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Symposium: Continuing to Fight Today's Environmental Challenges: Climate Change, Health Concerns, Energy, and Food Supply

Exposing the Invisible Costs of Commercial Agriculture: Shaping Policies with True Costs Accounting to Create a Sustainable Food Future

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EXPOSING THE INVISIBLE COSTS OF COMMERCIAL AGRICULTURE: SHAPING POLICIES WITH TRUE COSTS ACCOUNTING TO CREATE A SUSTAINABLE FOOD FUTURE

Nicole E. Negowetti*

I. INTRODUCTION

Cheap food has been the hallmark of the American food system for decades.[1] However, the True Cost Accounting 2015 Report by Food Tank and the subsequent True Cost of American Food Conference in April 2016 has exposed the realities of food production.[2] In particular, the real cost to the environment is extremely high.[3] The American agricultural industry enjoys significant legal protections and exemptions from environmental regulation. For example, nearly every major federal environmental statute, including the Clean Water Act ("CWA"), Safe Drinking Water Act, Clean Air Act ("CAA"), and Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") has included carve-outs for farms.[4] In addition, economic subsidies support large-scale, commodity crop and animal production that significantly impacts the environment and depletes natural resources.[5] This agricultural "exceptionalism" results in externalized pollution costs

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1 *See* David Wallinga, *Today's Food System: How Healthy Is It?*, 4 J. HUNGER & ENVTL. NUTRITION 251, 266–67 (2009) (promoting that the cheap food policy in America took off in 1974 under U.S. Secretary of Agriculture, Earl Butz).

2 *See* Savanna Henderson et al., *The Real Cost of Food: Examining the Social, Environmental, and Health Impacts of Producing Food*, FOOD TANK 6 (2015), http://futureoffood.org/wp-content/uploads/2016/09/The-Real-Cost-of-Food-Food-Tank-November-2015.pdf [https://perma.cc/LA74-9Y9X] (expressing that food production is putting pressure on natural resources and the environment); *see also The True Cost of American Food*, SUSTAINABLE FOOD TRUST (2016), http://sustainablefoodtrust.org/events/the-true-cost-of-american-food/ [https://perma.cc/AE36-BFE4] (providing that world class speakers will be discussing the realities of food production).

3 *See* Henderson et al., *supra* note 2, at 7 ("The cost of soil erosion in Brazil was estimated to be US$242 million per year in the state of Paraná, and US$212 million per year in the state of São Paulo.").

4 *See* Jason Foscolo & Michael Zimmerman, *Alternative Growth: Forsaking the False Economies of Industrial Agriculture,* 25 FORDHAM ENVTL. L. REV. 316, 321, 325, 327 (2014) (explaining that the Clean Water Act, Clean Air Act, and Comprehensive Environmental Response, Compensation and Liability Act provide exemptions for regulation of farms).

5 *See id.* at 316 (discussing the first Agricultural Adjustment Act of 1933, which built a safety net of statutory exclusions and economic subsidies).

borne by the public.[6] First, this Article discusses the environmental impacts of American farming practices, including habitat loss and harm to protected species, soil erosion, water resources depletion, water pollution, and air pollution.[7] Then, this Article summarizes recent reports that begin to analyze the hidden benefits and costs of our agricultural systems.[8] Finally, this Article reviews several options to create an environmentally sustainable food system.[9]

II. BACKGROUND

A. American Agriculture: Monoculture

American agriculture was significantly transformed following World War II due to technological developments, advances in mechanization, and the availability of chemical inputs.[10] During the Green Revolution, hybridized plants created varieties of grains, such as wheat, rice, and corn, that produced larger crop yields.[11] This high crop yield was possible because of the saturation with water, chemical fertilizers, pesticides, and fossil fuels.[12] Corn, for example, is planted more widely than any other crop in the United States, and it also requires the most nitrogen fertilizer "in terms of application rates per acre, total acres treated, and total applications."[13] The United States Department of Agriculture ("USDA") reported that in 2007 alone, American crop farmers used 684 million pounds of pesticides.[14] Corn production accounted for over half of this pesticide usage, but a large percentage of conventionally-produced fruits

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6 *See id*. at 318 (explaining that the absence of regulations on agriculture results in society having to bear the costs).

7 *See infra* Part II.B (discussing the environmental impacts of American farming practices).

8 *See infra* Part II.D (summarizing recent reports of agricultural systems and the corresponding costs and benefits).

9 *See infra* Part II.E.1 (reviewing several options for a more sustainable food system).

10 *See* Carolyn Dimitri et al., *The 20th Century Transformation of U.S. Agriculture and Farm Policy*, U.S. DEP'T OF AGRIC. 6 (June 2005), http://www.ers.usda.gov/publications/eib3/eib3.pdf [https://perma.cc/44SK-WE2N] (determining that the advances have led to increasing farm size).

11 William S. Eubanks II, *A Rotten System: Subsidizing Environmental Degradation and Poor Public Health with Our Nation's Tax Dollars*, 28 STAN. ENVTL. L.J. 213, 251 (2009).

12 *See id*. at 252 (describing why the hybrid plants were successful in higher crop yields).

13 Marc Ribaudo et al., *Nitrogen Management on U.S. Corn Acres, 2001–10*, U.S. DEP'T OF AGRIC. 2 (Nov. 2012), http://www.ers.usda.gov/media/947769/eb20.pdf [https://perma.cc/2AJU-C43E].

14 *See Agricultural Resources and Environmental Indicators, 2012 Edition*, U.S. DEP'T OF AGRIC. 21 (Craig Osteen et al. eds., Aug. 2012), http://www.ers.usda.gov/media/874175/eib98.pdf [https://perma.cc/2BH2-DRF3] (admitting farmers spent $7.87 billion on millions of pounds of pesticides).

and vegetables—including over eighty percent of all onions, watermelons, and cucumbers—are also treated with pesticides.[15]

The industrialization of agriculture spurred the rapid growth in average farm size and caused an accompanying decline in the number of small crop-diverse farms and rural populations.[16] The cultivation of a single crop such as corn, soy, or wheat in a given area allows farmers to industrialize their production systems.[17] Large-scale commercial agricultural operations dominate the American farmland landscape.[18] Approximately "[forty-eight] million acres of corn, [sixteen] million soybean acres, and [sixteen] million wheat acres" have been planted.[19] These eighty million acres are approximately the size of New Mexico (the fifth largest state in the United States).[20] Although monoculture may decrease labor costs, it results in externalized environmental, social, and health costs.[21] According to a Food and Agriculture Organization ("FAO") of the United Nations study, the operational natural capital costs—use of natural resources such as air, land, and water—associated with crop production is nearly "1.15 trillion dollars, over 170 percent of its production value."[22]

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15 *See id.* ("U.S. corn, cotton, fall potatoes, soybeans, and wheat accounted for nearly two-thirds of pesticide quantitates applied."); *see also Agricultural Chemical Use: Corn, Upland Cotton and Fall Potatoes 2010*, U.S. DEP'T OF AGRIC. (May 25, 2011), http://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Chemical_Use/FieldCropChemicalUseFactSheet06.09.11.pdf [https://perma.cc/6X8J-QCHB] (highlighting the pesticide use for corn).

16 *See* Dimitri et al., *supra* note 10, at 6 (discerning that advances in mechanization and increases in chemical input have led to the decline of small farms).

17 *See Industrial Agriculture: The Outdated, Unsustainable System That Dominates U.S. Food Production*, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/our-work/food-agriculture/our-failing-food-system/industrial-agriculture [https://perma.cc/7USW-3R2A] (providing that monoculture is at the core of industrial food production).

18 *See* 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, 490 (2013) (explaining that large-scale commodity crop operations are agriculturally and physically prominent).

19 *Id.*

20 *Id.*

21 *See* Henderson et al., *supra* note 2, at 24 (stating that planting one, or even two crops, can have environmental, social, and health costs).

22 *See Natural Capital Impacts in Agriculture: Supporting Better Business Decision-Making*, FOOD & AGRIC. ORG. OF THE U.N. 6 (June 2015), http://www.fao.org/fileadmin/templates/nr/substainability_pathways/docs/Natural_Capital_Impacts_in_Agriculture_final.pdf [https://perma.cc/ECS9-3ZNQ] [hereinafter *Natural Capital Impacts*] (using a common definition of natural capital in the business arena). Natural capital is "the stock of natural ecosystems on Earth including air, land, soil, biodiversity and geological resources. This stock underpins our economy and society by producing value for people, both directly and indirectly." *Id.* at 9. The difference in livestock production in this study produces natural capital costs of over $1.81 trillion, 134 percent of its production value. *Id.* at 6.

Industrial agricultural practices, such as heavy reliance on chemical inputs, conversion of undeveloped land into agricultural fields, and intensive water use for irrigation causes significant environmental impacts to the water, land, wildlife, and air, and has significantly contributed to climate change.[23] According to acclaimed food author and journalist, Michael Pollan, "the way we feed ourselves contributes more greenhouse gases to the atmosphere than anything else we do–as much as [thirty-seven] percent, according to one study . . . [and] when we eat from the industrial food system, we are eating oil and spewing greenhouse gases."[24] The following section summarizes the tremendous environmental costs associated with industrial commodity crop production in the United States.

B. Environmental Effects

The industrial agricultural model of disassociating human and environmental health from economic prosperity is shortsighted.[25] Farming relies on freely available environmental resources to provide healthy soil, a stable climate and clean water to grow crops and raise livestock. However, pollution from agricultural practices severely damages these essential resources.[26]

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[23] *See* Mary Jane Angelo, *Corn, Carbon, and Conservation: Rethinking U.S. Agricultural Policy in a Changing Global Environment*, 17 GEO. MASON L. REV. 593, 603 (2010) (describing how the impacts of industrialized agricultural practices have helped contribute to climate change); *see also* Renée Johnson, *Climate Change: The Role of the U.S. Agriculture Sector*, CONG. RES. SERV. 1 (Nov. 9, 2009), http://nationalaglawcenter.org/wp-content/uploads/assets/crs/RL33898.pdf [https://perma.cc/XFY8-RR2N] ("The agriculture sector is a source of greenhouse gas ("GHG") emissions, which many scientists agree are contributing to observed climate change."); Frances Moore Lappé, *Farming for a Small Planet: Agroecology Now,* GREAT TRANSITION INITIATIVE (Apr. 2016), http://www.greattransition.org/publication/farming-for-a-small-planet [https://perma.cc/ZF6Z-G4ML] (providing that the industrial model of farming "contributes nearly 20 percent of all anthropogenic greenhouse gas emissions, even more than the transportation sector"). Although the environmental impacts of modern industrial animal agriculture are tremendous, the scope of this Article is limited to the effects of commodity crop production.

[24] Michael Pollan, *Farmer in Chief,* N.Y. TIMES (Oct. 9, 2008), http://www.nytimes.com/2008/10/12/magazine/12policty-t.html?_r=0 [https://perma.cc/VA42-3539].

[25] *See* Lappé, *supra* note 23 ("The primary obstacle to sustainable food security is an economic model and thought system, embodied in industrial agriculture, that views life in disassociated parts, obscuring the destructive impact this approach has on humans, natural resources, and the environment.").

[26] *See Trucost Reveals $3 Trillion Environmental Cost of Farming*, TRUCOST (Oct. 15, 2015), http://www.trucost.com/news-2015/212/FAO/farming [https://perma.cc/BDH8-NCST] [hereinafter *Trucost*] (stating that land clearances and climate change are contributing to the damage).

1. Damage to Soil

Commodity crop production results in soil erosion that threatens the productivity of agricultural fields and causes other environmental issues.[27] Nearly half of all land in the United States is used for farming and ranching.[28] In the United States, one out of every five acres consists of cropland.[29] In American agricultural fields, soil erodes at a much faster rate than it is replaced.[30] Soil that is lost is essentially irreplaceable.[31] Erosion impacts productivity because it removes the surface soils, which help to retain water and nutrients in the root zone where they are available to plants.[32] The remaining "subsoils" are typically "less fertile, less absorbent, and less able to retain pesticides, fertilizers, and other plant nutrients."[33] This situation illustrates the shortsightedness of industrial agriculture.[34] Although erosion control measures are costly to farmers, such expenses must be calculated in light of potential long-term erosion, which impedes soil fertility and water-holding capacity.[35] Increased fertilization and irrigation may compensate for lower soil fertility in the short term; however, such practices will result in long-term diminished farmland productivity, erosion, and environmental damage.[36]

Because governmental policies have encouraged farmers to maximize their production of commodity crops, corn and other subsidized annual crops, such as soybeans, are often grown without rotating in other crops

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27 *See* Eubanks, *supra* note 11, at 269 (describing other environmental issues, such as declining water quantity and quality, cultivation of marginal lands, and conversion of wetlands and wildlife habitats, that contribute to the deterioration of commodity crop production).

28 *See id.* at 261 (finding that 1.03 billion of the 2.3 billion acres of U.S. land are used by farmers and ranchers).

29 *See id.* (providing that cropland makes up 442 million acres).

30 *See* Nancy M. Trautmann et al., *Modern Agriculture: Its Effects on the Environment*, NAT. RES. CORNELL COOPERATIVE EXTENSION (2012), http://psep.cce.cornell.edu/facts-slides-self/facts/mod-ag-grw85.aspx [https://perma.cc/8L7L-7BC8] (expressing that soil erodes ten times as much from fields as is replaced by natural soil formation processes).

31 *See id.* (explaining that it takes up to 300 years for one inch of agricultural topsoil to form).

32 *See id*. (stating that surface soils contain organic matter, plant nutrients, and fine soil particles).

33 *Id.*

34 *See id*. (analyzing how the use of fertilizers and pesticides to increase short-term productivity of farms has caused excessive erosion).

35 *See id*. (admitting that up to a certain point, increased fertilization and irrigation will compensate for lower soil fertility).

36 *See* Trautmann et al., *supra* note 30 (discussing how the negative effects of soil erosion have been masked by improved technology).

that can prevent erosion and replace vital nutrients in the soil.[37] As a result of these devastating practices, profitable cropland can be rendered completely worthless.[38] There is already historical precedent for the effects of unsustainable agricultural practices—the American Dust Bowl in the 1930s was caused by a combination of aggressive tillage and prolonged drought across the American Midwest, which created severe dust storms and soil erosion.[39]

Soil erosion causes environmental issues.[40] Eroded soils contain nutrients and other chemicals that can impair water quality.[41] For example, drinking water supplies may contain concentrations of nitrate or organic chemicals that violate public health standards and surface waters may become clogged with excessive plant growth.[42]

Erosion from unsustainable agricultural methods has released billions of tons of carbon dioxide into the atmosphere, which has dangerous climatic consequences.[43] Soil absorbs and stores carbon dioxide.[44] When soil is then tilled, the tilled organic matter in the soil absorbs oxygen from the air.[45] Once this organic matter is exposed to oxygen and decomposes, carbon dioxide is released into the atmosphere.[46] When erosion occurs, it

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37 *See* Eubanks, *supra* note 11, at 262 (explaining how the Farm Bill encourages the production of commodity crops).

38 *Id.* at 262. *See also* Emile A. Frison, *From Uniformity to Diversity: A Paradigm Shift from Industrial Agriculture to Diversified Agroecological Systems*, INT'L PANEL OF EXPERTS ON SUSTAINABLE FOOD SYS. 18 (2016), http://www.ipes-food.org/images/Reports/UniformityToDiversity_FullReport.pdf [https://perma.cc/TT7E-95AU] (citing unsustainable industrial agricultural practices as the largest source of land degradation).

39 *See* Frison, *supra* note 38, at 1 (discussing how twenty percent of the Earth is currently considered degraded).

40 *See* Trautmann et al., *supra* note 30 ("Eroded soil clogs streams, rivers, lakes, and reservoirs, resulting in increased flooding, decreased reservoir capacity, and destruction of habitats for many species of fish and other aquatic life.").

41 *See id.* (issuing that soils can impair water quality when carried away by erosion).

42 *See id*. (adding that surface waters may become clogged with excessive plant growth from nutrients).

43 *See* Eubanks, *supra* note 11, at 262–63 (drawing how exposure to oxygen causes organic matter to decompose, causing carbon dioxide to be released into the air); *see also* Judith D. Schwartz, *Soil as Carbon Storehouse: New Weapon in Climate Fight?*, YALE ENV'T 360 (Mar. 4, 2014), http://e360.yale.edu/feature/soil_as_carbon_storehouse_new_weapon_in_climate_fight/2744/ [https://perma.cc/4NH4-SSD4] (reiterating how the release of carbon dioxide affects waterways as well as the atmosphere).

44 *See* Eubanks, *supra* note 11, at 262 (concluding that when the carbon dioxide is stored, the soil is tilled).

45 *See id.* (illustrating that tilling occurs by large machines that uproot soil and other underground materials).

46 *Id. See also* Schwartz, *supra* note 43 (stating that soil carbon may have important implications with regards to slowing the increase of atmospheric carbon dioxide).

carries the already decomposing topsoil away and exposes a new layer of topsoil to the decomposition process.[47]

The effects of soil deterioration have significant impact on the future of food production and climate change.[48] Thus, there are several important costs of industrial commodity crop production that must be considered by policymakers.[49]

2. Water Contamination

Commodity crop production can contribute various pollutants to surface water, including nutrients, pesticides, and sediment.[50] Surface runoff carries manure, fertilizers, and pesticides into streams, lakes, and reservoirs, often causing unacceptable levels of bacteria, nutrients, or synthetic organic compounds.[51] Water traveling downward through farm fields carries dissolved chemicals with it.[52]

Fertilizers used in commercial crop production of corn, soybeans, wheat, rice, and cotton were the results of experiments conducted by the military and are typically composed of high percentages of phosphorus and ammonium nitrate, an ingredient used in explosives.[53] Fertilizers may have increased agricultural yields, but they have also caused significant environmental damage.[54] Chemical fertilizers and manure are applied to promote plant growth, but crops cannot use all of the nitrogen and phosphorus made available to them—a problem that can be exacerbated by over-application.[55] When cropland becomes saturated due

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47 *See* Eubanks, *supra* note 11, at 262–63 (arguing how sustainable farming methods include no-till farming, cover cropping, crop rotation, and residue mulching, but these practices are not incorporated into commodity crop production).

48 *See id.* at 261–62 (emphasizing the importance of requiring farmers to implement better sustainable farming methods that can store carbon in the soil).

49 *See id.* at 215 (expressing the need for an amendment to the Farm Bill and how the bill is deceptive to the people).

50 *See* Trautmann et al., *supra* note 30 (explaining how in large quantities, the pollutants can contaminate groundwater supplies).

51 *See id.* (highlighting how bodies of water are polluted with surface runoff that contains pesticides, manure, and fertilizers).

52 *See id.* (adding that chemicals include nitrate fertilizers and soluble pesticides).

53 *See* Eubanks, *supra* note 11, at 255 (stating how higher crop yields only existed because of the input of potent fertilizers).

54 *See id.* (discussing the drawbacks of fertilizers).

55 *See Dead in the Water*, ENVTL. WORKING GROUP (Apr. 10, 2006), http://www.ewg.org/reports/deadzone [https://perma.cc/LN6F-T6YF] (analyzing how taxpayers' money is being used to fund the use of fertilizers, further aggravating the issue of soil erosion); *see generally* Marc Ribaudo et al., *Nitrogen in Agricultural Systems: Implications for Conservation Policy*, U.S. DEP'T OF AGRIC. 1 (Sept. 2011), http://www.ers.usda.gov/Publications/ERR127/ERR127.pdf [https://perma.cc/NCA9-KY8N] (confronting overuse and misapplication of nitrogen fertilizers).

to rainfall, snowmelt, irrigation, or flooding, unused fertilizer migrates to the surface and groundwater.[56] Thus, much of the fertilizer applied to agricultural fields ends up as runoff, which is leached into streams and rivers.[57] These fertilizers damage marine life and harm commercial fisheries in coastal waters.[58] For example, "dead zones" can form when nutrients from crop production cause expansion of algal blooms.[59] As the algae dies, it takes oxygen out of the water.[60] 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, causing hypoxia, or a shortage of oxygen.[61] A hypoxic area quickly becomes a "dead zone" because fish and other mobile organisms leave and all other organisms will die off and cause a food chain collapse.[62]

The largest example of hypoxia in the United States is the Gulf of Mexico Dead Zone.[63] This dead zone is largely the result of commodity crop production and fertilizer application in the U.S. Corn Belt close to the Mississippi River and other rivers.[64] United States Geological Survey ("USGS") research indicates that industrial agricultural practices in the form of fertilizers or manure runoff contribute to over sixty percent of the nitrogen and over forty percent of the phosphorus affecting the Gulf of Mexico.[65]

The runoff of these toxic chemicals also implicates public health concerns.[66] Pesticides are used to combat pests that commonly disturb

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56 *See* Linda K. Breggin et al., *It's Time to Put a Price Tag on the Environmental Impacts of Commodity Crop Agriculture*, 43 ENVTL. L. REP. 10130, 10131 (2013) (explaining that when cropland becomes saturated from rainfall, snowmelt, irrigation, or flooding, migration occurs).

57 *See id.* (providing how surface waters may be polluted with sediment because of commodity crop production).

58 *See* Eubanks, *supra* note 11, at 255 (explaining how the use of fertilizers affect the fishing community that rely on the water bodies that can be affected).

59 *See* Breggin et al., *supra* note 56, at 10131 (stating the chain of events that occurs when algal blooms are produced).

60 *See* Eubanks, *supra* note 11, at 256 (concluding that the oxygen is extracted for the process of decomposition).

61 *See id*. (discussing the effects of an increase in nutrients to the crops).

62 *See id*. (examining how fish leave due to the lack of oxygen).

63 *See id.* (reflecting on how the dead zone is longer than the distance between Washington, D.C. and Hartford, Connecticut).

64 *See id.* (recognizing that the rivers ultimately discharge into the Gulf of Mexico).

65 *See* Richard B. Alexander et al., *Differences in Phosphorus and Nitrogen Delivery to the Gulf of Mexico from the Mississippi River Basin*, U.S. GEOLOGICAL SURV. (Dec. 21, 2007), http://water.usgs.gov/nawqa/sparrow/gulf_findings/primary_sources.html [https://perma.cc/92PH-K8SC] (providing statistics regarding phosphorous and nitrogen nutrients delivered to the Gulf of Mexico).

66 *See* Eubanks, *supra* note 11, at 224–25 (discussing how agricultural progress was measured in the 1970s).

agricultural crops.[67] More than 1600 pesticides are currently available on the market.[68] Pesticides, which are highly water-soluble, may impair drinking water sources when they leach into ground water.[69] Sediments from U.S. waterways are often heavily contaminated.[70] Although nationwide sampling for pesticides has been limited, twenty-three states have reported at least one of twenty-two pesticides in groundwater.[71] A USGS study of untreated groundwater found one or more pesticide compounds in over forty percent of the samples.[72] Nitrogen contained in runoff from commodity crops can be harmful to human health.[73] "Blue baby syndrome," or methemoglobinemia, and adverse reproductive outcomes are among the risks.[74]

Agriculture presents problems not only with water quality, but also water quantity.[75] More than 135 billion gallons of water each day, which accounts for more than one-third of all U.S. water usage, is used for agricultural irrigation, which is the largest use of freshwater.[76] Commodity crop production is extremely water-intensive and requires large-scale irrigation systems.[77] Because of agriculture's demand for water consumption, farming has caused several water disputes among

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[67] *See id.* at 258 (rendering pesticides as the general term for both insecticides and herbicides).

[68] *See id.* (identifying that some of the pesticides were developed as nerve gases during World War II).

[69] Trautmann et al., *supra* note 30. For example:

> In Suffolk County at the eastern end of Long Island, for example, 13 different pesticides have been measured at least once in groundwater samples. Twelve percent of the wells tested in Suffolk County have exceeded the drinking water guideline for aldicarb, a highly soluble pesticide used from 1975 to 1979 to control the Colorado potato beetle.

Id.

[70] *See* Eubanks, *supra* note 11, at 258 (establishing that the waters are contaminated with pesticides).

[71] *See Pesticides in the Nation's Streams and Ground Water, 1992–2001–A Summary*, U.S. GEOLOGICAL SURV. (Mar. 2006), http://pubs.usgs.gov/fs/2006/3028/pdf/fs2006-3028.pdf [https://perma.cc/Z4CA-9JU5] (stating the percentages of pesticides found in the waters of different area types throughout the United States).

[72] *See* Breggin et al., *supra* note 56, at 10132 (asserting that the groundwater was taken from public supply wells).

[73] *See id.* (finding that within agricultural areas, users of shallow wells are at a substantial risk).

[74] *See id.* (composing the issues associated with high nitrate levels in well water).

[75] *See* Eubanks, *supra* note 11, at 253 (stating that over one-third of U.S. freshwater is used for agricultural irrigation).

[76] *See id*. (explaining how irrigation requires 135 billion gallons of water a day).

[77] *See id.* (expressing a solution to prevent future water scarcity because of commodity crops).

U.S. states.[78] Furthermore, as freshwater resources become depleted, at least thirty-six states anticipate water shortages in the next few years.[79]

3. Diminished Air Quality

Commodity crop product is highly dependent upon large amounts of fossil fuels to power gasoline and diesel tractors.[80] This reliance on machines by industrial commodity crop producers results in large amounts of air pollution.[81] In addition to the greenhouse gas emissions caused by soil erosion, agriculture is responsible for the majority of nitrous oxide emissions in the United States.[82] Air quality is further diminished by fossil fuel powered vehicles that travel thousands of miles to bring food from farm to supermarkets.[83]

4. Loss of Biodiversity and Wildlife Habitats

Pesticide use and habitat destruction caused by industrial agriculture have had significant impacts on wild biodiversity.[84] In fact, of all the plants and animal species considered "endangered or threatened," eighty-four percent received such status due, at least in part, to agriculture.[85] Hundreds of the nearly 1,300 species listed as threatened or endangered were listed solely because of pesticide use.[86] Wetlands and wildlife habitat are often converted by large farms to commodity producing croplands, destroying the habitats of many types of wildlife.[87] The impact of

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78 *See id.* at 254 ("Since the summer of 2007, the states of Georgia, Florida, and Alabama have been embroiled in a bitter conflict over the allocation of water in the Apalachicola-Chattahoochee-Flint River Basin.").

79 *See id.* (asserting that most states are outside of the traditionally dry regions of the country).

80 *See id.* at 266–67 (examining how agriculture utilizes about eight percent of the oil output in the world).

81 *See* Eubanks, *supra* note 11, at 267 (describing that air pollutants are produced by fossil fuel dependent farming).

82 *See id.* (supporting the view that greenhouse and nitrous emissions are causing harm to the environment).

83 *See id.* at 267–68 (providing that vehicles, which are used to deliver agricultural goods and food items to local supermarkets, cause harm).

84 *See id.* at 263 (discussing how wildlife habitats and biodiversity are affected by commodity agriculture).

85 *Id.* at 263–64.

86 *See* Brian Litmans & Jeff Miller, *Silent Spring Revisited: Pesticide Use and Endangered Species*, CTR. FOR BIOLOGICAL DIVERSITY 18, 51, 54, http://www.biologicaldiversity.org/publications/papers/Silent_Spring_revisited.pdf [https://perma.cc/8Q6Z-XNTS] (analyzing how the Environmental Protection Agency ("EPA") has shown reckless disregard for the impact of its Pesticide Regulation Program on wildlife and endangered species).

87 *See* Eubanks, *supra* note 11, at 264 (emphasizing how the conversion is a classic market failure because the wildlife and biodiversity is completely disregarded).

pesticides and other agricultural chemicals also threaten animals by impacting rates of reproduction, which threatens the viability of the species.[88] Agricultural pesticides have decimated species such as eagles, hawks, owls, ducks, geese, and many varieties of fish.[89]

A worldwide loss of pollinators is now occurring.[90] For example, the European honeybee declined by more than fifty percent between World War II and 2004.[91] Populations of animals provide important pollination and pest control services to crops.[92] There is also significant economic value of pollination—"approximately 9.5 percent of the value of global agricultural production for human food."[93] In the United States alone, over one hundred crops, including apples, broccoli, almonds, onions, pears, carrots, blueberries, amounting to more than twenty-five percent of all food items, depend on pollination.[94] These insect-pollinated crops contributed approximately $20 billion to the U.S. economy in 2000.[95] According to the Environmental Protection Agency ("EPA"), pesticide exposure is among several reasons that explain the near disappearance of bees and other extremely important pollinating species.[96]

Given the well-documented detrimental effects of commercial agriculture, it is "amazing [] that these consequences have escaped serious regulatory attention even through the recent decades of environmental

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88 *See id.* at 265 (stating how agriculture pesticides have led to a number of animal deaths).

89 *See id.* (recognizing the different types of animals that are affected by agricultural pesticides).

90 *See* Frison, *supra* note 38, at 22 (examining how several factors are connected to the loss of pollinators, such as the use of agrochemicals, particularly neonicotinoids, agricultural intensification, and habitat fragmentation).

91 *See id.* (emphasizing that the European Honeybee is the main pollinator in the United States).

92 *See id.* (listing birds, flies, bees, and moths as the types of animals that provide control services).

93 *Id.*

94 *See* Eubanks, *supra* note 11, at 265–66 (discussing how the crops contributed an estimated $20 billion to the American economy in the year 2000).

95 *See id.* at 266 (explaining the impact of the crops on the economy).

96 *See Pollinator Health Concerns*, U.S. ENVTL. PROTECTION AGENCY (Nov. 23, 2015), https://www.epa.gov/pollinator-protection/pollinator-health-concerns [https://perma.cc/6W3W-CZT7] (pointing out that pesticides are one of the major reasons for the death of insects).

awakening."[97] The following section discusses the "anti-law" that applies to agriculture in regards to environmental laws.[98]

C. Agricultural Exceptionalism

The obvious question that emerges after reviewing the facts discussed above regarding environmental effects of commercial agriculture is: how can this industry be permitted to cause such environmental destruction?[99] Agriculture is the only major industrial sector that is routinely exempt from baseline environmental safeguards.[100] "One would be hard pressed to identify another industry with as poor an environmental record and as light a regulatory burden."[101] As such, "farms are one of the last uncharted frontiers of environmental regulation in the United States."[102] As discussed above, agriculture inherently causes pollution, destroys natural habitats, and alters the composition of soils, lakes, and rivers.[103] Yet, environmental law has given farms a virtual license to do so because "[c]urrent laws regulating air pollution, water pollution, and the use of toxic chemicals implicitly or explicitly exempt all but the largest" farms.[104] This legal and regulatory advantage conferred upon agriculture, referred to as "agricultural exceptionalism," is based upon the premise that because agriculture is so vital to human survival, it merits this special treatment.[105] The following sections provide an overview of the legal

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97 *See* J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L. Q. 263, 266 (2001) (acknowledging that farms, which pollute and degrade the environment, should neither indict farming as a way of life nor denigrate the ideals farmers hold). Farming in America is a deeply rooted cultural institution with many noble qualities and important economic and social benefits. *Id*.

98 *See id.* at 263 (discussing a comprehensive analysis of the environmental harms farms cause and the safe harbors they enjoy in environmental law).

99 *See Environmental Destruction*, WORLD CENTRIC (2016), http://worldcentric.org/conscious-living/environmental-destruction [https://perma.cc/9ZKG-LYV5] (asking why there has been so much ignorance to this issue).

100 *See* Linda Breggin & D. Bruce Myers Jr., *Farm Policy and Environmental Protection: It's Time to Raise the Bar*, HARV. ENVTL. L. REV. (Apr. 16, 2014), http://harvardelr.com/tag/agriculture/ [https://perma.cc/B3AR-AQC6] (stating the rarity of the poor environmental record and light regulatory burden).

101 Ruhl, *supra* note 97, at 269.

102 *Id.* at 263.

103 *See id*. at 266 (explaining the massive destruction of agriculture).

104 *See* Nicolai V. Kuminoff, *Public Policy Solutions to Environmental Externalities from Agriculture*, 2 http://aic.ucdavis.edu/research/farmbill07/aeibriefs/20070515_kuminoff final.pdf [https://perma.cc/P4EE-TBGH] (discussing that current laws regulating pollution do not exempt the largest farms).

105 *See* Susan A. Schneider, *A Reconsideration of Agricultural Law: A Call for the Law of Food, Farming, and Sustainability*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 935, 935 (2010) (stating agricultural exceptionalism is based upon the premise that agriculture is vital to human survival).

loopholes and exemptions provided to agriculture under the most significant federal environmental laws.[106]

1. The Clean Water Act

The 1972 CWA is the principal U.S. environmental law that protects water resources by regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters.[107] However, many agricultural activities are not covered by the National Pollutant Discharge Elimination System ("NPDES") program established under § 402 of the CWA, which is a permitting program for point sources of pollution or facilities that discharge pollutants into waters of the United States.[108] The NPDES imposes monitoring and reporting burdens on permittees.[109] The permit limits and imposes conditions on discharges from "point sources," such as industrial facilities or wastewater pipes, which discharge effluents from discrete pipes, channels, ditches, or ducts, and are based on available control technologies and applicable water quality considerations.[110] However, the NPDES program expressly exempts irrigation return flows from the definition of point sources subject to regulation, which means that water containing pesticides, fertilizers, sediment, and other pollutants that flow from irrigated fields into surface waters are not regulated under the NPDES program.[111] Although nonpoint sources, such as farmlands or roads, are difficult to regulate because the pollution they cause can be difficult to measure, the CWA attempts to confer the burden of regulation to the states.[112] For example, states are required to identify "impaired" bodies of water and the Total Maximum Daily Load ("TMDL"), or level of further pollution each can tolerate while also meeting water quality standards, of each.[113]

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106 *See infra* Part II.C.1–6 (establishing the legal loopholes and exemptions that hinder the laws' effectiveness).

107 *See* 33 U.S.C. § 1251 (2012) (summarizing the U.S. environmental law that protects the United States and helps regulate the standards for surface waters).

108 *See* § 1362 (discussing scarce coverage by the National Pollutant Discharge Elimination System ("NPDES"); *see also id*. §§ 1251–1387 (underlining the NPDES active participation into the waters of the United States).

109 *See* § 1301(a) (observing that the NPDES regulates those who violate it).

110 *See* Ruhl, *supra* note 97, at 293 (analyzing a list of point sources which and how they are related to applicable water quality considerations).

111 *See id*. at 294–95 (showing that the NPDES program lacks appropriate regulation regarding point sources).

112 *See id*. at 304 (stating that nonpoint sources, such as farmland, are difficult to measure and that the Clean Water Act ("CWA") attempts to shift the burden of this issue onto the states).

113 *See* § 1251(g) (explaining states must meet a certain standard when identify certain bodies of water).

Meeting the TMDL requires consideration of nonpoint source water pollution because it is a quality-based, not effluent-based, standard.[114] Though the EPA has approval authority over states' TMDL compliance plans, the EPA has generally given the states wide discretion in choosing how to meet their TMDL standards.[115] Thus, rural states that are heavily dependent on agriculture have thus been free to leave farm waste unregulated.[116] The EPA admits that this nonpoint source exemption for farms is significant—this source of water pollution is responsible for forty percent of the pollution in the navigable waters of the United States—and agriculture is the single most responsible sector.[117] Approaching water quality regulation in this way is antithetical to the CWA's intent.[118]

The agriculture industry is also exempt from regulation under the CWA's industrial storm water permit program.[119] The CWA specifically excludes agricultural storm water discharges from the definition of point sources that may be regulated, resulting in large agricultural operations, thousands of acres in size, not being required to obtain storm water permits.[120] As a result, weather-related runoff containing pesticides, fertilizers, and other pollutants are not subject to CWA protections.[121]

2. Safe Drinking Water Act

Pollution from farms is also exempt from the Safe Drinking Water Act, which sets standards for public water systems' drinking water quality to

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[114] *See* Foscolo & Zimmerman, *supra* note 4, at 322 (summarizing that when meeting the "total maximum daily load" nonpoint source water must be considered pollution because it is quality-based not effluent-based).

[115] *See* § 1313(d) (clarifying that some areas have insufficient controls and revisions regarding certain limitation revision); *see also* Douglas R. Williams, *When Voluntary, Incentive-Based Controls Fail: Structuring a Regulatory Response to Agricultural Nonpoint Source Water Pollution*, 9 WASH. U. J.L. & POL'Y 21, 97–98 (2002) (noting the possibility of more expansive regulation under the CWA's total maximum daily load provisions, which allow for regulation of nonpoint sources in addition to point sources).

[116] *See* Ruhl, *supra* note 97, at 304 (explaining the EPA gives wide discretion to rural areas that are left unregulated).

[117] *See Nonpoint Source Pollution: The Nation's Largest Water Quality Problem*, U.S. ENVTL. PROTECTION AGENCY (Mar. 1996), http://infohouse.p2ric.org/ref/34/33626.pdf [https://perma.cc/8PCJ-R2FS] (mentioning some pointers the EPA provides to nonpoint sources).

[118] *See* Foscolo & Zimmerman, *supra* note 4, at 323 (arguing how the approach of exemptions on farms frustrates the CWA).

[119] *See* Breggin & Myers, *supra* note 100 (articulating that the CWA's exemption also includes the industrial storm water permit program).

[120] *See* § 1362(14) (showing when the CWA excludes agricultural storm water, thousands of storm water permits are obtained).

[121] *See* Breggin & Myers, *supra* note 100 (exposing that because of these exemptions weather-related runoff containing pesticides and fertilizers are not subject to CWA).

prevent contamination of surface and ground sources of drinking water.[122] Although the EPA recognizes that runoff containing fertilizers and pesticides from agricultural operations "can have significant impacts on vulnerable aquifers," the law does not regulate this runoff, but instead relies on state assessments, voluntary programs, and best management practices.[123]

3. The Clean Air Act

The CAA addresses large stationary sources of air pollution, such as electricity generating facilities or industrial manufacturing plants, which produce more air pollution than most individual farms.[124] When the CAA was initially drafted, pollution from agriculture was not a serious concern due to the nature and small scale of farming practices.[125] The CAA focuses most of its regulations on pollution sources that qualify as "major sources."[126] Though their aggregate discharges are significant, most agricultural operations, with the exception of concentrated animal feeding operations, do not qualify as "major sources" of air pollutants, and thereby escape the CAA's regulatory programs.[127]

Generally, facilities that use hazardous chemicals in quantities above specified thresholds must prepare and file a "risk management plan" with the EPA, detailing measures for prevention and response to accidental releases.[128] However, the EPA has wide latitude to set threshold quantities

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122 *See Understanding the Safe Drinking Water Act*, U.S. ENVTL. PROTECTION AGENCY (June 2004), https://www.epa.gov/sites/production/files/2015-04/documents/epa816f04030.pdf [https://perma.cc/423L-36JY] (discussing pollution from farms is also not included in the Safe Drinking Water Act).

123 *See* Breggin & Myers, *supra* note 100 (analyzing that runoff is not regulated, and therefore, state assessments, voluntary programs, and best management practices are the measures used to self-regulate).

124 *See* 42 U.S.C. § 7401 et seq. (2012) (explaining that the Clean Air Act ("CAA") is more effective against pollution control because it addresses large stationary sources of air pollution which produce more air pollution than most individual farms).

125 *See* Sarah C. Wilson, Comment, *Hogwash! Why Industrial Animal Agriculture is Not beyond the Scope of Clean Air Act Regulation*, 24 PACE ENVTL. L. REV. 439, 439 (2007) (stating that because of the small size of farming practices, agricultural pollution was not a serious concern).

126 *See* Ruhl, *supra* note 97, at 305 (exposing that the CAA does not focus on small scale pollution, rather it focuses on large manufacturing plants that produce more air pollution); *see also* § 7412(a)(1) (defining "major source" of air pollution as any source emitting ten tons or more of a single regulated pollutant, or twenty-five tons or more of a combination of such pollutants).

127 *See* Ruhl, *supra* note 97, at 263, 305 (distinguishing that most agricultural operations escape the CAA's regulatory programs).

128 *See id.* at 307 (explaining that facilities that use hazardous chemicals must prepare a risk management plan to ensure prevention of accidental releases).

and is permitted to "exempt entirely" any substance that is used as a nutrient in agriculture.[129] For example, the EPA has exempted from regulation the use of ammonia "when held by farmers."[130] The CAA also provides exemptions from emission standards for certain vehicles and machines used for agricultural purposes.[131]

4. The Comprehensive Environmental Response, Compensation, and Liability Act

CERCLA shifts the costs of remediating contaminated land onto its owners and imposes strict, joint, and retroactive liability on all of a site's current and past owners and lessees, including those who may have been otherwise innocent of any contaminating activities.[132] CERCLA identifies a wide range of hazardous substances, including many commonly used on farms that trigger a mandatory cleanup when present in the soil.[133] An owner of a contaminated site can only escape liability if the contamination was caused by an act of God, act of war, unrelated third party like the rogue trespassing dumper, and the "application of a pesticide product registered under the Federal Insecticide, Fungicide, and Rodenticide Act."[134] Under CERCLA, farms are exempt from monitoring and reporting obligations associated with "releases" of hazardous substances into the environment.[135] The statute provides for an extremely broad definition of "release," but explicitly excludes "normal application of fertilizer."[136] Therefore, farms have no legal obligation to inform surrounding communities of the quantity or nature of pesticides used.[137]

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129 *See id*. (providing the EPA's exemption on pollution if it is a substance used as a nutrient in agriculture).

130 *See* 40 C.F.R. § 68.125 (2007) (stating that the EPA has an exemption on the use of ammonia).

131 *See* Ruhl, *supra* note 97, at 307 (finding that there are certain exemptions for vehicles used in the performance of agricultural work); *see also* Elizabeth M. Stapleton, Note, *Agriculture as Industry: The Failure of Environmental and Agricultural Policy to Adapt to the Modern Agricultural Landscape*, 7 ALB. GOV'T L. REV. 321, 329 (2014) (reiterating that the EPA also gives exemptions from emission standards for some vehicles).

132 *See* 42 U.S.C. §§ 9601–9675 (2012) (discussing that CERCLA imposes a stricter liability to all current and past owners who may have been innocent and had no connection to any pollution on the land).

133 *See* § 9607 (indicating that CERCLA targets a wide range of hazardous substances).

134 *See* § 9601(1) (defining the term "act of God" for the purposes of CERCLA); *see also* § 9607(i) (indicating the limits on recovery).

135 *See* Foscolo & Zimmerman, *supra* note 4, at 327 (stating another exemption that farms are privileged to under CERCLA).

136 *See id*. (describing how CERCLA defines "release" for the purposes of the Act).

137 *See id.* (providing that because of the way certain words are defined in CERCLA, farms can use pesticides without informing communities about what is being released).

5. The Emergency Planning and Community Right-to-Know Act

The Emergency Planning and Community Right-To-Know Act ("EPCRA") is 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, and provides significant exemptions for agriculture.[138] The Act includes the Toxics Release Inventory ("TRI") which mandates that certain types of facilities that manufacture, process, or use threshold amounts of toxic chemicals submit annual toxic chemical release reports.[139] Although businesses, the public, the EPA, and other federal agencies use and rely upon TRI data, the TRI does not apply to the agriculture sector, and therefore, industrial commodity crop operations are not required to report releases of toxic chemicals.[140] The application of pesticides is also exempt from TRI reporting requirements.[141] As a result, 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.[142]

6. Effects of Agricultural Exceptionalism

The results of agricultural exceptionalism, in regards to environmental regulations, are the distortion of the true costs of food and the invisibility of nature in agricultural policymaking.[143] Thus, the costs

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138 *See generally* §§ 11001–11050 (discussing that the Emergency Planning and Community Right-To-Know Act ("EPCRA") is a good resource for more information regarding pollution); *see also What is EPCRA?*, U.S. ENVTL. PROTECTION AGENCY (2016), https://www.epa.gov/epcra [https://perma.cc/K3GS-G4VC] (showing that the EPCRA provides information regarding a plan for chemical emergencies and pollution questions).

139 *See* Breggin & Myers, *supra* note 18, at 512 (explaining that the Toxics Release Inventory ("TRI") includes the requirement of submitting an annual report if facilities produce toxic chemicals to help better regulate the amount of chemicals produced).

140 *See* § 11023(a) (expressing the agriculture sector does not require a TRI); *see also generally* 40 C.F.R. § 372.30 (2012) (mandating that facilities report to the EPA all of the known toxic chemicals released); *Toxic Chemical Releases: EPA Actions Could Reduce Environmental Information Available to Many Communities*, U.S GOV'T ACCOUNTABILITY OFF. (2007), http://www.gao.gov/new.items/d08128.pdf [https://perma.cc/2RRN-D9UJ] (arguing TRIs do not apply to the agriculture sector crop operations, so these operations are not required to report the release of chemicals).

141 *See* Ruhl, *supra* note 97, at 314 (stating the application of pesticides are not required to be reported during a TRI report); *see also* 40 C.F.R. § 355.32(c) (2011) (providing a circumstance in which reporting may be reduced).

142 *See* Breggin & Myers, *supra* note 18, at 513–14 (stating because of the exemption allowed under a TRI, the public is uniformed about the quality of fertilizers and pesticides).

143 *See TEEB for Agriculture & Food Interim Report*, ECON. OF ECOSYSTEMS & BIODIVERSITY 17 (2015), http://img.teebweb.org/wp-content/uploads/2016/01/TEEBAgFood_Interim_Report_2015_web.pdf [https://perma.cc/RYS5-FDZR] (discussing the distortion that is

of environmental damage are not accounted for by the growers of commodity crops, grain-trading companies, meatpackers, or feedlots.[144] Although farmers have long-term financial interests in preserving agricultural productivity, in the short term, measures such as crop rotation, preserving borderlands, reducing tillage, and reducing pesticide application increase production costs that cannot easily be passed to consumers.[145] Such ignorance of agriculture's environmental impacts is shortsighted because the resources relied upon by the agricultural industry, and the American public in general, will soon be depleted if current practices continue.[146] While agriculture is completely reliant upon nature for water, pollination, and genetic diversity, ecosystems and biodiversity are mainly public goods, provided by nature for free, and, while invisible in their contributions, they are quickly degrading due to population growth, urbanization, and increased demand for animal products.[147]

A key purpose of environmental law is to reallocate the external costs of pollution onto the polluters themselves.[148] Environmental laws force regulated industries to internalize the actual costs of their activities, whether by mandated use of cleaner technologies, permit costs, or penalties for noncompliance, and are given a tangible incentive to diminish their pollution output.[149] The externalized costs of unregulated industrial agriculture are borne by the owners of affected land, and by the public, through pollution of air, water, and wildlife resources.[150] By externalizing the environmental costs, the environmental effects of industrial agriculture are easily ignored by consumers and policymakers

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brought on by agricultural exceptionalism and how it effects the actual cost of foods due to the invisible nature in agricultural decision-making).

144 *See* Breggin & Myers, *supra* note 18, at 505 (clarifying the current U.S. policy to address the pollution related to commodity crop agriculture).

145 *See* Margot J. Pollans, *Regulating Farming: Balancing Food Safety and Environmental Protection in a Cooperative Governance Regime*, 50 WAKE FOREST L. REV. 399, 408 (2015) (explaining farmers do not always take steps in the short term because many of the short term measures raise production costs).

146 *See TEEB for Agriculture & Food Interim Report*, *supra* note 143, at 12 (discussing the severe effects that depleted natural resources may have on the environment).

147 *See id*. at 17 (establishing that although natural resources are important and sustain a healthy ecosystem, they are slowly degrading because of man-made pollution).

148 *See* Foscolo & Zimmerman, *supra* note 4, at 317–18 (summarizing that a crucial part of protecting environmental law is to put the costs of pollution onto the polluters).

149 *See id*. at 318 (discussing that fines act as an incentive to force industries to diminish their pollution output).

150 *See* Breggin & Myers, *supra* note 18, at 505–06 (explaining that fines ultimately benefit the public who benefit from cleaner air, water, and wildlife resources).

who support the production and availability of "cheap" food.[151] Without the cost of food directly reflecting the tremendous true expenses, farmers, consumers, and policymakers have a short-term incentive to ignore the environmental effects.[152] As a result, food markets become economically inefficient.[153] Though consumers are paying lower out-of-pocket retail prices at grocery stores or restaurants, the efficiencies are illusory.[154] Consumers also bear invisible and indirect costs of commodity crop production through taxes for public health programs, farm subsidies for commodity crops, pollution from pesticides and fertilizers and other agrochemicals, antibiotic resistance in humans and animals, depletion and contamination of natural resources, and loss of biodiversity.[155] These "hidden" costs are often distributed unfairly throughout society.[156]

The following section discusses the necessity of aligning the actual cost of water, fertilizer, and pesticide use with the commodities produced.[157] The economic invisibility of the impacts of industrial agriculture to humans and ecosystems shields this food system from scrutiny by decision-makers.[158] When natural resources escape pricing, they are ignored or undetected by markets.[159] Evaluating all significant externalities of agricultural production and demonstrating the value of nature in economic terms is necessary to better inform decision-makers in governments, businesses, and on farms so they can reach decisions that

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151 *See id.* at 506 (externalizing costs can ultimately require consumers to pay three times for the production of commodity crops).

152 *See id.* at 409 (stating the environmental effects do not directly affect the cost of food and consumers have incentives to ignore the effect on the environment).

153 *See* Foscolo & Zimmerman, *supra* note 4, at 317–18 (positing that food markets are not affected by pollution due to the lack of environmental efficiency).

154 *See* Erin M. Tegtmeier & Michael D. Duffy, *External Costs of Agricultural Production in the United States*, 2 INT'L J. AGRIC. SUSTAINABILITY 1, 1 (2004) (estimating that external environmental and human health costs of U.S. agricultural production amounted to $5.7 billion to $16.9 billion annually).

155 *See* Henderson et al., *supra* note 2, at 5 (showing that consumers bear several invisible costs to have cheap food).

156 *See id.* (observing the costs paid by the consumer are unfairly hidden and distributed through society).

157 *See infra* Part II.D (providing a discussion of integrating the production of commodities with the actual costs of production).

158 *See Agriculture and Food*, ECON. OF ECOSYSTEMS & BIODIVERSITY, http://www.teebweb.org/agriculture-and-food/ [https://perma.cc/GRL8-63LC] (explaining that because natural resources do not have a direct economic effect, the damage done by agricultural and food systems is overlooked by lawmakers).

159 *See* Pavan Sukhdev, *The Economics of Ecosystems and Biodiversity*, EUR. COMMISSION (2008), http://ec.europa.eu/environment/nature/biodiversity/economics/ [https://perma.cc/93BE-K36U] (pointing out that natural resources do not affect the market; therefore, they are ignored).

account for the full costs and benefits of ecosystem use, rather than just costs of private goods sold on the market.[160]

D. Accounting for the True Cost of Industrial Crop Production

The previous section explained how agriculture is largely exempt from environmental laws.[161] The result is a distortion of the true costs of industrial food production.[162] Recently, several national and international organizations working to improve the food system have called for true cost accounting, which assigns value to the social, environmental, and health impacts of food production.[163] Taking these costs into account is essential; the economic cost of global environmental degradation from industry, such as greenhouse gas emissions, water use, pollution, and waste, is estimated at $2 to $5 trillion per year.[164] At present, the price of our food does not include these costs and benefits.[165] When a large agricultural operation, for example, uses excessive amounts of water or fertilizers, there is no legal obligation to take financial responsibility for the environmental effects.[166] Similarly, although a true cost accounting of industrial food production should include the cost of cleaning pesticide and nitrate residues from drinking water, consumers bear this "invisible" cost when they pay their water bills.[167] This payment subsidizes the

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160 *See id.* (stating the importance of analyzing the environment in relation to the economy).

161 *See supra* Part II.C (illustrating that environmental laws tend to exclude agriculture from its mandates).

162 *See* Megan Perry, *The Real Cost of Food*, SUSTAINABLE FOOD TRUST (Nov. 20, 2015), http://sustainablefoodtrust.org/articles/the-real-cost-of-food/ [https://perma.cc/AGM5-2B6P] (positing that unsustainable food production distorts the costs of food and appears cheaper compared to responsible, sustainable food production).

163 *See True Cost Accounting*, LEXICON OF SUSTAINABILITY (2014), http://lexiconofsustainability.com/true-cost-accounting/ [https://perma.cc/36GX-27B8] (describing that true cost accounting takes into account external costs for food production).

165 *See OECD Environmental Outlook to 2050: The Consequences of Inaction*, ORG. FOR ECON. COOPERATION & DEV. (2012), http://www.oecd-ilibrary.org/docserver/download/env_outlook-2012-sum-en.pdf?expires=1474334746&id=id&accname=guest&checksum=B38284 4880966DFFF48EEB84DD5F21F8 [https://perma.cc/CG24-2ABV] (noting costs associated with the drop in biodiversity).

165 *See* Sustainable Food Trust, *A True Cost of Food Q&A with Liz Earle* (Nov. 22, 2013), http://sustainablefoodtrust.org/articles/the-true-cost-of-food/ [https://perma.cc/DD46-F8NW] (explaining the hidden costs of cheap food).

166 *See id*. (discussing how the costs to water and air from fertilizers and pollutants pass the costs to others); *see also* David Millon, *Shareholder Social Responsibility*, 36 SEATTLE U. L. REV. 911, 919 (2013) (stating that the short-term concerns mean that companies will exploit workers and the environment if they are able to externalize the costs, leading to large profits and costs that are passed to the environment or exploited workers).

167 *See* Sustainable Food Trust, *supra* note 165 (summarizing the cost-shifting by users of pesticides and nitrates as the environmental costs are externalized to the water companies and water customers).

production of the crops on which pesticides are used.[168] Because the cost of cleaning the water is not paid by the farmer, that savings is reflected in the "cheap" price of food.[169] As nutrient pollution has worsened, installation of expensive drinking water treatment equipment has become increasingly necessary across the country.[170] While there are few estimates of the damages caused by nutrients in water sources, the costs incurred by localities to remedy this impact exemplifies the economic impact.[171] For example, since the 1990s, Des Moines Water Works, a municipal water utility in Des Moines, Iowa, has spent millions of dollars to remove nitrate from drinking water.[172] In 2013, the city spent $900,000 just on nitrate removal alone, which will cost its 500,000 customers a ten percent rate increase.[173]

In contrast, farming systems that deliver significant health, social, and environmental benefits, such as building soil fertility and locking atmospheric carbon into the soil, usually pay higher costs to deliver these benefits.[174] As a result, the cost of food products to consumers is grossly distorted.[175] Because the food system is extensively propped up with

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168 *See id.* (reasoning that the cost of the pesticide cleansing is not carried by the pesticide users, but instead by water drinkers).

169 *See id.* (reporting cost externalization as it relates to water costs, which makes food cheaper than it normally would be if the cost were not externalized).

170 *See* Laura Kerr, Comment, *Compelling a Nutrient Pollution Solution: How Nutrient Pollution Litigation is Redefining Cooperative Federalism under the Clean Water Act*, 44 ENVTL. L. 1219, 1220–21 (2014) (citing the costs of water treatment that rise due to pollutant nutrients in the water supply).

171 *See generally* Alan J. Krupnick, *Reducing Bay Nutrients: An Economic Perspective*, 47 MD. L. REV. 452, 480 (1988) (noting difficulties associated with nutrient cleanup, which include cleanup costs as well as the economic impact on people using the bay).

172 *See* Complaint at 3–4, Bd. of Water Works Trs. of Des Moines v. SAC Cty. Bd. of Supervisors as Trs. of Drainage Dists. 32, 42, 65, 79, 81, 83, 86, 2015 WL 1191173, at *3–4 (N.D. Iowa 2015) (No. 5:15-cv-04020), https://www.calt.iastate.edu/sites/default/files/1513756-0--20402.pdf [https://perma.cc/UA6L-V38S] (providing that Des Moines Water Works filed a citizen's enforcement action under the CWA against three rural counties, alleging that the counties had been polluting the city's drinking water with impunity for years).

173 *See* Clay Masters, *Iowa's Nasty Water War*, POLITICO (Jan. 21, 2016), http://www.politico.com/magazine/story/2016/01/iowas-nasty-water-war-213551 [https://perma.cc/9N97-HU29] (reporting the costs of nitrate removal and how that cost reflects on the municipal water customers' bills).

174 *See* Aine Moris, *Paying for Our Cheap Food Choices*, SUSTAINABLE FOOD TRUST (Mar. 21, 2014), http://sustainablefoodtrust.org/articles/true-cost-accounting-cost-of-food/ [https://perma.cc/X67A-2XTQ] (explaining that sustainable practice via the methods mentioned adds costs, which other producers externalize, thus lowering the perceived costs of food).

175 *See id.* (drawing the conclusion that the difference between externalized costs compared to sustainable farming results in distorted consumer prices).

protective policies and supporting subsidies, it is possible for a fast food meal to cost less than a locally grown head of lettuce.[176]

There are a variety of ways to assign a dollar value to the environmental harms caused by commodity crop agriculture.[177] For example:

> Overall impacts attributable to a farming sector, or to a particular type of crop (e.g., corn or soybeans) quantifying the impacts associated with a particular agricultural pollutant, such as a pesticide or herbicide; or quantifying the impact of a particular form of pollution, such as nitrate contamination in drinking water, or injury to commercial fisheries caused by hypoxia, and determining what share of that impact is attributable to an agricultural activity.[178]

There are a variety of inherent challenges in the process of environmental cost accounting for agriculture.[179] For example, there is a wide range of local and regional variations that are intrinsic in agricultural production.[180] Amounts of runoff that enter waterways can be influenced by factors such as growing conditions, climate in different parts of the country, crop rotations, and proximity of fields to surface waters.[181] Because runoff from concentrated animal feed operations as well as nonagricultural sources, such as lawns and municipal stormwater, can also play a significant role in downstream impacts, assigning a price tag

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176 *See id.* (questioning how a globalized food system, based on these policies, results in the price disparities between locally grown food and non-locally grown, global food).

177 *See* Breggin et al., *supra* note 56, at 10132 (indicating that assessing the value of the harm done to the environment can be done in several ways).

178 *See id*. at 10132–33 (describing the various methods used to determine how to quantify the various environmental impacts).

179 *See id*. at 10134 (observing that pesticide pollution costs $9.645 billion per year in the United States). In particular, challenges are inherent in attempting to accurately measure costs, such as the difficulty of monetizing wildlife. *Id.* As a result, many costs were not included in the estimate. *Id.* In assessing the costs imposed by a dead zone for all impacted commercial fisheries, for example, it is challenging to quantify all costs in terms of finding more productive fishing grounds, lost time, and lost catch. *Id.* at 10136.

180 *See* Breggin et al., *supra* note 56, at 10136 (outlining the various difficulties associated with assessing costs of agricultural production).

181 *See id.* (arguing that uncontrollable factors frustrate the ability to identify the accurate costs of production).

to the harm is only the first step.[182] The next step is determining the extent to which specific agricultural sources are responsible for the damage.[183]

Despite the challenges, several groundbreaking studies have attempted to calculate the true environmental costs of industrial commodity crop production.[184] The following sections summarize the findings and recommendations from four such studies.[185]

1. 2004 U.S. Agricultural Costs Study

An important 2004 study attempted to calculate the environmental impact of agriculture.[186] 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 $5 billion and $16 billion annually.[187] This figure reflects external costs of crop production at between twenty-nine and ninety-six dollars per hectare.[188] The study was conducted by aggregating existing valuation data from previous studies.[189] The authors concluded that crop production was associated with the following costs: at least $300 million in damage to water resources from nutrients and pesticides, while noting that it is not a complete review of all relevant impacts on water; $2 to $13 billion in damage to soil resources; $283 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.[190] Although this study provided useful data from which to understand the environmental impacts of crop production, it did not break out the cropland data by type

182 *See id.* at 10133 (detailing the variables associated with agricultural operations, which makes the determination of actual harm an extremely difficult step).

183 *See id.* (outlining what is required to determine the effects of nutrient pollution).

184 *See infra* Part II.D.1–4 (presenting the environmental costs of industrial production through the examination of several studies).

185 *See infra* Part II.D.1–4 (introducing the findings and recommendations of the four groundbreaking studies that quantify the environmental costs of industrial commodity crop production).

186 *See* Tegtmeier & Duffy, *supra* note 154, at 1 (providing the premise of the study to attempt to calculate the environmental impacts on agriculture).

187 *See id.* at 14 (summarizing the externalized costs associated with agriculture in the United States).

188 *See id.* (pointing out that the study separates out the costs attributable primarily to livestock production).

189 *See id.* at 2 (noting similar studies that were incorporated into the calculations of the instant work).

190 *See id.* at 4–5 (gauging the damage to various environmental necessities).

of crop.[191] This twelve-year-old study is limited because the data is now outdated.[192]

2. 2015 Food and Agriculture Organization of the United Nations Study

The FAO of the United Nations recently commissioned a global study of agriculture's environmental impacts.[193] The goal was "to demonstrate to agri-businesses that by measuring its environmental impact, and indirectly its dependency on natural capital, this can inform more sustainable farming decisions, increase profitability, and ensure a more resilient and stable supply of each commodity."[194] Conducted by environmental consultants Trucost, the study provided stakeholders with calculations of the true economic and natural capital costs of commodity production and offered a framework to measure the environmental benefits of different agricultural management practices.[195] Two different types of analyses were conducted: (1) a global, commodity-based "materiality" approach to assess the natural capital impacts caused by the production of four crops—corn, rice, soybean and wheat—and four livestock commodities—beef (from cattle), milk (from cattle), pork, and poultry; and (2) a set of four case studies, including soy farming in the United States, focusing on different agri-commodities and exploring the costs and benefits of adopting different farming practices, such as organic versus conventional.[196]

The research demonstrated that the cost of crop production, in terms of environmental impacts, far exceeded its value.[197] The study concluded that the operational natural capital costs of crop production worldwide costs $1.15 trillion per year, equivalent to 170 percent of its production

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191 *See id*. at 14 (suggesting further research on externalities divided by geographic region or production type).

192 *See* Tegtmeier & Duffy, *supra* note 154, at 4–5 (furthering that the study is outdated, as it is over a decade old).

193 *See Natural Capital Impacts*, *supra* note 22, at 5 (explaining the purpose of the study).

194 *See id*. at 15 (proclaiming that one of the goals of the study was to evaluate the environmental effects so as to necessitate more sustainable farming practices).

195 *See id.* at 5 (declaring that the identification of the significance of the economic and natural capital costs is the intended objective).

196 *See id*. (noting the types of analyses, goals, and variables in the study focused on the United States). The other three studies included: "holistic grazing management vs. conventional cattle grazing in Brazil [to produce beef]; system of rice intensification (SRI) vs. conventional rice farming in India; and organic farming vs. conventional wheat farming in Germany." *Id*.

197 *See id.* at 6 (summarizing that the production costs outweigh the value of the production when taking externalized costs into account).

value.[198] Evaluating soybean farming in the United States, the study concluded that the adoption of organic farming practices, which utilize crop rotations and the use of cover crops, can significantly reduce water pollution, air pollution, and water consumption.[199] Therefore, organic farming has both economic and natural capital advantages over conventional soybean farming.[200] Reductions in pollution and water consumption amount to a sixteen percent reduction of natural capital impacts.[201] Due to the premium price for organic produce, gross margins for organic soybean can be increased by up to 220 percent.[202] Finally, organic soybean farming helps maintain long-term yields and farm profitability by improving soil structure and water filtration, and reducing soil erosion.[203]

3. 2015 United Nations Environment Programme, The Economics of Ecosystems and Biodiversity ("TEEB") Study

Another report by the United Nations Environment Programme's ("UNEP") TEEB for Agriculture & Food asked the question: "are we paying the correct price for our food?"[204] The report recognized that the cost of food may fail to reflect the full range of public costs.[205] In March 2007, environment ministers from G8+5 industrialized nations called for a

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198 *See Natural Capital Impacts*, *supra* note 22, at 6 (providing the dollar value and percentages associated with the cost of crop production when taking into account the externalized costs).

199 *See id*. at 7 (stating that through the use of organic practices, soybean farmers can benefit the environment). The study also concluded that natural capital impacts due to organic wheat farming in Germany were reduced approximately forty-six percent. *Id*. at 71.

200 *See id*. at 7, 71 (analyzing the concurrent economic and environmental benefits associated with organic farming as opposed to traditional, industrialized crop production).

201 *See id*. at 68 (noting that organic farming can lead to beneficial environmental effects).

202 *See id*. (explaining that the margins for the production of organic soybeans, based on its price premium, are driving the gross margin, rather than externalities).

203 *See Natural Capital Impacts*, *supra* note 22, at 68 (noting additional short- and long-term benefits derived from organic farming).

204 *See TEEB for Agriculture & Food Interim Report*, *supra* note 143, at v (presenting the central question of the study). The principal objective of TEEB is the following:

> The Economics of Ecosystems and Biodiversity (TEEB) is a global initiative focused on "making nature's values visible." Its principal objective is to mainstream the values of biodiversity and ecosystem services into decision-making at all levels. It aims to achieve this goal by following a structured approach to valuation that helps decision-makers *recognize* the wide range of benefits provided by ecosystems and biodiversity, *demonstrate* their values in economic terms and, where appropriate, suggest how to *capture* those values in decision-making.

Id. at i. (Emphasis added).

205 *See id*. at v (questioning whether consumers pay too little for food due to uncounted externalized costs).

global study of biodiversity loss and its resulting economic impacts.[206] To assess the costs of worldwide biodiversity loss, TEEB was established.[207] TEEB study analyzes and structures valuation according to three core principles.[208] First, it helps policymakers recognize the value of biodiversity, ecosystems, landscapes, and species.[209] Second, the study aims to demonstrate the economic value of ecosystems which will assist policy makers and businesses in decisionmaking that fully considers the costs and benefits of biodiversity, rather than just those costs of private goods.[210] Third, the study will capture value by introducing incentives to consider ecosystems in decisionmaking, such as payments for ecosystem services, introducing tax breaks for conservation, or reforming environmentally harmful subsidies.[211]

TEEB study is ongoing, but an interim report was published in 2015, which announced the goal of developing a universal framework for evaluating natural capital costs.[212] The framework will use a widely accepted and common lexicon, enabling policymakers and decision-makers to recognize, describe in economic and social terms, and capture the "hidden" costs and benefits of different farming methods.[213] TEEB identifies this as a "fundamental 'first step'" towards achieving a sustainable food system that "produces, processes[,] and distributes food in a manner that is ecologically sustainable, socially just, and provides nutrition, food safety and health, for future generations."[214] The benefit of TEEB's universal framework is that each type of food system, method of farming and food production, or consumer choice can be assessed in the

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206 *See* Zachary Laub, *The Group of Eight (G8) Industrialized Nations*, COUNCIL ON FOREIGN REL. (Mar. 3, 2014), http://www.cfr.org/international-organizations-and-alliances/group-eight-g8-industrialized-nations/p10647 [https://perma.cc/S4LS-VYP8] (stating that the G8 discusses important global issues and the corresponding solutions for such issues). The British Prime Minister, Tony Blair, included Brazil, China, India, Mexico, and South Africa in the summit called the G8+5 because of each country's emerging market. *Id. See also* Sukhdev, *supra* note 159 (noting that biodiversity was the subject of the G8+5 summit).

207 *See* Sukhdev, *supra* note 159 (relating the establishment of TEEB).

208 *See The Initiative*, ECON. OF ECOSYSTEMS & BIODIVERSITY, http://www.teebweb.org/about/the-initiative/ [https://perma.cc/DLG8-5BJJ] (listing the core principles of recognizing value, demonstrating economic value, and capturing value).

209 *See id.* (noting that value in ecosystems is part of human societies).

210 *See id.* (declaring that an economic calculus should also include cost comparison, such as comparing the economic cost of a wetland versus flood control measures).

211 *See id.* (explaining that capturing value means incorporating all externalities into the economic analysis of food production).

212 *See TEEB for Agriculture & Food Interim Report, supra* note 143, at xi (proposing a universal framework to assess costs and externalized costs).

213 *See id*. at 29 (emphasizing the goal of developing a shared lexicon in a universal framework).

214 *See id.* (determining that the use of the universal framework to identify all costs of production is essential to have a sustainable food production system).

same way, taking into consideration all significant economic and social costs, benefits, and risks.[215]

4. 2015 Food Tank, True Cost Accounting Report

A recent report from the nonprofit Food Tank provides an overview of the current work being done on True Costs Accounting ("TCA"), identifies gaps in research, and calls industry, consumers, and governments to action "to instill better accounting measures in food and agricultural production."[216] In its report, Food Tank calls on everyone involved in the food chain to take certain measures to mitigate environmental damage caused by food production and distribution.[217] Businesses must look beyond the short-term benefits of profit to the long-term economic, social, and environmental consequences, and civil society groups advocating for TCA practices must communicate clearly and provide concrete tools and experiences so that business, policy, and community members can act.[218] The report also recognizes the power of consumers and the necessity for improved transparency to empower consumers to choose sustainable food products, rather than foods that are seemingly fast, easy, and cheap.[219] Identifying the "hidden costs" of food production will also enable farmers to identify how they can reduce costs and limit their use of agricultural inputs such as water, pesticides, and fertilizers.[220] The TCA process can reveal inefficiencies within a particular farm or product's production process and can be a catalyst for changes in the process.[221] The TCA process can also assist large corporations and agribusinesses to identify waste or inefficiencies in the food supply chain.[222] Companies can use data about their use of natural resources to create business models that respond to consumer demand for sustainable

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[215] *See id*. at 28 (mentioning the benefits of a universal framework and its ability to provide more data on costs associated with food production).

[216] *See* Henderson et al., *supra* note 2, at 3 (stating the mission statement of the True Costs Accounting report).

[217] *See id*. at 22 (suggesting that all members in the food chain can take measures that will reduce the impact on the environment, such as reduction of food waste, manure emissions, and other things that negatively impact the environment).

[218] *See id*. at 23 (mentioning that civil society groups can affect other groups, thus proposals for better practices in food production should be utilized).

[219] *See id*. (recognizing that consumers have the ability to push for more sustainable food production).

[220] *See id*. (referring to true cost accounting as a way for farmers to make their food production more efficient in terms of lowering externalized costs).

[221] *See id*. (observing how true cost accounting can be used to identify and aid in making a process more efficient and less externalized on the environment).

[222] *See* Henderson et al., *supra* note 2, at 23 (noting that inefficiencies can be identified through factoring in externalized costs).

food systems and also minimize negative environmental impacts.[223] Donors, funders, and investors should support farmers and food entrepreneurs who take responsibility for the full cost of production.[224]

Researchers and scientists must also play a role in evaluating the TCA.[225] Additional research is needed to assess the TCA and its application throughout the food supply chain.[226] This type of research is essential for consumers to advocate for healthier and more sustainable farming practices and would also help change our current food policies.[227] Ultimately, the TCA can inform policymakers of the full costs of food production—both visible and invisible—and help to design and implement effective policies that address environmental, labor, and public health concerns.[228]

E. Informing Agricultural Policymaking with True Costs Accounting

Understanding the actual impacts of industrial agriculture would be useful for pricing water and fertilizer, which will help to accurately reflect the true economic and environmental costs of these inputs.[229] Such an approach encourages use that is appropriate in terms of economics and sustainability.[230] Patrick Holden offers a striking example of how failure to properly account for the costs of industrial agriculture not only affects consumer behavior, but also influences farming decisions:

> One ton of ammonium nitrate costs a U.S. farmer about US$387. The benefit to the farmer is between US$666 and US$2,666 per U.S. ton, but the negative costs—the damage to the environment, pollution, human health, depletion of natural capital—are between US$990 and

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223 *See id.* at 14 (relating how true cost accounting can change and inform business practices).

224 *See id.* at 25 (mentioning the possible funding avenues to support true cost accounting in food production).

225 *See id*. (reporting that researchers and scientists are important because of the tools and data used to apply to true cost accounting in food production).

226 *See id.* (suggesting other routes of scientific research for true cost accounting in food production).

227 *See id.* (noting that research provides the fundamental information to allow civil groups to advocate along the lines of true cost accounting).

228 *See* Henderson et al., *supra* note 2, at 25 (emphasizing the importance of identifying all costs of production to form adequate environmental policies).

229 *See* David E. Adelman & John H. Barton, *Environmental Regulation for Agriculture: Towards a Framework to Promote Sustainable Intensive Agriculture*, 21 STAN. ENVTL. L.J. 3, 36–37 (2002) (stressing the importance of the true cost and impact of water and fertilizer in agriculture).

230 *See id.* at 37 (offering that the true cost accounting approach is more feasible than current agricultural practices).

> US$5,172 per U.S. ton of ammonium nitrate. So in other words, if the damage done was charged to the farmer or the nitrogen fertilizer manufacturer, it would completely cancel out the business case for using it and transform agriculture all over the world, but that's not happening.[231]

Understanding the dollar value of environmental harm associated with industrial agriculture would assist policymakers in accurately evaluating the justifications for subsidies and other support programs and would better explain environmental harms to the public.[232] The emerging data assigning actual costs of industrial commodity crop production should be guiding considerations for agricultural policymakers.[233] The current agricultural policies in the United States support unsustainable food production by promoting large-scale industrialized commodity crop growing.[234] For example, the Farm Bill has provided a variety of subsidy vehicles, such as direct payments and crop insurance payments to commodity crop producers.[235] However, an accurate understanding and accounting of the external costs of our food system, governments and policymakers can craft appropriate policies such as subsidies, incentives, and taxes to farmers and producers to increase transparency in our food system. According to Olivier De Schutter, former United Nations Special Rapporteur, on the right to food, "governments have few sources of leverage over increasingly globalized food systems–but public procurement is one of them. When sourcing food for schools, hospitals[,] and public administrations, governments have a rare opportunity to support more nutritious diets and more sustainable food systems in one fell swoop."[236]

Reforms to the current hands–off approach regarding commodity crop production's environmental impacts should be guided by the goal of

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231 *Accounting for the Hidden Costs of Monoculture Crops*, FOOD TANK (June 4, 2015), http://foodtank.com/news/2015/06/accounting-for-the-hidden-costs-of-monoculture-crops [https://perma.cc/4R7P-JVPQ].

232 *See* Breggin et al., *supra* note 56, at 10136 (expressing that policymakers should become more aware of the economic costs of industrial agriculture).

233 *See id*. (describing how policymakers should take actual costs of production into account when developing laws).

234 *See id*. at 10137 (reiterating that current agricultural practices in the United States continue to support unsustainable food production processes).

235 *See* William S. Eubanks II, *The Future of Federal Farm Policy: Steps for Achieving a More Sustainable Food System*, 37 VT. L. REV. 957, 978 (2013) (providing an overview of U.S. farm policies and advocating for reform to achieve a more sustainable food system).

236 *See id*. (noting that it is rare for a government to combine nutrition with a sustainable food system).

achieving a sustainable food system.[237] As defined by the 1990 Farm Bill, sustainable agriculture is:

> [A]n integrated system of plant and animal production practices having a site-specific application that will, over the long term, satisfy human food and fiber needs; enhance environmental quality and the natural resources base upon which the agricultural economy depends; make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; sustain the economic viability of farm operations; and enhance the quality of life for farmers and society as a whole.[238]

The term "sustainable agriculture" is generally focused on obtaining and maintaining three main objectives: environmental health, economic profitability, and social and economic equity.[239] The Union of Concerned Scientists explains that sustainable agriculture views a farm as a type of ecosystem, an agroecosystem, made up of elements like soil, plants, insects, and animals, and when taken together, can produce high yields and profits for farmers while protecting human health, animal health, and the environment.[240] Although defined and explained in various ways, "the underlying principle of sustainability is the desire to meet current needs of society while still preserving sufficient resources for future generations to meet their needs."[241] Current agricultural practices utilize the equivalent of 1.5 planets to provide the resources we use to help absorb our waste.[242] However, these demands on natural resources are clearly unsustainable and threaten the ability of our planet to accommodate

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[237] *See id*. at 16 (explaining that the current approach should be changed to a more hands-on approach to achieve a sustainable food system).

[238] *Sustainable Agriculture: Definitions and Terms*, U.S. DEP'T OF AGRIC. (Aug. 2007), https://www.nal.usda.gov/afsic/sustainable-agriculture-definitions-and-terms [https://perma.cc/VR4M-LE73].

[239] *See* Gail Feenstra et al., *What is Sustainable Agriculture?*, U.C. DAVIS AGRIC. SUSTAINABILITY INST., http://asi.ucdavis.edu/programs/sarep/about/what-is-sustainable-agriculture/#concept-themes [https://perma.cc/5JXH-7MGP] (examining the goals associated with sustainable agriculture).

[240] *See Solutions: Advance Sustainable Agriculture*, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/our-work/food-agriculture/solutions/advance-sustainable-agriculture#.V-1EDfkrLcu [https://perma.cc/6PDK-3MUL] (defining agroecosystem and how its qualities can improve and create a more sustainable agricultural system).

[241] *See* Angelo, *supra* note 23, at 641(describing the principles of sustainability).

[242] *See TEEB for Agriculture & Food Interim Report*, *supra* note 143, at 8 (criticizing current agricultural practices that use and emit an enormous amount of waste that causes damage to the biosphere).

future generations.[243] Creating a sustainable food system necessarily requires consideration of modern agriculture's impact on land, water, and biodiversity, and account for the contribution of agriculture on climate change.[244] As aptly stated by Nadia El–Hage Scialabba, Food and Agriculture Organization Senior Natural Resources Officer:

> Unveiling the hidden costs of mainstream agriculture is necessary to convince decision-makers that investing in conversion to sustainable food and agriculture systems is a much cheaper option than current expenditures for environmental mitigation and public health. True food prices entail reflecting producers' efforts to meet their needs for the time required to reproduce the value, while the cost of environmental damage should not [be] paid by society through higher food prices but by those who irresponsibly abuse common goods offered by our natural environment.[245]

True cost accounting is a critical piece of any analysis of sustainability because distorted costs—lack of consideration of the tremendous environmental effects—continue to justify exclusions from environmental laws and government incentives in support of such practices.[246] The result is the consumer paying a price for food products at the store, through taxes in the form of government subsidies, and again in the destruction of the environment.[247] To achieve sustainability in agriculture, governments must implement regulatory and incentive-based tools to require such practices.[248] The ultimate (and daunting) challenge is to revise current policies to ensure an affordable and healthful food supply while creating an agricultural system that is environmentally, economically, and socially sustainable.[249] Rather than merely incorporating true-cost into the retail price of food product, true-cost accounting calls for "policy initiatives, and a range of incentives, taxes, and subsidy redistribution" to promote

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[243] *See id.* (pointing out the unsustainability of current agricultural practices and the potential impact on future generations).

[244] *See id.* (noting the need to reflect on current practices in order to create a more sustainable food practice in the future).

[245] *Trucost*, *supra* note 26.

[246] *See* Angelo, *supra* note 23, at 655 (stressing the importance of true cost accounting and how it should be included in new legislation to truly accomplish sustainable agriculture).

[247] *See id*. (demonstrating that the hidden costs of food that are placed on consumers can take different forms, including the implementation of ecosystem services).

[248] *See id*. at 642 (introducing the concept that developable tools have the ability to instill better practices for food production).

[249] *See id*. (noting that challenges exist when creating a sustainable food system).

sustainable farming practices and ensure that those polluting pay more than those who are utilizing more environmentally-friendly measures.[250]

Certainly, one solution would be to amend key environmental laws to minimize or eliminate the exemptions from coverage that are currently afforded to large-scale commodity crop operations to ensure that agricultural impacts to the environment are regulated "to the same extent and with the same standards as other industrial operations."[251] However advantageous such an approach may be, it is impractical, considering the current economic and political landscape, to expect new legislation to thoroughly address pollution from commodity crop production.[252]

In consideration of the environmental effects of industrial commodity crop production, several scholars and commentators have proposed reforms to agricultural policy, focusing primarily on the Farm Bill.[253] In particular, the proposals focus on two categories of reforms: first, to the Farm Bill's subsidy programs, and second, a mandatory disclosure of the agri-chemicals used in crop production.[254] The goal of these measures is the same—to encourage farmers to use less fertilizers and instead incorporate more sustainable practices.[255] The following sections briefly summarize those proposals.[256]

1. Subsidy Reforms

According to Professor Mary Jane Angelo, addressing the environmental effects of modern agricultural practices will require:

> [A] dramatic shift to a more sustainable system of agriculture. To accomplish such a transformative shift, mere tinkering with existing regulatory regimes will not be sufficient. A complete overhaul of existing agricultural policy is warranted, and a significant

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250 *See* Moris, *supra* note 174 (comparing true cost accounting with other methods of agricultural production and explaining why true cost accounting is a better model).

251 *See* Adelman & Barton, *supra* note 229, at 39–40 (arguing that environmental agricultural laws should be amended to mirror other industrial standards to improve the regulatory framework governing agriculture).

252 *See* Breggin & Myers, *supra* note 18, at 522 (presenting expected challenges associated with new approaches proposed to the legislature).

253 *See id.* (discussing how scholars tried to propose reform to the Farm Bill because of large-scale commodity crop agricultural operations).

254 *See id*. at 522, 535 (identifying two proposed reforms to the Farm Bill).

255 *See id*. at 512–13 (expressing the goal to use less fertilizer usage and promote the use of more sustainable practices).

256 *See infra* Part II.E.1–2 (summarizing proposals of using less fertilizer and creating a more sustainable farming practice).

> component of such an overhaul would be a complete rethinking of commodity subsidy programs.[257]

In the United States and in other industrialized countries, subsidies are predominately provided to farmers who grow commodity crops, such as corn and soy.[258] Annual agricultural subsidies in the United States for commodity crops, such as corn and soybeans, are $3.52 billion and $1.56 billion respectively, while all fruit and vegetable subsidies are only $0.37 billion.[259] As discussed above, production of these crops on an industrial scale has devastating environmental effects.[260] To bring about true cost accounting, subsidies should be redirected towards sustainable farmers who minimize negative externalities.[261]

Several commentators have recommended variations of "conservation compliance," requiring large-scale commodity crop operations that choose to accept federal subsidy payments to assume responsibility for implementing stewardship practices.[262] The 2014 Farm Bill included Highly Erodible Land Conservation ("HELC") and Wetland Conservation ("WC") provisions applicable to all land that is considered highly erodible or a wetland to reduce soil loss and to protect wetlands.[263] Crop producers are now required to adopt basic soil conservation measures to obtain crop insurance subsidies.[264] To comply with these provisions, crop producers are prohibited from planting or producing an

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257 Angelo, *supra* note 23, at 646.

258 *See* Henderson et al., *supra* note 2, at 10 (pointing out that governments favor commodity crops for subsidies).

259 *See Toward Healthy Food and Farms: How Science-Based Policies Can Transform Agriculture*, UNION OF CONCERNED SCIENTISTS 1 (Mar. 2002), http://www.ucsusa.org/sites/default/files/legacy/assets/documents/food_and_agriculture/healthy-food-and-farms-policy-brief.pdf [https://perma.cc/DUP3-YTJJ] (comparing annual agricultural subsidies for commodity crops, such as corn and soybeans, with other fruit and vegetables).

260 *See id*. at 2 (discussing the devastating impact that industrial farming has on the environment, including the polluting effects on reservoirs and the groundwater supply).

261 *See id*. at 2–4 (describing subsidies for sustainable farming within the true cost accounting method and providing policies to expand the production and accessibility of healthy foods).

262 *See* Breggin & Myers, *supra* note 100 (defining the different proposed requirements for conservation compliance and illustrating policy arguments associate with such conservation compliance).

263 *See Highly Erodible Land Conservation Compliance Provisions*, U.S. DEP'T OF AGRIC., http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/programs/alphabetical/camr/?cid=nrcs143_008440 [https://perma.cc/QBS9-VGZH] (listing the Highly Erodible Land Conservation ("HELC") and Wetland Conservation ("WC") provisions of the Farm Bill).

264 *See id.* (explaining that those who engage in programs offered by the Farm Services Agency, the Natural Resources Conservation Service, and the Risk Management Agency must comply with the HELC and WC provisions).

agricultural commodity on highly erodible land unless they comply with an NRCS approved conservation plan or system, plant or produce commodity crop on converted wetland, or convert a wetland to produce a crop.[265] While labeled a victory by some environmentalists, others criticize the provisions for only partially addressing the environmental consequences of large-scale commodity crop production.[266] For example, Breggin and Myers argue that the measure "[sets] the bar too low" by addressing only sediment pollution, while ignoring nutrient and pesticide pollution resulting from commodity crop operations.[267] The authors also propose that "large-scale commodity crops" adopt baseline stewardship measures for nutrient pollution that have been implemented, which are "appropriate to the particular crop, geography, climate, and other local circumstances of the operation."[268]

Professor Angelo has also argued in support of extensive subsidy reforms and has proposed a system that ties subsidy levels to the adoption by farmers of different levels of sustainable practices.[269] A tiered system could be created where large-scale commodity crop growers would "reduce their use of fertilizers, pesticides, and water, and employ certain best management practices to limit erosion, depletion of organic matter in soils, contamination of ground and surfacewater, and harm to surrounding biodiversity, receive a tier-one level of subsidy."[270] Growers who meet existing United States Department of Agriculture ("USDA") organic certification standards could receive a higher level of subsidy.[271] This subsidy would reward organic growers by encouraging more growers to produce organic crops, which would lower consumer prices, and thus increase consumer demand for these products.[272] A third tier of

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265 *See id.* (describing specific provisions that must be followed under the HELC and WC).

266 *See* Breggin & Myers, *supra* note 100 (comparing the differing opinions regarding the recent changes of the Farm Bill provisions and the concerns with conservation compliance).

267 *See id.* (emphasizing why nutrient and pesticide pollution from commodity crop operations may also have harmful concerns to bodies of water).

268 *See* Breggin & Myers, *supra* note 18, at 529–30 (highlighting additional proposals to the Farm Bill that would create better stewardship amongst large-scale commodity crops). The authors also emphasize that implementing the requirements in a fair and equitable manner will require exemptions for undue economic hardship and good faith efforts to implement stewardship measures that fail, as well as technical assistance as needed. *Id.* at 530.

269 *See* Angelo, *supra* note 23, at 654 (claiming that other scholars have proposed provisions to the Farm Bill that include a tiered system).

270 *Id.*

271 *See id.* (describing a higher tier of subsidies that could be available to farmers that meet certain criteria).

272 *See id.* (offering an example of how this tiered system could effect change towards a more sustainable food system).

subsidies could also be provided to growers who do not meet organic standards, but engage in identified sustainable practices.[273]

Another proposal involves the use of progressive tax rates assigned to farms using chemicals in excess of the desired threshold and farms using chemicals below the target level would be rewarded through decreased taxes or subsidies.[274] According to Professor C. Ford Runge, imposing a negative pollution tax could reduce the use of chemical inputs on farms.[275] The French Ministry of the Environment recommended such a tax on pesticides and fertilizers that would be imposed directly on farmers and adjusted based on the environmental toxicity of each chemical.[276] Based on maximum acceptable levels of each chemical input—determined by a set crop on a regional basis—tax revenues would be refunded to farmers who use less than the maximum amount.[277] To incentivize organic farmers who use no chemicals, they would receive a payment equal to farmers who use chemicals up to the ceilings.[278] This tax system would address chemical use on every farm in an economically and administratively efficient way.[279]

2. Disclosure

Professor Ruhl has proposed the adoption of a "Farm Release Inventory," an approach similar to the TRI, which would require farms to publicly report releases to regarding the quantity, type, and timing of fertilizers they apply.[280] Experience with the TRI has shown that simply requiring industrial operations to report to the public the types and amount of toxic releases from industrial facilities results in significant

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[273] *See id* at 654–55 (recognizing that the third-tier proposal would be a different approach to farming compared to large-scale monoculture industrialized production).

[274] *See* Ruhl, *supra* note 97, at 339 (introducing another proposal called the "negative pollution tax" that would tax based on chemical levels of farms).

[275] *See id.* (reviewing the goal of the "negative pollution tax").

[276] *See id*. (discussing recommended farming and environmental taxes to reach suitable chemical levels on farms).

[277] *See id.* (speculating on an incentive for farmers to use less than the maximum chemicals allowed).

[278] *See id*. (identifying incentives organic farmers could receive under the negative pollution tax, compared to the farmers who use chemicals).

[279] *See id.* (explaining that a negative pollution tax is more economical and efficient in changing the behavior of farmers who use harmful chemicals).

[280] *See* Ruhl, *supra* note 97, at 337–38 (introducing the proposal of the Farm Release Inventory requiring farmers to publicly disclose fertilizer usage information); *see also* Breggin & Myers, *supra* note 18, at 535–36 (recommending that large-scale commodity crop operations publicly report on the quantity, type, and timing of fertilizers used to increase public access to information on the sources and quantities of nutrient pollution entering surface waters and groundwater).

reductions of toxic releases, in part because the industry will voluntarily reduce its emissions to avoid being seen as the "bad neighbor," and in part because citizens often use the information to put political pressure on the industry to find ways to reduce releases or substitute less toxic materials.[281] Breggin and Myers have also supported this proposal and argue that large crop operations should publicly disclose information about their application of agricultural chemicals in exchange for receipt of any form of federal farm subsidy.[282] Documentation of the actual amounts of agricultural chemicals used will increase public access to information on the sources and quantities of chemical pollution potentially entering surface waters and groundwater, while at the same time helping to discourage practices that result in the overuse of fertilizers and pesticides through penalties.[283]

III. CONCLUSION

Obtaining more accurate and comprehensive data about the true costs of industrial commodity crop production should be a key priority of agencies, such as the EPA and USDA. Such information would be valuable to policymakers to enact measures to appropriately address pollution from commodity crop producers. Achieving a sustainable food system—one that meets the current needs of society while still preserving sufficient resources for future generations—demands an accurate assessment of all significant externalities of our modern agriculture. Furthermore, agricultural producers, businesses, and government agencies must take true cost accounting into consideration when shaping agricultural policies.

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281 *See* Ruhl, *supra* note 977, at 337 (explaining the importance of reporting toxic chemicals used in industrial farming).

282 *See* Breggin and Myers, *supra* note 18, at 512 (commenting that large crop operations must disclose chemicals used in order for farmers to receive any subsidies).

283 *See id.* at 535 (emphasizing the importance of documenting the use of agricultural chemicals used in farming operations). This regulatory approach adopts the public disclosure strategy that has been successful in another environmental statute, the EPCRA. *Supra* Part II.C.5.