwf-statement-on-the-introduction-of-the-aquaa-act [https://perma.cc/VP2V-78Q4] (stating that organization "look[s] forward to working with the Senate and the House to build in the types of precautions necessary to get program design and implementation right for people and nature"), *and* Letter from Jonathan W. White, President & CEO, Consortium for Ocean Leadership, to U.S. Senate, Coalition Letter in Support of the Advancing the Quality and Understanding of American Aquaculture Act (AQUAA Act) (Feb. 6, 2019), https://oceanleadership.org/coalition-letter-in-support-of-the-advancing-the-quality-and-understanding-of-american-aquaculture-act-aquaa-act/ [https://perma.cc/9HZD-44JV] (urging "U.S. production of healthful, sustainable and affordable seafood through marine aquaculture").

[226] *See* Hallie Templeton, *It's Not Deja Vu. Congress Really Is Trying to Pass Another Failing Industrial Ocean Fish Farm Bill.*, FRIENDS OF THE EARTH, https://foe.org/blog/not-deja-vu-congress-really-trying-pass-another-failing-industrial-ocean-fish-farm-bill/ [https://perma.cc/N8CE-K9KZ] (last visited Mar. 21, 2022) ("Essentially, these facilities are floating factory farms that can devastate the ocean ecosystem and hurt our wild-capture fishing industry.").

[227] Gulf Fishermens Ass'n v. Nat'l Marine Fisheries Serv., 968 F.3d 454, 454 (5th Cir. 2020); *see, e.g.*, Johns, *supra* note 16, at 719 (stating NOAA is proper lead agency to ensure environmental protection); Ketchum, *supra* note 25, at 5 (stating plan amendment went into effect due to NOAA's lack of action); Lowenstein, *supra* note 25, at 497-98 ("In one way or

already has an Office of Aquaculture and has been formulating plans to regulate offshore aquaculture.[228] It makes sense to assign the central authority to an agency that is already getting its hands wet in the industry. Indeed, AQUAA would have made NOAA the central regulating agency.[229]

Having NOAA at the center is reasonable and perhaps the easiest part of the scheme to figure out. More importantly, a successful regime will require significant involvement from other agencies, namely the USDA, FDA, and EPA. The USDA has typically been associated with land-based agriculture, but aquaculture is essentially agriculture that takes place in the water, and if fish is to become a larger part of domestic food production, it makes sense to have the USDA involved in overseeing operations and monitoring compliance. "It appears that some of USDA's programs and experiences that focus on land-based agriculture, such as finance, research, [and] disaster assistance . . . may be adapted and applied to marine aquaculture development."[230] In fact, the USDA has been significantly involved in research efforts regarding freshwater aquaculture in the United States.[231] The USDA's experience and resources position it to be a leading source of research into sustainable species, fish feed sources, and the general effects of climate change on offshore aquaculture. Further, the USDA may be in the best position to directly relate the failures of factory farming to what aquaculture can do differently, given its experience in animal agriculture regulation and compliance.

This Note also posits that the FDA and EPA need to have a significant role in the interagency structure, on par with the USDA's involvement. A 2019 Congressional Research Service report suggested that the FDA and EPA were among agencies that "have roles that are indirectly related to aquaculture."[232] As evidenced by the many environmental issues and the threat of overuse of antibiotics in aquaculture outlined earlier in this Note,[233] if aquaculture is to

the other, NOAA should be the regulating agency for offshore aquaculture to maintain proper procedures and scientifically backed development."); Exec. Order No. 13,921, 85 Fed. Reg. 28,471, 28,473 (May 12, 2020) (giving central authority to NOAA); UPTON, *supra* note 14, at 38 (stating stakeholders have supported NOAA's managerial role in aquaculture resources, NOAA already has authority to evaluate proposed marine activities, and NOAA is responsible for federal management of marine fisheries).

[228] UPTON, *supra* note 14, at 10 ("The NMFS Office of Aquaculture . . . focuses on regulatory, technical, and scientific services related to marine aquaculture. NOAA headquarters provides general direction for the program and coordinates with other NOAA offices, federal agencies, and the general public.").

[229] S. 4723, 116th Cong. § 401 (2020) (stating "an Office of Aquaculture within the National Marine Fisheries Service at the National Oceanic and Atmospheric Administration headquarters" shall be established and provided with resources to implement bill).

[230] UPTON, *supra* note 14, at 9.

[231] *Id.* ("USDA plays a lead role in support of freshwater aquaculture for species such as catfish that are raised on private property in fishponds. USDA is authorized to conduct cooperative research and extension: it funds five aquaculture regional research centers.").

[232] *Id.*

[233] *See* discussion *supra* Section II.B.2.

learn anything from the failures of animal agriculture and chart a sustainable and profitable course, the roles of the FDA and EPA should not be merely symbolic, but direct and substantial.

While AQUAA discusses research into the environmental impacts of aquaculture, the only mention of FDA involvement is a directive that it should participate in "simplify[ing] the Federal permitting process for offshore aquaculture."[234] The FDA's role, however, should not be to simplify the permitting process. Rather, FDA involvement is required to coordinate a strategic research effort and plan of attack on the contribution of aquaculture to antibiotic pollution and resistance. The FDA is already responsible for approving drugs used in nearshore aquaculture, so it makes sense to use their expertise in the expansion offshore.[235] However, legislation will need to direct the FDA to create a strategic plan to minimize use, as well as provide funding for substantial research into antibiotic use and its effects in aquaculture.[236]

Perhaps even more than environmental degradation and vulnerability to the effects of climate change, antibiotic use is aquaculture's greatest threat. It will be a sad day if offshore aquaculture is allowed to prosper without first addressing this most fundamental and obvious flaw. The aquaculture industry needs to learn from the prolific use of antibiotics in animal agriculture, and its own uses in near-shore and inland operations thus far and stop it before the industry expands offshore.

The EPA has a role to play in coordinating with the FDA in the efforts to lower antibiotic use in aquaculture, as such use has environmental effects as well.[237] This and the environmentally detrimental effects of aquaculture listed above similarly necessitate the elevation of the EPA's role in the interagency structure. Most importantly, the EPA's input is needed to structure rules specific to aquaculture pollution that avoid the loopholes CAFOs have enjoyed. Simply applying the current NPDES permitting scheme to offshore aquaculture will not sufficiently alleviate water pollution from waste discharges from CAAPs, and many CAAPs are small enough to escape permitting requirements entirely.[238] Further, the EPA needs to address issues of fish escapes and subsequent species pollution, as well as the many effects of climate change on aquaculture.[239]

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[234] S. 4723 § 406(b).

[235] *See* UPTON, *supra* note 14, at 23 ("Only drugs approved by the FDA Center for Veterinary Medicine may be administered to aquatic animals.").

[236] *See supra* note 188 and accompanying text (stressing severity of antibiotic problem while noting how little research on issue has been devoted to antibiotic use in field).

[237] *See supra* Section II.B.2 (discussing how antibiotic use in aquaculture is poorly regulated and how antibiotics can damage environment by creating resistance in bacterial flora).

[238] *See supra* note 172 (stating effluent guidelines only exist for CAAPs producing at least 100,000 pounds of aquatic animals per year).

[239] *See supra* notes 173-78 (discussing issues including fish escapes, species pollution, and fish-borne pathogens that can be spread onto wild populations); *supra* Section II.B.3

Legislation needs to direct the EPA to research these issues (in coordination with the USDA) and propose solutions for the new industry. Much of the focus of proposed legislation and conversations on the topic of offshore aquaculture have focused on simplifying the permitting requirements, with research into environmental effects of aquaculture incidental to the regulatory scheme.[240] And proposals to deal with the effects of climate change beyond a cursory glance at disaster management plans have largely been absent.[241] While simplification of permitting is necessary on a fundamental level to even allow the industry to operate in the first place, it is only the first step. The rest of the steps must focus on how to make the industry sustainable, with an eye toward not repeating the mistakes of animal agriculture. Strong input from the USDA, FDA, and EPA are required in this effort.

While some issues fit neatly under the purview of one agency, food policy is not one of them, and aquaculture will not be the first food production issue that requires an interagency approach. While not always aligned in their goals, the USDA and FDA have recently started working together more on the issue of food safety.[242] And since 2018, the USDA, FDA, and EPA have worked to align their goals and pool their resources to address food waste.[243] While this interagency coordination is relatively new, certain keys to success have been identified that could easily be applied to an interagency approach to aquaculture regulation, such as identifying the lead agency;[244] "engag[ing] state, local, and tribal governments as key partners"; providing for stakeholder and public participation; "requir[ing] publication of accessible, public-facing reports that measure progress against the strategy's goals"; and updating the strategy as needed.[245] The fact that the USDA, FDA, and EPA are already learning to coordinate in these other areas puts them in a great position to find success as partners in regulating offshore aquaculture.

(discussing how climate change effects on aquaculture include increased frequency of severe storms and ocean acidification).

[240] *See, e.g.*, S. 4723, 116th Cong. §§ 203, 406 (2020) (simplifying permitting requirements while establishing research grant program).

[241] *See id.* (neglecting to mention climate change). *But see generally* Craig, *supra* note 191 (advocating for ways governments could change fisheries and aquaculture operations to deal with climate change); De Silva & Soto, s*upra* note 191 (identifying key issues relating to climate change and fisheries).

[242] *See* BROAD LEIB & BEYRANEVAND, *supra* note 58, at 17-19 ("Since 2017, USDA and FDA made a series of cross-agency commitments to streamline food safety oversight and improve interagency communication around particular issues.").

[243] *See id.* at 18.

[244] In this case, NOAA will likely be the lead agency, but coordination between the other three main agencies would follow the rest of these guidelines.

[245] *See* BROAD LEIB & BEYRANEVAND, *supra* note 58, at 15.

While the USDA, FDA, and EPA faced funding cuts during the Trump Administration[246] (and it is safe to say that prioritizing the *sustainability* of offshore aquaculture would have taken a backseat to maximizing profitability of the industry under his Executive Order and any further plans he might have implemented), there is hope that the Biden Administration will turn this around.[247] The effects of the COVID-19 pandemic on food security, farmers, and worker safety has received attention and, justifiably, funding for these agencies is currently directed toward recovery.[248] But there is good reason to believe that the USDA, FDA, and EPA will be well supported in efforts toward sustainability under the Biden Administration.

C. *Conditional Subsidization of Offshore Aquaculture*

Another lesson of factory farming, the out-of-control subsidization of a detrimental industry, may be a harder lesson to carry forward to offshore aquaculture. While it may be best to allow offshore aquaculture to succeed or fail on its own merits without subsidization (in contrast to CAFOs),[249] it is likely not terribly realistic that the industry would be successful, at least initially, without subsidies. And in order to truly move away from animal agriculture, there needs to be a functioning alternative. Further, if offshore aquaculture is able to address some of the problems it faces and move forward having learned the lessons from factory farming outlined in this Note, it may well be worth

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[246] *See Trump Wants Cuts to USDA, FDA 2017 Funding*, POLITICO (Mar. 28, 2017, 10:00 AM), https://www.politico.com/tipsheets/morning-agriculture/2017/03/trump-wants-cuts-to-usda-fda-2017-funding-219458 (discussing how Trump's proposal called for millions of dollars of cuts to programs such as FDA and Food for Peace); Glenn Thrush & Coral Davenport, *Donald Trump Budget Slashes Funds for E.P.A. and State Department*, N.Y. TIMES (Mar. 15, 2017), https://www.nytimes.com/2017/03/15/us/politics/budget-epa-state-department-cuts.html.

[247] *See* Naveena Sadasivam, *Inside Biden's Uphill Battle to Restore the EPA After Trump*, GRIST (Mar. 1, 2021), https://grist.org/politics/epa-joe-biden-environmental-law-enforcement-trump/ [https://perma.cc/AE4Y-XFDP] (noting how nine Trump policy documents have already been retracted); Liz Crampton, *Trump Left Biden a $30 Billion Fund Used for Trade Wars. Biden Has Other Plans for It.*, POLITICO (Jan. 31, 2021, 11:26 AM), https://www.politico.com/news/2021/01/31/usda-agriculture-tug-of-war-463843 ("Now the Biden administration wants to deploy a $30 billion pot of money in the Agriculture Department to tackle climate change, support restaurants and kickstart other programs without waiting for Congress."). For a review of all the detrimental policies Trump enacted or tried to enact regarding food and farming, see Lisa Held, *How Four Years of Trump Reshaped Food and Farming*, CIVIL EATS (Nov. 2, 2020), https://civileats.com/2020/11/02/how-four-years-of-trump-reshaped-food-and-farming/ [https://perma.cc/T6LX-HAGK].

[248] John Newton, *What's in the American Rescue Plan Act of 2021 for Agriculture?*, FARM BUREAU (Mar. 8, 2021), https://www.fb.org/market-intel/whats-in-the-american-rescue-plan-act-of-2021-for-agriculture [https://perma.cc/9YT7-VPJE] (noting American Rescue Plan Act of 2021 includes $22.7 billion in nutrition and agricultural provisions).

[249] *See supra* Section II.A.4 (discussing how direct and indirect subsidization of factory farming props up industry).

subsidizing it as a positive, healthy alternative to meat production. But the possibility of subsidization should be approached carefully and strategically.

Just as the lack of a regulatory structure for offshore aquaculture is an opportunity for Congress to create a sustainable regime from the outset, subsidies present Congress with another opportunity. Subsidies can not only soften the barriers to entering the offshore arena but serve to push forward the sustainable agenda. Programs like EQIP incentivize operations to clean up their act. But if such operations find the costs of cleanup (even with the subsidy) outweigh the benefits, or more simply, detract from profits more than they are willing to withstand, they will simply not apply for the subsidy and not implement the cleanup program. They can continue operating and polluting as they did before. There is an important difference between giving subsidies to an operation to *incentivize* it to clean up operations (when it does not depend on the subsidy to operate), and giving subsidies *conditioned* on compliance with sustainability practices, especially when those subsidies may provide the necessary funds for an operation to enter the industry in the first place.

This Note proposes a conditional subsidization plan based on operations meeting certain sustainability criteria and cooperating with research efforts. In order for operations to be granted permits they should have met the requirements of NPDES. Although the loopholes mentioned above[250] should be closed by the new regulatory scheme, subsidies could help close any gaps that are leftover. For instance, if small operations are still exempt from NPDES permitting requirements, subsidies should be conditioned on operations implementing pollution reduction plans.

In regard to the effects of climate change, proposed legislation should include a requirement for disaster management plans (and expound much more than AQUAA did on the requirements for such plans),[251] but subsidies should also be conditioned on operations actively participating in research into sustainable species and aiming to incorporate farming of such species into their operations. Currently, research into the effects of climate change on offshore operations is lacking.[252] The USDA, or whichever agency leads the charge on such research, will need the cooperation and involvement of new operations in order to assess these effects. Similarly, cooperation with the FDA on research into reducing antibiotic use should also be part of a conditional subsidy.

As discussed above, most subsidies come to animal agriculture indirectly, through subsidization of corn and soy.[253] These same crops may be an alternative

[250] *See supra* note 172 and accompanying text (stating effluent guidelines only exist for CAAPs producing at least 100,000 pounds of aquatic animals per year).

[251] The entirety of the provision for disaster management plans in both bills is "plans to respond to . . . a natural disaster," making no mention of climate change resilience or any specific requirements. H.R. 6191, 116th Cong. § 201(c)(1)(E)(i) (2020); S. 4723, 116th Cong. § 202(c)(1)(E)(i) (2020).

[252] *See* UPTON, *supra* note 14, at 7, 35-36.

[253] *See supra* notes 142-48.

to fish feed when aquaculture moves away from feed sourced from capture fisheries, potentially leading to the problem of corn and soy subsidies indirectly subsidizing aquaculture.[254] Corn and soy subsidies should be reduced for a myriad of reasons beyond the scope of this Note, but perhaps some of the money currently directed to corn and soy could instead be put into the conditional subsidization plan outlined here. Further, if the subsidies for corn and soy were reduced, it would increase the market price, in turn increasing the cost of production for factory farms and aquaculture operations that use corn and soy for fish feed, pushing both industries a little closer to a cost of production model. Perhaps this would further incentivize aquaculture operations to comply with the conditions in order to receive subsidies.

Other sources have suggested conditional subsidization in the area of food production.[255] The difference in the area of offshore aquaculture is the timing: many operations will need these subsidies to enter the industry, posing an opportunity for Congress to ensure compliance with sustainability and research efforts from the start. Congress can put the program in place and capture the highest benefits of the plan by implementing it at the outset of the industry.

Subsidies should also be directed toward smaller operations, and not those owned by large conglomerates, in order to support small businesses and local communities, while avoiding potential agency capture. Indeed, smaller operations are more likely to need the subsidy and be willing to comply with the conditions. If a conglomerate buys multiple smaller operations, the subsidies should be forfeited. The power of the meat industry over the regulations that govern it is vast; if aquaculture grows to a similar size and concentration, all bets regarding protection of the environment and workers, and creating a sustainable industry are off.[256] Although larger companies may be able to afford to enter the market without subsidies, at least subsidization of smaller entities may help level the playing field.

The externalization of costs by CAFOs is the ultimate lesson that aquaculture should keep in mind at all stages of growth. Placing the cost of the industry onto the environment and consumers would ensure offshore aquaculture becomes just

[254] *See* De Silva & Soto, s*upra* note 191, at 181-83 ("For example soybean meal and corn meal are often used in feeds for cultured aquatic organisms . . . .").

[255] *See* Tim Searchinger, *Redirecting Agricultural Subsidies for a Sustainable Food Future*, WORLD RES. INST. (July 21, 2020), https://www.wri.org/blog/2020/07/redirecting-agricultural-subsidies-sustainable-food-future [https://perma.cc/HKC2-RCYW] (using Brazil as example of "condition[ing] farm financial aid on the protection of forests and other native areas" and Europe as example of plan that "conditions all direct funding to farmers based on some environmental practices and distributes much aid in ways that are supposed to improve the environment"); UNION OF CONCERNED SCIENTISTS, SUBSIDIZING WASTE 10 (2016), https://www.ucsusa.org/sites/default/files/attach/2016/08/Subsidizing-Waste-full-report.pdf [https://perma.cc/3V3J-HDD5] (suggesting "increas[ing] funding and technical assistance to encourage on-farm conservation practices, and ensure their adoption as a condition for receiving federal farm subsidies").

[256] *See supra* notes 157-61 (indicating how concentrated meat industry limits their regulations to detriment of society and environment).

as unsustainable as its animal agriculture counterpart. To address this possibility, subsidies to jump-start the industry should be readdressed periodically. Legislation should include a schedule to decrease subsidies at certain yearly increments once the operations are up and running to move toward a true cost of production model.

CONCLUSION

The development of offshore aquaculture presents the United States with an opportunity to increase profits and jobs to meet increasing domestic demand for fish, at a time when capture fisheries are becoming unsustainable. Entering the industry, however, is nearly impossible due to the lack of a cohesive regulatory scheme to guide the process. Congress will need to pass legislation to clarify an interagency structure before operations can move offshore. This need also presents an opportunity. Offshore aquaculture could form a movement away from traditional animal agriculture, which has become unsustainable and detrimental to the environment and public health. Instead of simply passing a permitting regime for offshore aquaculture, Congress needs to take a hard look at the specific failures of animal agriculture and ensure that those mistakes are not repeated. Factory farming has been greatly detrimental to the environment, contributed to antibiotic resistance, and profited by externalizing costs and benefitting from massive direct and indirect subsidies and the power of strong lobbyists. Aquaculture is vulnerable to strikingly similar problems. Water and species pollution, overuse of antibiotics, and vulnerability to climate change are facets that need to be researched and addressed. Legislation that clarifies a regulatory structure can also ensure that offshore aquaculture does not fall victim to the same failures as factory farming. The opportunity to move operations offshore is not only an opportunity for increased profitability but a way to deliberately and strategically move our domestic food system in a more sustainable direction.