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DATA FEAST: INFORMATION-FORCING FOR INDUSTRIALIZED AGRICULTURE

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ABSTRACT

Modern-day agriculture promotes the use of monoculture, high-yield crop-types, and pesticides in order to increase crop yield. These practices are at the cost of natural resources, resulting in the destruction of land, contamination of water, release of pollutants, emissions of greenhouse gases, and excessive use of valuable drinking water. Agriculture is America's leading contributor to green-house gases and a myriad of other environmental detriments. Surprisingly, how-ever, agriculture is exempted from many of the environmental laws and regulations in effect currently, allowing farms to pollute at will. Costs from environmental harms are not shouldered by the agricultural polluters themselves, rather, costs are placed on society as a whole. In order to remedy the environmental harms that industrialized agriculture has caused, large agricultural operations should be re-quired to compile and publically release information on inputs and outputs such as: pesticide use, greenhouse gas emissions from livestock, nitrate emissions, wa-ter use, land use, and soil runoff. There are many examples of information-forcing programs which have been successful in reducing pollution and future environ-mental harms. Information-forcing could be more effective than traditional regu-lation because information-forcing provides knowledge of what agriculture is cur-rently doing to harm the environment, informing policy-makers and consumers alike. Generally behind-the-scenes, this information will affect consumers who make purchasing decisions and may be better equipped to push for further regu-lation, farms who may use the data to self-regulate, and policymakers who will use the data to create and amend future legislation.

I. INTRODUCTION

The International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) published one of the most rigorous and comprehensive assessments of agriculture to-date.[1] Co-sponsored by leading organizations such as the World Bank and the Food and Agriculture Organization, its

1. *See generally* INT'L. ASSESSMENT OF AGRIC. KNOWLEDGE, SCI. & TECH. FOR DEV.,

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assessment concluded a radical change is needed in agricultural policy and practice in order to address the issue of, among many others, environmental sustainability.[2] The report indicated industrial agriculture as we know it today uses enormous amounts of water, fertilizer, land, and energy, causing damage to the environment.[3] This damage has a ripple effect: it increases land loss and habitat loss; quickens climate change due to greenhouse gas emissions; causes soil erosion from monoculture (the continual farming of one type of crop on each plot of land); creates toxic drinking water from runoff; and leads to increased pesticide use.

A. The Green Revolution

The current environmental problems observed stem from the increased industrialization of agriculture, originating from a time period of agricultural advancements coined "The Green Revolution."[4] During this time, scientist Norman Borlaug discovered ways to breed hardier grains and used improved technology to produce more crops, faster. The new technologies expanded the use of improved fertilizers, chemical inputs, pesticides, and huge irrigation projects, which led to dramatic increases in crop production.[5] Because of the new practices encouraged by the Green Revolution, thousands of people were able to avoid starvation. Overall, the Green Revolution was a major success and allowed for an unprecedented level of national food security. This also led to a population boom.

This industrial model of farming became increasingly popular because it allowed for a large increase in production, creating food sources for those who would have otherwise gone hungry at the time.[6] As such, industrialization was lauded as a savior in the short term, but this was at tremendous cost to the environment in the long term. Reports—such as the one mentioned previously published by IAASTD—are very important to American consumers. American farms are a protected secret, having the ability to withhold information from the public, exempt themselves from environmental statutes, and continue to pollute without consequence while ultimately putting the environmental cost on the rest of the country.

SYNTHESIS REPORT: AGRICULTURE AT A CROSSROADS (2009), http://apps.unep.org/redirect.php?file=/publications/pmtdocuments/-Agriculture%20at%20a%20crossroads%20-%20Synthesis%20report-2009Agriculture_at_Crossroads_Synthesis_Report.pdf.

2. *Id*. at vii-viii.

3. *Id*. at 59-64.

4. *See* Jonathan Harwood, *Development Policy and History: Lessons from the Green Revolution*, HIST. & POL'Y (June 14, 2013), http://www.historyandpolicy.org/policy-papers/papers/development-policy-and-history-lessons-from-the-green-revolution.

5. Prabhu Pingali, *Green Revolution: Impacts, Limits, and the Path Ahead*, PROC. NAT'L ACAD. SCI., July 31, at 12302, 12303.

6. *Id*. at 12302.

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B. Agriculture as the Protected Fruit

In a letter to John Jay, Thomas Jefferson wrote, "[C]ultivators of the earth are the most valuable citizens. [T]hey are the most vigorous, the most independant, the most virtuous, & they are tied to their country & wedded to it's liberty & interests by the most lasting bands."[7] Jefferson's opinion of the American farmer continues to have far-reaching social applications. The United States has built itself around farming. Thus, it is easy to see one reason why Americans are reluctant to force regulation on farms. After all, is farming not the American way?

Across the nation, several states are introducing "ag-gag" laws.[8] Ag-gag legislation is designed specifically to prevent undercover investigations by criminalizing the release of information on farm operations.[9] Since ag-gag's inception in the early 1990s, six states have passed ag-gag into law.[10]

Agriculture is mostly excluded from federal and state environmental regulations. Agribusiness gives enormous amounts of money to political groups who represent their interests accordingly, thus allowing agriculture to pollute without penalty, keep costs unfairly low, and keep subsidies rolling in.[11] In agriculture policy, the influence of corporate money in the American political system is spread as wide as the waves of amber grains they so dutifully protect. The most recent Farm Bill is a good example in which the crop insurance industry spent more than $57 million on lobbying to benefit the industry.[12] From buying ballot initiative wins on GMO labeling[13] to factory farm "Right-to-Farm" rules[14] (allowing farmers to avoid nuisance claims brought against them), money talks on the farm. It does not seem there will be any slowdown to this huge industry, either. In the 2012 election cycle

7. *Extract from Thomas Jefferson to John Jay*, JEFFERSON QUOTES & FAM. LETTERS, http://tjrs.monticello.org/letter/69#X3184736 (last visited July 28, 2017).

8. Katherine Paul & Ronnie Cummins, *Shocking: Reporting Factory Farm Abuses to be Considered "Act of Terrorism" If New Laws Pass*, ALTERNET (Jan. 24, 2013), http://www.alternet.org/environment/shocking-reporting-factory-farm-abuses-be-considered-act-terrorism-if-new-laws-pass.

9. *Id.*

10. *Id.*

11. *See* Ben Lilliston, *Agribusiness and Food Corporations Are Not People*, INST. FOR AGRIC. & TRADE POL'Y (Jan. 20, 2015), https://www.iatp.org/blog/201501/agribusiness-and-food-corporations-are-not-people.

12. *Id.*

13. *See, e.g.*, Carey Gillam, *U.S. GMO Labeling Foes Triple Spending in First Half of This Year Over 2013*, REUTERS (Sept. 2, 2014, 11:05 PM), http://www.reuters.com/article/us-usa-gmo-labeling-idUSKBN0GY09O20140903.

14. *See, e.g.*, Lorne Fultonberg, *Cleaner Water? Safer Animals? Who's Right in 'Right to Farm' Debate?*, KFOR-TV (Nov. 3, 2016, 10:00 PM), http://kfor.com/2016/11/03/cleaner-water-safer-animals-whos-right-in-right-to-farm-debate/.

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alone, agribusiness "contributed more than $90 million at the federal level."[15]

C. The Solution: Information-Forcing

Regulating agriculture has proven to be difficult as large subsidies, government assistance, and the American archetype of the farmer as a hard-working, humble hero has created large barriers.

The agricultural industry has exempted itself from current regulation, and due to the large amount of money in agriculture lobbies, it will likely never be subjected to environmental legislation with any teeth. Because of this under-regulation, we must create a system that highlights the astounding environmental impacts created by agriculture. Information-forcing represents a procedural remedy for the self-inflicted blindfold that the government has placed over its eyes. By generating information and data on farms, we can create informed future policy and increase transparency among big farms who may want to conceal their practices from consumers. Releasing certain types of information has been controversial, but there is an appetite among consumers to have information and to make purchasing decisions accordingly.

Instead of the outside regulation of agriculture, which to-date has not been effective, legislation requiring internal data generation and publication should be implemented. This internal data would be collected on the following metrics: pesticide use and amounts, greenhouse gas emissions from livestock, nitrate emissions and synthetic nitrate use, water use amounts, land acreage use, and soil runoff amounts. This information, normally privately kept, should be made public. This will cause consumers to be more informed and encourage farms to regulate themselves in an effort to keep the consumer satisfied.

Congress, through its implementation of the Farm Bill and through the United States Department of Agriculture (USDA), must encourage and support comprehensive efforts to quantify and make publicly available cost data on the environmental impacts associated with agricultural operations. The data that is released from farms will provide resources that are currently lacking for policymakers, environmental and public health advocates, and the agricultural industry. Furthermore, it will inform on the development of sound agricultural policy in the United States.

This Article will highlight what environmental harms industrialized farming causes and how the agricultural industry is currently regulated. This Article will

15. Monica Vendituoli, *Agribusiness: Background*, OPENSECRETS.ORG, http://www.opensecrets.org/industries/background.php?cycle=2016&ind=A (last updated Sept., 2013).

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then suggest that in order to combat the environmental harms, data should be generated from farms so that policy can be informed and the public can have a more transparent perspective. Additionally, this Article will make clear why information-forcing, as opposed to traditional regulation, is a more realistic approach to protect the environment against future damage from agriculture. Finally, this Article will highlight information-forcing examples, focusing on implementation, potential obstacles, and suggestions.

II. WHY FARMING HAS INDUSTRIALIZED: THE GREEN REVOLUTION

The Green Revolution is the name given to the agricultural modernization program that "encouraged countries to shift to monoculture farming dependent on chemical fertilizers and pesticides with the purported goal of increasing yields and agricultural profitability."[16] In the 1940s, as famine was looming, an American scientist by the name of Norman Borlaug began conducting research in Mexico and developed a new disease resistant, high-yield variety of wheat.[17] Because of his advancements, Mexico was able to produce more wheat than was demanded and exported much of its extra crop.[18] This was a massive transformation, as Mexico was importing up to half of its wheat only years before.[19] Because of the success in Mexico, this type of farming advancements spread with wide implementation in the United States—from this the Green Revolution was coined.[20] Between 1950 and 2000, world production of grain nearly tripled,[21] and total world food production grew by 145% in the past four decades.[22]

16. Mohsen Al Attar Ahmed, *Monocultures of the Law: Legal Sameness in the Restructuring of Global Agriculture*, 11 DRAKE J. AGRIC. L. 139, 143-44 (2006).

17. Henry I. Miller, *Norman Borlaug: The Genius Behind the Green Revolution*, FORBES (Jan. 18, 2012), https://www.forbes.com/sites/henrymiller/2012/01/18/norman-borlaug-the-genius-behind-the-green-revolution/#57bb5a5d6a43.

18. *The Green Revolution & Dr. Norman Borlaug: Towards the "Evergreen Revolution"*, AGBIOWORLD, http://www.agbioworld.org/biotech-info/topics/borlaug/green-revolution.html (last visited July 28, 2017).

19. Miller, *supra* note 17.

20. INT'L FOOD POLICY RESEARCH INST. [IFPRI], GREEN REVOLUTION: CURE OR BLESSING? 3 (2002), https://oregonstate.edu/instruct/css/330/three/Green.pdf.

21. LESTER R. BROWN, PLAN B 4.0: MOBILIZING TO SAVE CIVILIZATION (2009) (ebook).

22. Jules Pretty, *Agricultural Sustainability: Concepts, Principles and Evidence*, PHIL. TRANSACTIONS ROYAL SOC'Y B. (July 25, 2007), http://alyxia.umd.edu/teaching/files/Pretty_2008.pdf.

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III. ENVIRONMENTAL HARMS FROM ANIMAL AGRICULTURE

A. Methane Emissions and Greenhouse Gases

"Livestock populations . . . emit gases that are harmful to the earth's atmosphere including ammonia, carbon dioxide, methane, and nitrous oxide."[23] Carbon dioxide, methane, and nitrous oxide play a primary role in the build-up of greenhouse gases and, subsequently, climate change.[24] Manure contributes methane, which is the strongest of all greenhouse gases (nearly 320 times stronger than carbon dioxide) released into the atmosphere.[25] Methane comes from animals' waste-manure and enteric fermentation (a process that takes place in the digestive systems of certain animals).[26] In the United States, manure and enteric fermentation account for over one-third of total methane emissions (more than any other source, such as the major sources of oil and gas systems, landfills, and coal mining).[27]

B. Excess Nutrient Runoff and Ocean Dead Zones

1. Excess Nutrient Runoff

"Nitrogen is the single most important input a farmer can control to increase crop yields."[28] Given nitrogen's importance and cheap cost, "farmers have an economic incentive to 'apply a little extra' to ensure that crops have the necessary nutrients" to produce large yields.[29] As a consequence of over-application, "excess nitrogen remains in the soil and freely moves into water resources."[30] Farmers do not over apply nitrogen in an adverse manner, but in the forty years since the Green Revolution, the United States has invested in a type of agriculture that rewards high yields over all other considerations. Under the Farm Bill, commodity farmers receive subsidies based on how many bushels they produce rather than how efficiently they use nitrogen.

23. Ujjayant Chakravorty et al., *Environmental Effects of Intensification of Agriculture: Livestock Production and Regulation*, 8 ENVTL. ECON. & POL'Y STUD. 315, 326 (2007).

24. *Id.*

25. *Id.*

26. U.S. ENVTL. PROT. AGENCY, 14.4 ENTERIC FERMENTATION—GREENHOUSE GASES (2009), https://www3.epa.gov/ttn/chief/ap42/ch14/final/c14s04.pdf.

27. U.S. ENVTL. PROT. AGENCY, OVERVIEW OF GREENHOUSE GASES, https://www.epa.gov/ghgemissions/overview-greenhouse-gases#methane (last updated Apr. 14, 2017).

28. Marc Ribaudo, *Reducing Agriculture's Nitrogen Footprint: Are New Policy Approaches Needed?*, USDA (Sept. 1, 2011), https://www.ers.usda.gov/amber-waves/2011/september/nitrogen-footprint/.

29. *Id.*

30. *Id.*

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According to the USDA:

> Agriculture is the single largest source of nitrogen compounds entering the environment in the U.S., contributing 73 percent of nitrous oxide emissions, 84 percent of ammonia emissions, and 54 percent of nitrate emissions in recent years. The production and release of nitrogen, however, has greatly changed the Earth's natural balance of nitrogen. The influx of nitrogen compounds that can change form and move easily between air, land, and water, such as nitrate, nitrous oxide, and ammonia, contributes to both beneficial and harmful changes in ecosystems.[31]

Much of the fertilizer applied to agricultural fields ends up in runoff that is leached into streams and rivers.[32] Fertilizers have been responsible for increased nitrate content in drinking water. This can be linked to thyroid production problems and methemoglobinemia (known as "blue baby syndrome," an oxygen-restricting condition, which can be fatal among infants).[33] Not only do these toxic chemicals contribute to public health concerns, they also pollute waterbodies and harm aquatic species that rely on those waterbodies.[34]

2. Ocean Dead Zones

Eutrophication, a condition of too much nitrogen or phosphorus, is a serious problem that occurs when rising concentrations of these chemical nutrients result in increased algae growth.[35] As this algae dies, it takes oxygen out of the water for its process of decomposition.[36] Therefore, as more algae is created from increased chemical nutrients in the water, less oxygen is available for phytoplankton and other organisms in the aquatic ecosystem.[37] When the oxygen slips below a certain level, the water takes on the effects of hypoxia, or a shortage of oxygen.[38] A hypoxic area quickly becomes a "dead zone" because fish and other mobile organisms migrate to other ecosystems due to the lack of oxygen, and all other organisms will

31. *Id*.

32. *See* J.B. Ruhl, *Farmland Stewardship: Can Ecosystems Stand Any More of It?*, 9 WASH. U. J.L. & POL'Y 1, 13 (2002).

33. *Drinking Water Blues: Nitrate Pollution from Coast to Coast*, GRACE COMM. FOUND., http://www.gracelinks.org/789/drinking-water-blues-nitrate-pollution-from-coast-to-coast (last visited July 28, 2017).

34. Ruhl, *supra* note 32, at 17-18.

35. Linda Breggin & D. Bruce Myers, Jr., *Subsidies with Responsibilities: Placing Stewardship and Disclosure Conditions on Government Payments to Large-Scale Commodity Crop Operations*, 37 HARV. ENVTL. L. Rev. 487, 497, 499 (2013).

36. *Id*. at 496.

37. *See id*.

38. *Id*.

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die off and cause a food chain collapse.[39] The largest example of hypoxia in the United States is the Gulf of Mexico dead zone.[40]

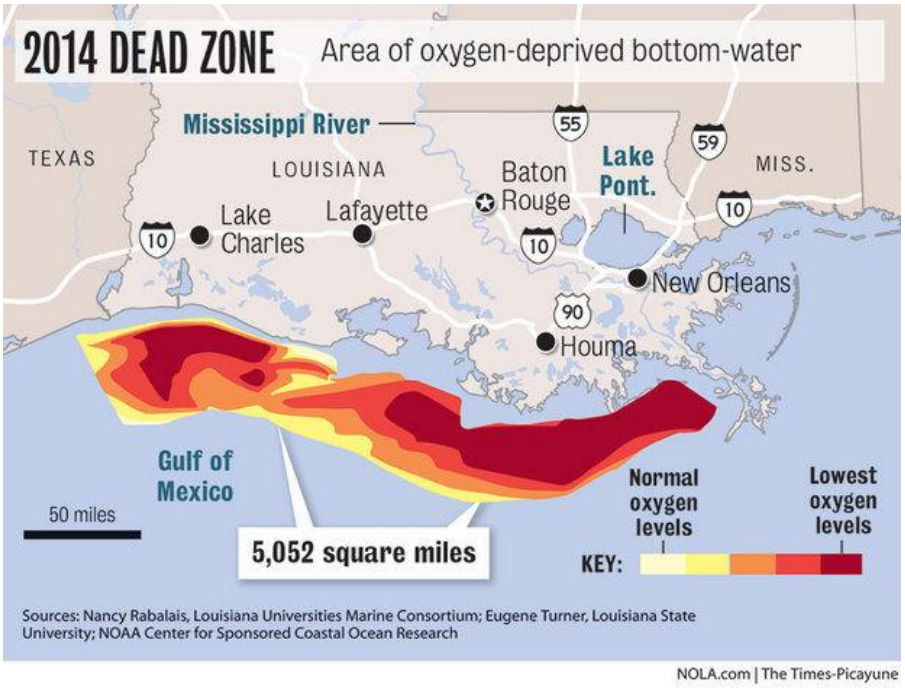

FIGURE 1.[41]

The Gulf of Mexico dead zone is largely the result of commodity crop production and fertilizer application in what is known as the corn belt of the United States near the Mississippi River.[42] Approximately two-thirds of the nitrogen entering the Gulf comes from industrial agricultural practices in the form of fertilizers or manure runoff. The USDA acknowledges the gravity of this problem and recommends changing the application and management of nitrogen fertilizer on farm

39. *Id*.

40. *See id*.

41. Mark Schleifstein, *Gulf's Low-Oxygen 'Dead Zone' Covers 5,052 Square Miles Along Louisiana's Coast*, TIMES-PICAYUNE (Aug. 4, 2014, 5:03 PM), http://www.nola.com/environment/index.ssf/2014/08/low_oxygen_dead_zone_covers_50.html.

42. Andrea Basche, *There's Nothing Average About This Year's Gulf of Mexico 'Dead Zone'*, ECOWATCH (June 13, 2016), https://www.ecowatch.com/theres-nothing-average-about-this-years-gulf-of-mexico-dead-zone-1891172459.html.

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fields.[43] However, until such changes are put into practice, the impacts to the Gulf of Mexico dead zone, and others like it, will continue to be astonishing. For instance, the aquatic ecosystems will be devastated, local residents will have difficulty securing seafood for personal consumption, and fishing communities will suffer as catches dwindle.

C. Over-Use of Antibiotics

Highly concentrated animal populations are often prone to disease.[44] The sheer density of thousands of animals, lack of sanitation in their living areas, poor diets, and the widespread use of antibiotics has caused issues such as the creation of new resistant strains of salmonella and E. coli.[45] In the United States, almost "12 million infections and 3900 deaths are estimated to arise from food-borne diseases."[46] Under current USDA regulations, farms do not need to publicize what kind or how many antibiotics are used in their livestock. This is another area in which information-forcing could reveal environmental harms and possibly inspire self-regulation.

IV. ENVIRONMENTAL HARMS FROM PLANT AGRICULTURE

A. Poor Nutrient Uptake Due to Monoculture

"In response to rising demand for food and reduced space for agricultural expansion, farmers have shortened or abandoned fallow periods and crop rotations in favor of continuous production."[47] The use of monoculture (also called monocropping), or planting the same type of crops repeatedly,[48] has caused a lack of

43. John H. Davidson, *The Federal Farm Bill and the Environment*, NAT. RESOURCES & ENV'T., Summer 2003, at 3 ("Perhaps the most dramatic physical evidence of this intense agricultural activity is the development of a large 'hypoxic' zone in the Gulf of Mexico. An area of the Gulf sometimes equal in size to New Jersey becomes depleted of oxygen every year because of the heavy flow of nitrogen and other nutrients down the Mississippi River. The Gulf's so-called dead zone can only be corrected, according to some government reports, by reducing fertilizer use by twenty percent and restoring five million acres of wetlands.").

44. Monica Nickelsburg, *5 Modern Diseases Grown by Factory Farming*, WEEK (Nov. 7, 2013), http://theweek.com/articles/457135/5-modern-diseases-grown-by-factory-farming.

45. *See id.*

46. Chakravorty, *supra* note 23, at 330.

47. KATHERINE KILLEBREW & HENDRIK WOLFF, UNIV. OF WASH., ENVIRONMENTAL IMPACTS OF AGRICULTURAL TECHNOLOGIES 4 (2010).

48. Susan Patterson, *What is Monocropping: Disadvantages of Monoculture in Gardening*, GARDENING KNOW HOW, https://www.gardeningknowhow.com/plant-problems/environmental/monoculture-gardening.htm (last updated Aug. 15, 2016).

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fertility in the soil.[49] "Historically, farmers have alternated cultivation with long fallow periods or rotations with other crops to manage soil fertility."[50] While this method has significantly increased crop yields, mono-cropping "can have detrimental impacts on soil conditions."[51] Economically, monoculture is a very efficient system, allowing for specialization in equipment and crop production.[52] However, monoculture is also controversial, as it can damage soil and provide habitat for parasitic species—increasing crop vulnerability to insects, invasive plants, and dangerous microorganisms.[53] The result is a more fragile ecosystem with an increased dependency on pesticides and artificial fertilizers.[54] The more frequent harvest also removes nutrients from the soil at a quicker pace, eventually causing deficiencies.[55]

B. Pesticide Use and Runoff

The increase in usage of chemical herbicides and pesticides over the past several decades has had a profound environmental impact. Over 98% of sprayed insecticides and 95% of herbicides reach a destination other than their target species; this includes non-target species, air, water, and soil.[56] The pollution can have harmful effects both near the production area and far downstream where the cumulative impacts of the pollution can be most severe. Human health and environmental cost from pesticides in the United States is estimated at $10 billion offset by $40 billion in increased agricultural production.[57]

Pesticide use has increased because farmers are engaging in monoculture. Normally, crops would be rotated to allow the soil a chance to build up its nutrient levels. However, as a result of monoculture, pests are able to attack these crops with more ferocity, requiring farmers to coat crops in higher amounts of pesticides.[58] Not surprisingly, nature has responded negatively to industrialized production. Pests attack monoculture yields more aggressively, insects develop resistance

49. *Id*.

50. KILLEBREW & WOLFF, *supra* note 47, at 4.

51. *Id*.

52. *Industrial Crop Production*, GRACE COMM. FOUND., http://www.sustainabletable.org/804/industrial-crop-production (last visited July 31, 2017).

53. Judith E. Koons, *Earth Jurisprudence: The Moral Value of Nature*, 25 PACE ENVTL. L. REV. 263, 316-17 (2008).

54. *Id*.

55. *Id*.

56. *Pesticides*, EVERYTHING CONNECTS, http://www.everythingconnects.org/pesticides.html (last visited July 31, 2017).

57. David Pimentel, *Environmental and Economic Costs of the Application of Pesticides Primarily in the United States*, 7 ENV'T DEV. & SUSTAINABILITY 229, 246 (2005).

58. *Why Insect Pests Love Monocultures, and How Plant Diversity Could Change That*,

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to pesticides, and bacteria develop further resistance.[59] The waters of the United States, and the 300 million Americans who rely on them, will continue to pay the environmental costs while agribusiness muddies our streams and rivers with pollution.[60]

C. Water Use and Irrigation Issues

The USDA estimates agricultural water use represents between 80% to 90% of the United States water consumption.[61] Below is a chart relating the approximate amount of water needed for each serving of common foods in the United States.

Food Item	**Water Needed for Production (Liter)**[62]
1 cup of coffee (125 ml)	140
1 glass of milk (200 ml)	200
1 slice of bread (30 g)	40
1 slice of bread (30 g) with cheese (10 g)	90
1 potato (100 g)	25
1 bag of potato chips (200 g)	185
1 tomato (70 g)	13
1 apple (100 g)	70
1 glass of apple juice (200 ml)	190
1 egg (40 g)	135
1 hamburger (150 g)	2400
Dry pasta (made in Italy; 1 kg)	1924
Margherita pizza (made in Italy; 725 g)	1216

SCI. DAILY (Oct. 12, 2016), https://www.sciencedaily.com/releases/2016/10/161012134054.htm.

59. Susan A. Schneider, Professor, Univ. of Ark. Sch. of Law, Reconsidering the Industrialization of Agriculture, Keynote Address Before the Journal of Environmental Law and Litigation Symposium (Oct. 1, 2010), *in* 26 J. ENVTL. L. & LITIG. 19, 21 (2011).

60. Chakravorty, *supra* note 23, at 326.

61. *Irrigation & Water Use*, USDA, https://www.ers.usda.gov/topics/farm-practices-management/irrigation-water-use/background.aspx (last updated Apr. 28, 2017) [hereinafter *Irrigation & Water Use*].

62. A.K. CHAPAGAIN & A.Y. HOEKSTRA, UNESCO-IHE INST. FOR WATER EDUC., WATER FOOTPRINTS OF NATIONS 42 (2004); *see also* M.M. ALDAYA & A.Y. HOEKSTRA, UNESCO-IHE INST. FOR WATER EDUC., THE WATER NEEDED TO HAVE ITALIANS EAT PASTA AND PIZZA 5 (2009).

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Agricultural advancement has preached the value of scientific innovation, and there is no argument the new irrigation techniques employed during this time and after were a mighty scientific advancement. The USDA estimates roughly 55.8 million acres (7.6%) of all U.S. cropland and pastureland were irrigated in 2012.[63] "In 2012, irrigated farms accounted for roughly half of the total value of crop sales on 28 percent of U.S. harvested cropland."[64] Indirectly, irrigation supports livestock "through irrigated production of animal forage and feed crops."[65] Irrigators continue to make significant capital investments in irrigation equipment and infrastructure.[66]

Agricultural water consumption can be greatly reduced if agricultural giants are simply pressured to publish how many millions of gallons of freshwater they are using for commodity crops. Scientific innovation swept into agriculture to prevent famine; therefore, scientific innovation can be motivated by consumer demand for crop production that uses less water.

V. CURRENT AGRICULTURE REGULATIONS AND PROGRAMS

A. Government Subsidies

Federal subsidies for farmers originally began in the 1930s as a safety net.[67] Today, only five crops—corn, cotton, wheat, rice, and soybeans—receive subsidies.[68] "American taxpayers spent $172 billion on commodity subsidies in a single decade between 1997 and 2006."[69] Further, "[c]orn farmers alone receive more than $4 billion annually from government subsidies," making corn the most subsidized American crop.[70] In 2005 alone, when pre-tax farm profits were $72 billion, the federal government handed out more than $25 billion in aid to farms (almost 50% more than the amount it pays to families receiving welfare in the United States).[71]

63. *Irrigation & Water Use, supra* note 61.

64. *Id.*

65. *Id.*

66. *Id.*

67. *See* Tom Morain, *The Great Depression Hits Farms and Cities in the 1930s*, IOWA PUB. TELEVISION, http://site.iptv.org/iowapathways/mypath/great-depression-hits-farms-and-cities-1930s (last visited July 31, 2017).

68. Deborah White, *What are U.S. Farm Subsidies?*, THOUGHTCO., https://www.thoughtco.com/us-farm-subsidies-3325162 (last updated Oct. 5, 2016).

69. William S. Eubanks II, *The Sustainable Farm Bill: A Proposal for Permanent Environmental Change*, 39 ENVTL. L. REP. 10493, 10497 (2009).

70. *Id.*

71. *Id.*; Dan Morgan et al., *Farm Program Pays $1.3 Billion to People Who Don't Farm*, WASH. POST (July 2, 2006), http://www.washingtonpost.com/wp-dyn/content/article/2006/07/01/AR2006070100962.html.

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Amongst the parade of horrible figures, roughly 36% of the current corn crop in the United States is fed to livestock.[72] By feeding animals corn instead of grass, which is a part of a cow's natural diet, livestock owners have been able to transition to large Concentrated Animal Feeding Operations (CAFO) because there is less need for open land when subsidized corn is readily available.[73]

Due to poor nutrition and confined quarters, many cattle are fed more antibiotics just to stave off disease.[74] Poor sanitation and the lack of reinforced waste lagoons leads to large volumes of waste often spilled into local rivers during rainstorms; this creates public health problems.[75] For example, in 1995, a waste lagoon burst in North Carolina releasing 25 million gallons of hog excrement sludge into the New River, killing fish and endangering residents.[76]

B. Regulatory Regimes That Apply

There is no federal statute that regulates the environmental impacts of farms. Most states do not regulate environmental harms, as well. For regulation that does take place, it must be pieced together through other statutes, such as the Clean Water Act (CWA) and Clean Air Act (CAA). While these statutes were landmark bills at the time, they contain many express and implied exemptions for farms.[77] For example, the CWA's wastewater permit program for point sources was amended to exclude "return flows from irrigated agriculture."[78] Similarly, the CAA contains de minimus discharge exceptions, typically applied to farms, that allow them to escape regulation.[79]

72. Jonathan Foley, *It's Time to Rethink America's Corn System*, SCI. AM. (Mar. 5, 2013), https://www.scientificamerican.com/article/time-to-rethink-corn/.

73. Chakravorty, *supra* note 23, at 332; *see CAFO: Concentrated Animal Feeding Operation: This is Animal Husbandry?*, FACTORY FARMING, http://www.factory-farming.com/CAFO.html (last visited Aug. 1, 2017).

74. *See* Chakravorty, *supra* note 23, at 330.

75. *See A Watershed Moment: Michigan CAFO Mapping Report*, NOCAFOS, http://nocafos.org/watershed-moment-michigan-cafo-mapping-report (last visited Aug. 1, 2017).

76. *Huge Spill of Hog Waste Fuels an Old Debate in North Carolina*, N.Y. TIMES (June 25, 1995), http://www.nytimes.com/1995/06/25/us/huge-spill-of-hog-waste-fuels-an-old-debate-in-north-carolina.html?mcubz=1.

77. *See Section 404 of the Clean Water Act: Exemptions to Permit Requirements*, EPA, https://www.epa.gov/cwa-404/exemptions-permit-requirements (last visited Aug. 1, 2017); *Agriculture: Agriculture and Air Quality*, EPA, https://www.epa.gov/agriculture/agriculture-agriculture-and-air-quality (last visited Aug. 1, 2017) [hereinafter *Agriculture and Air Quality*].

78. 33 U.S.C. § 1362(14) (2012).

79. *Agriculture and Air Quality*, *supra* note 77.

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Additionally, EPA regulations do not have a scope wide enough to approach the issue of livestock-related greenhouse gases. The EPA does have legal authority under several Clean Air Act mechanisms to regulate greenhouse gas emissions from CAFOs,[80] but it raised emissions thresholds under the Title V operating permits program so that only the largest emitters of greenhouse gases are required to have permits. Few livestock producers would qualify.

On June 23, 2014, however, the United States Supreme Court issued a decision addressing the application of stationary source permitting requirements to greenhouse gases in *Utility Air Regulatory Group v. Environmental Protection Agency*.[81]

> In very brief summary, the Supreme Court said that the EPA may not treat greenhouse gases as an air pollutant for purposes of determining whether a source is a major source required to obtain a Prevention of Significant Deterioration (PSD) or title V permit. The Supreme Court also said that the EPA could continue to require that PSD permits, otherwise required based on emissions of conventional pollutants, contain limitations on GHG emissions based on the application of Best Available Control Technology (BACT). The EPA is continuing to examine the implications of the Supreme Court's decision, including how the EPA will need to revise its permitting regulations and related impacts to state programs.[82]

Congress has prohibited the EPA from using its funds to issue or implement any rule that would require livestock producers to secure a Title V permit for greenhouse gas emissions, sometimes referred to as the cow tax.[83] The EPA does require mandatory greenhouse gas reporting, and its rules cover manure management at certain kinds of facilities, but these are a very small subset of all CAFOs.[84]

Virtually all major federal environmental statutes and their expanding regulations give favorable treatment and many exemptions to the agriculture sector. In the last 100 years, farms have transformed into large-scale operations that generate significant amounts of pollution, and environmental laws have not been updated to keep pace. Agriculture is now the only major industrial sector that is routinely exempted from baseline environmental safeguards.

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80. *Id*.

81. *See generally* Util. Air Regulatory Grp. v. Envtl. Prot. Agency, 134 S. Ct. 2427 (2014).

82. Memorandum from Janet G. McCabe, Acting Assistant Adm'r: Office of Air and Radiation & Cynthia Giles, Assistant Adm'r: Office of Enf't and Compliance Assurance, to Regional Adm'r, U.S. Envtl. Prot. Agency (July 24, 2014) (on file with author).

83. Consolidated Appropriations Act, Pub. L. No. 114-113, § 418 (2016).

84. *See* 40 C.F.R. §§ 98.1–98.2 (2017).

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Currently, the farming industry is one of the greatest sources of water pollution in the nation.[85] The 1998 White Paper entitled the "Clinton Administration Clean Water Action Plan" stated that:

> Leading causes of water quality impairments reported by states include siltation, nutrients, bacteria, oxygen-depleting substances, metals, habitat alteration, pesticides, and organic toxic chemicals. The majority of this pollution results from polluted runoff. . . . Nationally, agriculture is the most extensive source of water pollution, affecting 70 percent of impaired rivers and streams and 49 percent of impaired lake acres.[86]

The federal government allows the pollution (mainly due to under-regulation) to continue in such federal legislation as the CWA, which exempts many environmentally harmful farming practices from its scope.[87] Despite the inclusion of CAFOs, any animal feeding operation that sustains crops, vegetation, forage growth, or post-harvest residues is exempt from the CAFOs regulations under the Act.[88] Therefore, there are still many CAFOs that are unregulated, and numerous other facilities that are legally allowed to pollute.[89] CAFOs are given a huge doorway in which to pollute, as the provision regarding nutrient management plans can escape the effluent limitation prohibition.

The Unites States deals with livestock runoff primarily under the CWA.[90] The Act distinguishes between point and nonpoint sources.[91] Discharge from animal confinements and process areas represent point sources of pollution, while application of manure solids and lagoon effluent to pasture or cropland may cause nonpoint source pollution.[92] Any CAFO can discharge pollutants based on possession of a permit issued by the National Pollutant Discharge Elimination System (NPDES).[93] However, CAFOs are treated as low priority, and loopholes allow CAFOs to avoid obtaining an NPDES permit.[94]

85. *Nutrient Pollution: Sources and Solutions*, EPA, https://www.epa.gov/nutrientpollution/sources-and-solutions (last visited Aug. 1, 2017).

86. CAROL BROWNER, ADMINISTRATOR OF THE EPA & DAN GLICKMAN, SECRETARY OF THE USDA, CLEAN WATER ACTION PLAN: RESTORING AND PROTECTING AMERICAS WATERS 9 (1998), http://infohouse.p2ric.org/ref/32/31802.pdf.

87. Ruhl, *supra* note 32, at 17.

88. 40 C.F.R. § 122.21(b)(1) (2017).

89. *See id.*

90. *See* 40 C.F.R. § 122.23 (2017).

91. *Id.*

92. 40 C.F.R. § 122.24 (2017).

93. 40 C.F.R. § 122.26 (2017).

94. Georgina Gustin, *Groups Seek End to Factory Farm Pollution Loopholes Dating*

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Under the CAA, each state must develop an enforceable plan to meet national ambient air quality standards or be regulated by the EPA.[95] Regulations emphasize major sources that emit threshold levels of pollutants;[96] these thresholds implicitly or explicitly exclude farmers. Federal and state officials generally place a low priority on regulating agricultural sources, and a lack of adequate air quality monitoring data hampers the ability of regulators to answer key questions.[97]

Finally, all states have enacted "right-to-farm" laws, which generally exempt farms from common law nuisance attack.[98] Although the degrees of protection afforded by these laws vary, the basic theme is to protect farms from private nuisance actions by codifying the "coming to the nuisance" rule.[99] These laws are a significant obstacle to the use of common law environmental remedies against farms.

C. Other Federal Statutes

1. The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)

Farms purchase pesticides and fertilizers, apply them to crops and soils, and any excess is removed by water runoff and air dispersal. The CWA and CAA do not cover the disposal of chemicals in a way that ensures efficiency or safety. Consistent with that theme, a statute that is mainly charged with the regulation of chemicals in agriculture, FIFRA, does little to regulate farm applications of pesticides and leaves fertilizers untouched.[100] FIFRA is primarily a product-licensing statute under which no one may sell, distribute, or use a pesticide unless it has been registered with the EPA.[101]

Back to 1970s, INSIDE CLIMATE NEWS (Mar. 9, 2017), https://insideclimatenews.org/news/08032017/cafo-epa-regulations-scott-pruitt-concentrated-animal-feeding-operations (illustrating for instance, if their lagoon can contain all wastewater absent a 25-year, 24-hour storm event).

95. 42 U.S.C. § 7410(a)(1) (2012).

96. 42 U.S.C. § 7413(b) (2012).

97. *See* CLAUDIA COPELAND, CONG. RESEARCH SERV., AIR QUALITY ISSUES AND ANIMAL AGRICULTURE: A PRIMER 9, 10 (2014), http://nationalaglawcenter.org/wp-content/uploads/assets/crs/RL32948.pdf.

98. *See generally* Neil D. Hamilton, *Right-to-farm Laws Reconsidered: Ten Reasons Why Legislative Efforts to Resolve Agricultural Nuisances May Be Ineffective*, 3 DRAKE J. AGRIC. L. 103, 104 (1998).

99. *See generally id.*

100. *See generally* 7 U.S.C. § l36 (2012).

101. *See* 7 U.S.C. § 136a (2012).

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2. The Toxic Substances Control Act (TSCA)

Farm use of fertilizers is subject to very little federal and state control. TSCA requires registration of chemical ingredients of fertilizers. However, it imposes no use restrictions equivalent to FIFRA's labeling, certification, worker safety, or recordkeeping provisions. Furthermore, few states impose more rigorous controls.[102] Other federal environmental laws contain numerous express exemptions for normal application of fertilizers.[103] Overall, fertilizers are simply not in the purview of federal environmental laws.

3. Resource Conservation and Recovery Act (RCRA)

Farms handle large volumes of chemicals, much of which are disposed either directly as spent or residue material, or indirectly as excess fertilizer or pesticide. Most industries in this position must deal with hazardous waste management and disposal under the regulation of RCRA.[104] Farms, however, do not. Large farms do not need to engage in monitoring, reporting, or liability for storage and disposal of toxic chemicals. In fact, FIFRA-registered pesticides and agricultural uses of fertilizers are also exempt.[105]

VI. INFORMATION-FORCING, GENERALLY

A. Example: The Emergency Planning and Community Right-to-Know Act

An appropriate example of information-forcing in a different industry is found in The Emergency Planning and Community Right-To-Know Act (Right-to-Know Act).[106] This Act was passed by Congress "in response to concerns regarding the environmental and safety hazards posed by the storage and handling of toxic chemicals" (this was "triggered by the 1984 disaster in Bhopal, India, caused by an accidental release of methylisocyanate," a known toxin used in pesticides).[107] The release "killed or severely injured more than 2000 people."[108] Pulmonary edema was the cause of most deaths, and many resulted from secondary respiratory

102. *See Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) and Federal Facilities*, EPA, https://www.epa.gov/enforcement/federal-insecticide-fungicide-and-rodenticide-act-fifra-and-federal-facilities (last visited Aug. 1, 2017).

103. J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L. Q. 263, 315 (2000) (citations omitted).

104. *See* 42 U.S C. § 6901 (2012).

105. *See* 42 U.S.C. §§ 6901–6992k (2012).

106. *See generally* 42 U.S.C. §§ 11001–11050 (2012).

107. *What is EPCRA?*, EPA, https://www.epa.gov/epcra/what-epcra (last visited Aug. 2, 2017) [hereinafter *What is EPCRA?*].

108. *Id.*

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infections.[109] Survivors continue to exhibit damage to the lungs and eyes.[110] Reproductive effects and an increased number of stillbirths and miscarriages were also noted in the survivors of the accident.[111]

To reduce the likelihood of such a disaster in the United States, Congress imposed requirements for federal governments, state and local governments, tribes, and industries regarding chemicals.[112] "These requirements covered emergency planning and 'Community Right-to-Know' reporting on hazardous and toxic chemicals."[113]

The Right-to-Know provisions continue to help increase the public's "access to information on chemicals at individual facilities, their uses, and releases into the environment."[114] Facilities that involve manufacturing, processing, or storing of designated hazardous chemicals must make Material Safety Data Sheets (MSDSs) available to state officials, local officials, and local fire departments.[115] MSDSs "describe the properties and health effects of these chemicals."[116] Facilities must also report inventories of all on-site chemicals for which MSDSs exist.[117]

The EPA maintains the data reported in a publicly accessible database, providing communities with information about toxic chemical releases and waste management activities.[118] This public data supports informed decision-making at all levels by industry, government, nongovernmental organizations, and the public. This data is used by a range of stakeholders—including businesses that are required to report the information—allowing interested parties to identify sources of releases, analyze hazards to public health and the environment, and encourage pollution prevention.

Not only does the EPA and other federal agencies have similar data requirements, businesses also use their own reports to achieve gains in cost reduction and

109. *Methyl Isocyanate*, EPA, https://www.epa.gov/sites/production/files/2016-09/documents/methyl-isocyanate.pdf (last visited Aug. 2, 2017).

110. Edward Broughton, *The Bhopal Disaster and Its Aftermath: A Review*, ENVTL. HEALTH (May 10, 2005), https://ehjournal.biomedcentral.com/articles/10.1186/1476-069X-4-6#Tab1.

111. *Id*.

112. *Id*.

113. *What is EPCRA?*, *supra* note 107.

114. *Id*.

115. *See* 42 U.S.C. § 11023 (2012).

116. *What is EPCRA?*, *supra* note 107.

117. *Id*.

118. *EPCRA Sections 311-312*, EPA, https://www.epa.gov/epcra/epcra-sections-311-312 (last visited Aug. 2, 2017).

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performance management. DuPont, an American chemical company, lists this data on its website and uses the emissions reductions as a marketing tool.[119] DuPont's 2014 Global Reporting Initiative Report states, "DuPont's corporate energy efficiency strategy is managed through our Bold Energy Plan. We have an online database that tracks plant performance toward annual energy targets. The database currently tracks over 2,400 completed, in progress, and proposed projects, some of which require capital investment."[120] Capital investment, DuPont says, is the backbone of the Plan: "Availability of capital for energy efficiency improvement projects is critical—setting public goals alone will not drive improvement unless you have adequate financial and personnel resources available to implement improvements."[121]

Boeing similarly "tracks its progress at reducing [Toxic Release Inventory (TRI)] emissions and invests in pollution prevention technology that has resulted in more than 81 percent reductions in emissions since 1991."[122] The public relies on TRI emissions data for a range of activities including policy assessment, strategies for pollution reduction, and investment options.[123] "Outside of the regulated community, investment companies have used TRI data to advise clients who want to invest in companies with a record of reducing environmental releases."[124] "TRI data have been useful in measuring companies' overall environmental performance, which includes their compliance with regulations and their overall emissions."[125]

B. Example: Safe Drinking Water and Toxic Enforcement Act

Another example of information-forcing can be found in the Safe Drinking Water and Toxic Enforcement Act. In 1986, California adopted a ballot initiative popularly known as Proposition 65 (Prop. 65)—officially known as the Safe Drinking Water and Toxic Enforcement Act.[126] Prop. 65 requires businesses to give "clear and reasonable warning" to anyone they expose to listed carcinogens and

119. *See generally* DUPONT, 2014 GLOBAL REPORTING INITIATIVE REPORT 3 (2014), http://www.dupont.com/content/dam/assets/corporate-functions/our-approach/sustainability/documents/DuPont2014GRIReport.pdf.

120. *Id*. at 31.

121. *Id*. at 36.

122. U.S. GOV'T ACCOUNTABILITY OFFICE, REPORT TO CONGRESSIONAL REQUESTERS, TOXIC CHEMICAL RELEASES: EPA ACTIONS COULD REDUCE ENVIRONMENTAL INFORMATION AVAILABLE TO MANY COMMUNITIES 24 (2007), http://www.gao.gov/new.items/d08128.pdf.

123. *See generally id*.

124. *Id*. at 24.

125. *Id*.

126. *See* CAL. HEALTH & SAFETY CODE §§ 25249.5–25249.13 (West 2017).

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reproductive toxins.[127] Failure to give adequate warning may result in stiff civil penalties enforceable by the Attorney General or by citizen suit, unless the person responsible can show that the exposure poses no significant risk.[128] The effect of Prop. 65, and its key strength, is placing the burden on businesses to determine when exposures above a minimum risk threshold may occur.[129]

Prop. 65 further requires businesses to warn those likely to be exposed or to take preventive action to reduce exposures below the actionable risk threshold.[130] This shifts the burden of producing the information needed to determine whether a particular level of emissions is permissible from the regulatory agency to the regulated business. Under conventional approaches in environmental law, the regulatory agency bears the burden of producing the information necessary to justify regulation, and polluters have a perverse incentive not to produce or reveal toxicity and exposure information that might lead to regulation. Prop. 65 reverses the incentive, adopting "a broad and indefinite duty to warn, coupled with stiff liability for breach of that duty."[131]

Prop. 65 is not enforced by a governmental regulatory agency.[132] Instead, it is enforced when legal action is brought against a business that allegedly has failed to warn or has discharged a listed chemical into a source of drinking water.[133] There are three ways that Prop. 65 can be enforced: (1) The California Attorney General can bring a Prop. 65 enforcement action; (2) Any district attorney or city attorney (for cities whose population exceeds 750,000) may also enforce Prop. 65; (3) any party (defined as an individual or a group) acting in the public interest may enforce Prop. 65 by filing a lawsuit against a business alleged to be in violation of the law.[134] Penalties for violating Prop. 65 can be as high as $2500 per day for each violation.[135]

C. Example: Securities and Exchange Commission (SEC) Requirements

A final example of how information-forcing is implemented can be found in the regulations under the purview of the SEC. Regulation S-K, under the standard

127. CAL. HEALTH & SAFETY CODE § 25249.6 (West 2017).

128. *See* CAL. HEALTH & SAFETY CODE § 25249.7 (West 2017).

129. *See Businesses and Proposition 65*, OEHHA, https://oehha.ca.gov/proposition-65/businesses-and-proposition-65 (last visited Aug. 2, 2017).

130. *See Proposition 65 in Plain Language*, OEHHA (Feb. 1, 2013), https://oehha.ca.gov/proposition-65/general-info/proposition-65-plain-language.

131. Bradley C. Karkkainen, *Information-Forcing Environmental Regulation*, 33 FLA. ST. U. L. REV. 861, 875 (2006).

132. *See id.* at 867.

133. *See id.*

134. CAL. HEALTH & SAFETY CODE § 25249.7 (West 2017).

135. CAL. HEALTH & SAFETY CODE § 25249.7(b)(1) (West 2017).

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instructions for filing with the Securities and Exchange Act of 1934 and the Energy Policy and Conservations Act of 1975, requires companies to disclose any facts that are reasonably likely to have a material effect on the company's financial condition or operating performance.[136] Regulation S-K also requires companies to disclose risk factors that may affect them.[137] Environmentally-related information has often met this description, and over time, proper analysis requires the consideration that consumers may demand more or less of a company's product based on perceptions of its environmental effects.[138] For example, companies that sell organic food products may see increased demand based on environmental information.[139] While this is not a hard-and-fast rule, it has slowly wound itself around the disclosure requirements, organically making the information-forcing of environmental metrics an obligation.[140]

A company that develops a negative reputation for its environmental practices may suffer decreased demand for its products or services.[141] Accordingly, the SEC considers this environmental information trend relevant to the company's present and future financial performance; therefore, it is material under Regulation S-K.[142]

Requiring disclosure of these trends "in consumer demand could result in substantial environmental benefits."[143] The SEC's environmental guidance, however, has not addressed the materiality of information about exogenous changes in consumer behavior related to a company's environmental reputation or the environmental attributes of its products—even though such information seems potentially relevant to investors and therefore material under Regulation S-K.[144] Some major companies, such as Wal-Mart, have imposed environmental requirements on their supply chains.[145] Scholars studying the phenomenon have linked compa-

136. 17 C.F.R. § 229.303(a)(3)(ii) (2017).

137. 17 C.F.R. § 229.503(c) (2017).

138. Todd S. Aagaard, *Using Non-Environmental Law to Accomplish Environmental Objectives*, 30 J. LAND USE & ENVTL. L. 35, 41-43 (2014).

139. *See* Matthew Saltmarsh, *Strong Sales of Organic Foods Attract Investors*, N.Y. TIMES (May 23, 2011), http://www.nytimes.com/2011/05/24/business/global/24organic.html?mcubz=1.

140. Aagaard, *supra* note 138, at 41-43.

141. *See, e.g.*, PROCTER & GAMBLE CO., 2013 ANNUAL REPORT (2013), http://www.pginvestor.com.

142. Aagaard, *supra* note 138, at 43.

143. *Id.* at 44.

144. *Id.*

145. *See Walmart Highlights Progress on the Sustainability Index*, WALMART (Sept. 12, 2013), http://corporate.walmart.com/_news_/news-archive/2013/09/12/walmart-highlights-

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nies' decisions to impose environmental standards on their supply chain to pressure from consumers and investors, which seems to suggest the materiality of information about supply chain environmental performance.[146]

D. Information-Forcing on Hydraulic Fracturing

Taking a helpful model from information-demands on hydraulic fracturing, we can begin to see how this type of regulatory scheme may affect a large industry like agriculture. In a world with no cost limitations, we would know the exact state of the environment in a given region prior to drilling and fracturing: the amount of industrial and residential development (and associated pollution) that has already occurred, existing human populations in the area and their current health status, plant and animal species in the area, habitat fragmentation, average air quality for each regulated air pollutant, and current water quality as measured by the concentration of every potential substance that could enter water as a result of drilling and fracturing. We would then identify and record data on the type and area of habitat affected by new development, the types and numbers of species impacted, the types and volumes of chemicals and wastes spilled and total area affected by the spill, and the types and quantities of air pollutants emitted at each site. We would also assess the extent to which human health in the area had been impacted.

Information plays several key roles in any environmental regulatory regime. First, collecting data on the current state of the environment provides an important baseline. With knowledge of these matters (the level of contaminants in the air, water, and soil), we can better understand the impacts caused by later industrial activity. Requiring industrial actors to disclose information about their activities, including the chemicals used and certain pollutions released, can allow us to identify impacts above the baseline and potentially incentivize better industrial behavior.

"The U.S. Geological Survey (USGS) is embarking upon a relatively ambitious temporal and spatial analysis of surface-water and groundwater quality in areas of unconventional oil and gas development.'"[147] The analysis "will use 'existing national and regional datasets to describe water quality' and will later 'evaluate water-quality changes over time where there are sufficient data' available."[148]

Several states have previously required (or otherwise incentivized) industry

progress-on-the-sustainability-index.

146. Michael P. Vandenbergh, *The New Wal-Mart Effect: The Role of Private Contracting in Global Governance*, 54 UCLA L. REV. 913, 947 (2007).

147. Hannah J. Wiseman, *Hydraulic Fracturing and Information Forcing*, 74 OHIO ST. L.J. FURTHERMORE 86, 90-91 (2013) (citations omitted).

148. *Id.* at 91 (citations omitted).

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> to conduct baseline tests, and more are beginning to add this mandate to their regulations. The most common types of baseline tests required or incentivized by states are the sampling of water for certain pollutants, although some states also require information on water quantity and the source of water to be used in fracturing.[149]

Baseline testing gives policy makers more information to determine whether current regulations are effective and helps inform future policy. Similar testing requirements could be used in the agricultural industry with similar outcomes.

> Prior to 2012, Pennsylvania incentivized baseline testing for existing pollution in water by presuming that water contamination within 1,000 feet of oil and gas operations that was identified within six months of the end of the operations was caused by oil and gas activity. This presumption could be rebutted by industry, thus incentivizing very careful baseline testing near the proposed oil or gas well site.[150]

West Virginia "has a similar presumption for water pollution that occurs within 1,500 feet of an oil or gas well."[151] Other states, like Michigan, "directly require baseline testing, some of which covers existing water quantity and flow in addition to chemical constituents."[152] Michigan "requires a 'hydrogeological investigation' around a proposed well facility to 'establish local background groundwater quality,' including sampling of certain water constituents . . . , a 'geologic description of earth materials,' a description of the most shallow groundwater, and an analysis of groundwater flow."[153] This data "can suggest how far chemicals leaking from surface pits would have to migrate before reaching an aquifer, as well as how well the soil would slow migration."[154] An application of this data may help forge new technology and policy. For example, "clay might better prevent pollutants from leaching into groundwater than would sand," which was used previously.[155]

VII. INFORMATION-FORCING PROPOSAL FOR THE AGRICULTURAL INDUSTRY

The proposal to address industrial farms through conventional prescriptive regulation requires that we know as much as possible about the identified farm sectors. Moreover, any program directed at the remainder of farms will require

149. *Id*. at 92 (citations omitted).
150. *Id*. (citations omitted).
151. *Id*. (citations omitted).
152. *Id*. (citations omitted).
153. *Id*. (citations omitted).
154. *Id*.
155. *Id*.

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massive amounts of information to enable the use of other instruments such as taxes, incentives, and trading, to work effectively. Information, in other words, is a critical component of the administration of an environmental law for all farms and one that is in short supply. Nowhere is this more accurate than for the use and release of agricultural pesticides and fertilizers.

The metrics that should be collected and distributed publicly are: pesticide use and amounts, greenhouse gas emissions from livestock, nitrate emissions and synthetic nitrate use, water use amounts, land acreage use, and soil runoff amounts. This information, normally silenced, should be made public. This will cause consumers to be more informed, and encourage farms to regulate themselves in an effort to keep the consumer satisfied. As mentioned previously, the TRI program for reporting toxic chemical releases from manufacturing industries illustrates how information can facilitate the education of regulators, the public, and the industry about the magnitude of pollutant releases. This aspect of the TRI alone has had beneficial pollution reduction effects. A similar program for agro-chemical releases—a Farm Release Record (FRR)—would provide a crucial source of information for the industrial farm-permitting programs already in place (such as those under the CAA and CWA) and feed directly into future tax incentives. The administration and pollution reduction benefits of this type of program are already apparent in California, where state pesticide application reporting requirements exceed those of FIFRA. This accomplishment demonstrates a national FRR can be established and used to benefit farms, consumers, and policy makers alike.

A. Advantages of Information-Forcing

The current agricultural system places externalities (costs of transaction) on society as a whole, rather than on the individual producer.[156] For example, the environmental cost of the dead zone in the Gulf of Mexico is not factored into the cost of the commodity crops grown in the upper Midwest, even though the fertilizer runoff from those crops is a direct cause. Additionally, the impact of antibiotic resistance is not included in the cost of meat production, even though experts warn of significant public health concerns. All of these costs are associated with the basic tenets of industrialized production, but they are not considered in the economic analysis of the overall model.[157] They are externalities with costs spread throughout society over the long-term and not factored into the cost of production.[158]

An important study on the external costs of agricultural production in 2004

156. Erin M. Tegtmeier & Michael D. Duffy, *External Costs of Agricultural Production in the United States*, 2 INT'L J. AGRIC. SUSTAINABILITY 1 (2004).

157. *Id.*

158. *Id.* at 2.

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attempted to fully calculate the environmental impacts of agriculture.[159] The study valued externalities of crop production in the United States with respect to natural resources, wildlife and ecosystem biodiversity, and human health at roughly between $6 billion and $17 billion annually.[160] The authors conclude that crop production is associated with the following costs: at least $300 million in damage to water resources from nutrients and pesticides (while noting this is not a complete review of all relevant impacts on water); $2 billion to $13 billion in damage to soil resources; $450 million in damage to air resources; $1.1 billion in damage to wildlife and ecosystem biodiversity; and $1 billion in damage to human health due to pesticides.[161] This is precisely the type of study needed to characterize (in dollar amounts) the downstream harms attributable to agricultural operations. In order to adequately address and internalize the costs associated with industrial agriculture, we need more information from studies such as this.

One of the advantages of information-forcing, as opposed to traditional regulation, is that data provides a better understanding about the impact of agriculture. For example, while there may be a large amount of information and data about the current state of environmental issues (for instance, the ocean dead zone in the Gulf of Mexico, where oxygen in the water is depleted by runoff from farms), the responsibility for their creation is entirely generalized because we do not have information about the specific activities of agricultural operations. Generating that information could create public pressure on farming operations to change behavior.

The public receives little or no information about the quantity of fertilizers and pesticides that are contained in the runoff from large-scale commodity crop operations.[162] The environmental laws that are intended to help communities plan for and respond to chemical spills and other emergencies, as well as provide information to citizens about releases of toxic chemicals, contain significant exemptions for agriculture.[163]

Without at least a rudimentary understanding of how industrialized agriculture impacts climate change and how, in turn, climate change impacts the planet, vast sources of greenhouse gas emissions will remain difficult to subject to regulatory influence. In this respect, recent steps away from greater governmental sunshine in the area of environmental information deserve serious inspection.

159. *See generally id*.
160. *Id*. at 1.
161. *Id*. at 4.
162. *See* 7 U.S.C. § 2276 (2012).
163. *See id*.

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One economic theory states that in a comparison of two solutions to optimization of resources, the second-best theory may look nothing like the first.[164] This economic thesis is called the "Theory of the Second-Best" and was first discussed in a 1956 paper entitled, "The General Theory of the Second Best" by Richard Lipsey and Kevin Lancaster.[165] Lipsey and Lancaster explained, when it comes to the theoretical conditions for an optimal allocation of resources the absence of any of the jointly necessary conditions does not imply the next-best allocation is secured by the presence of all the other conditions.[166] Rather, the second-best scenario may require the other necessary conditions for optimality also be absent, maybe even all of them.[167] Additionally, Lipsey and Lancaster clarified the Theory of the Second-Best does not equate to a watered-down first-best solution, but rather, it may look completely different than the first-best solution.[168]

Applying this theory, the regulation of agriculture and the forcing of information look starkly different. The former deals chiefly with the behavior of agricultural entities, and the latter merely requires the behavior be documented. Because agricultural regulation has not stopped environmental damage, the Theory of the Second-Best is a better allocation of resources. In this sense, forcing agricultural entities to release information regarding chemical releases, greenhouse gas emissions, and water use (or otherwise publicizing their environmental footprint) could cause these entities to self-regulate. This Article argues that such rules may prove especially useful in designing a new generation of environmental measures that are more flexible than conventional command style rules (requiring the industry to either do something or not to do something that will directly impact their inputs and outputs), but do not sacrifice regulatory accountability.

B. Potential Obstacles to an Information-Forcing Requirement

There are currently many laws in place to prevent the spread of potentially damaging information regarding agricultural facilities. For instance, 7 U.S.C. § 2276(a) prohibits the release of information from agricultural operations where the party responsible is identifiable.[169] These prohibitions apply to the Secretary of Agriculture, any employee or officer of the Department, and to any contractors or cooperators of the Department.[170] The general confidentiality rules of § 2276 extend

164. R. G. Lipsey & Kelvin Lancaster, *The General Theory of the Second Best*, 24 REV. ECON. STUD. 11, 11 (1957).

165. *See generally id*.

166. *Id*. at 27-32.

167. *Id*.

168. *Id*.

169. 7 U.S.C. § 2276(a) (2012).

170. *Id*.

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the reach of the prohibition to "any other person."[171] Under § 2276, this information is immune from disclosure laws and cannot be requested or obtained for a court proceeding. Revealing such information carries penalties of up to $10,000 in fines and up to a year in prison.[172]

In February of 2013:

> [F]arm groups discovered that the EPA had disclosed data about livestock operations that had been gathered from agencies in 30 states. The information, which in some cases included cellphone numbers and the number of animals farms have, was turned over to the Natural Resources Defense Council, Earthjustice, and the Pew Charitable Trust under the Freedom of Information Act [(FOIA)]. The states included the two largest hog producers, Iowa and North Carolina, as well as California, Nebraska and Texas.[173]

The American Farm Bureau Federation and National Pork Producers Council subsequently filed suit against the EPA, and in September 2016, the federal appeals court ruled "the agency had erred in not exempting the release of personal information about CAFO owners through [FOIA]."[174]

Additionally, a provision inserted in the omnibus spending package "directs the Government Accountability Office to analyze the EPA's policies for responding to requests for personal information of private businesses, as well as steps the EPA is taking to better manage private information."[175] A second measure, added to the most recent version of the Farm Bill, "would prohibit the EPA from publicly disclosing names, telephone numbers, email addresses, GPS coordinates and other information on agricultural operations. The agency would be barred from requiring farms to consent to information disclosure in order to get a permit approved."[176]

An example of a potential obstacle can be foreseen by looking at the greenhouse gas emissions from livestock and the difficulties surrounding the information-gathering therein. As mentioned previously, livestock greenhouse gases (largely methane), carbon dioxide, and nitrous oxide are a major part of the greenhouse gas problem. There are several reasons why regulators have not pushed to

171. *Id*.

172. 7 U.S.C. § 2276(c) (2012).

173. Phillip Brasher, *Farm Groups Sue to Stop Data Disclosure*, ROLL CALL (Jan. 24, 2014), http://www.rollcall.com/news/farm_groups_sue_to_stop_data_disclosure-230371-1.html.

174. Todd Neeley, *CAFO Suit Settled*, PROGRESSIVE FARMER (Apr. 3, 2017, 11:55 AM), https://www.dtnpf.com/agriculture/web/ag/news/livestock/article/2017/04/03/epa-info-release-scope-narrowed.

175. Brasher, *supra* note 173.

176. *Id*.

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have livestock emissions controlled. Emissions from livestock are difficult to measure and model.[177] Compared to smokestacks or tailpipes, tracking emissions from cows, pigs, chickens, and their waste is difficult.[178]

Another reason for the lack of data regulation is that livestock greenhouse gas regulations are generally controversial, politically.[179] Any stringent regulation would likely increase the cost of meat. When California started regulating fuel suppliers under AB 32, the hidden gas tax, Californians were outraged.[180] Other similar hidden taxes would fall under the same outrage.

The United States pioneered many efforts to collect and disseminate information regarding environmental hazards.[181] More recently, however, those laws have been curtailed in light of the desire to protect potentially valuable commercial information embodied within environmental disclosures.[182] The difficulty in obtaining information is a major obstacle, coupled with the difficulty in actually publishing that information. These are matters to keep in mind when implementing an FRR.

VIII. CONCLUSION

Much of the earth's environmental harms are caused by modern industrialized agriculture practices, which were developed for the sole purpose of maximizing production. Large-scale industrialized agriculture has produced long-term environmental harms that are not adequately taken into account and are not remedied. The current system of agricultural regulations does little to actually regulate. Industrialized agriculture is allowed to exempt itself from almost all of the major environmental statutes and has even attempted to limit what little information can be acquired through ag-gag laws.

Information-forcing will have a much better chance at limiting the environ-

177. Bobby Magill, *Measuring Cow & Pig Emissions Goes to New Heights*, CLIMATE CENT. (July 10, 2014), http://www.climatecentral.org/news/livestock-methane-emissions-satellite-co2-17749.

178. *Id*.

179. *See, e.g.*, Harry Drajpuch, *California Gas Tax Should Be Delayed*, SAN DIEGO UNION-TRIB. (Aug. 6, 2014), http://www.sandiegouniontribune.com/opinion/commentary/sdut-california-gas-tax-delay-carb-perea-2014aug06-story.html.

180. *See id*.

181. *See generally* Karkkainen, *supra* note 131, at 883.

182. Mary L. Lyndon, *Secrecy and Access in an Innovation Intensive Economy: Reordering Information Privileges in Environmental, Health, and Safety Law*, 78 U. COLO. L. REV. 465, 531 (2007).

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mental harms caused by agriculture than the regulation the United States has already attempted to implement. The information gathered will not only inform policy makers, but it will also attempt to curb environmental harms through consumer-informed purchasing information and internal regulation by the farms. Metrics can be stored in a database system and open to use by the public, stockholders, businesses, and the farms themselves.