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# Applying Sustainable Land Use Development Studies to Sustainable Agriculture: Are the Conditions Ripe for a Successful Movement Toward Sustainable Agriculture?

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# Applying Sustainable Land Use Development Studies to Sustainable Agriculture

## ARE THE CONDITIONS RIPE FOR A SUCCESSFUL MOVEMENT TOWARD SUSTAINABLE AGRICULTURE?

### INTRODUCTION

Agriculture inherently causes pollution, destroys natural habitats, and alters the composition of soils, lakes, and rivers.[1] The transition from traditional farming practices to modern agricultural industry has multiplied and escalated the gravity of these environmental impacts.[2] All farmers typically engage in intensive practices, which include "first, remov[ing] all existing vegetation from the land and level[ing] it; second, deploy[ing] a single-species regime of crop or livestock; third, cultivat[ing] the crop or livestock with water and chemicals; [and] finally, remov[ing] the crop or livestock and associated waste products from the land and start[ing] over."[3] Industrialization has made efficient use of "capital, labor and technology" the primary focus of agriculture, simultaneously decreasing the number of farms and increasing productivity, but also ignoring the negative ecological impacts.[4]

In the United States, farms account for over 930 million acres—45 percent of the nation's soil.[5] The 2007 Intergovernmental Panel on Climate Change's Fourth Assessment Report indicates that almost half of the Earth's land

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[1] J.B. Ruhl, *Farms, Their Environmental Harms, and Environmental Law*, 27 ECOLOGY L.Q. 263, 266 (2000).

[2] Mary Jane Angelo, *Corn, Carbon, and Conservation: Rethinking U.S. Agricultural Policy in a Changing Global Environment*, 17 GEO. MASON L. REV. 593, 602 (2010).

[3] Ruhl, *supra* note 1, at 274.

[4] Christopher B. Connard, *Sustaining Agriculture: An Examination of Current Legislation Promoting Sustainable Agriculture as an Alternative to Conventional Farming Practices*, 13 PENN ST. ENVTL. L. REV. 125, 128-29 (2004).

[5] Ruhl, *supra* note 1, at 272.

surface is used for agricultural purposes.[6] On these vast stretches of land, agricultural fertilizer and soils emit significant amounts of carbon dioxide, nitrous oxide, and methane[7]—the three critical gases responsible for climate shifts.[8] The notion of farming as a natural, intrinsic element of human civilization, however, has afforded the American agricultural industry a significant exemption from environmental regulation.[9] Although environmental regulations generally represent the growing acknowledgement of the deteriorating state of the environment, agricultural practices have not been adequately regulated.[10]

Federal regulation of agriculture exists in various environmental statutes, giving it a piecemeal character and making it difficult to navigate, even before accounting for the collection of active and passive exemptions for farms.[11] Under the Clean Air Act (CAA), for example, farms are either given specific exemptions or lack the necessary thresholds for the Environmental Protection Agency (EPA) to initiate regulatory actions.[12] The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) treats the farming industry with a hands-off approach. Permit requirements, environmental performance standards, and pesticide level monitors are inapplicable to farmers.[13] Similarly, as all states currently recognize "right-to-farm" laws, common law nuisance does not offer recourse against harmful farming operations.[14] Society's view of agriculture as a natural part of civilization[15] and "the current system of agricultural law exceptionalism,"[16] has allowed farms to enjoy a special "safe harbor" from environmental regulatory programs that would otherwise limit the negative side-effects

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[6] Pete Smith et al., *Agriculture*, *in* FOURTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 497, 499 (2007), *available at* http://www.ipcc.ch/pdf/assessment-report/ar4/wg3/ar4-wg3-chapter8.pdf (last visited Feb. 10, 2013).

[7] Ruhl, *supra* note 1, at 291.

[8] *See* Smith, *supra* note 6, at 499.

[9] Ruhl, *supra* note 1, at 269.

[10] *Id.* at 266.

[11] *Id.* at 293.

[12] *Id.* at 307.

[13] *Id.* at 311.

[14] *Id.* at 315.

[15] David E. Adelman & John H. Barton, *Environmental Regulation for Agriculture: Towards a Framework to Promote Sustainable Intensive Agriculture*, 21 STAN. ENVTL. L.J. 3, 5 (2002).

[16] 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, 961 (2010).

of farming.[17] To solve this problem, the farming industry must begin addressing the reality of its effects on the environment by implementing a new system of farming: *sustainable agriculture*.

Recognizing the detrimental consequences of industrial agriculture, a growing number of farmers, environmentalists, and agricultural researchers have begun to explore better farming methods.[18] Sustainable agriculture, which seeks to achieve the often conflicting goals of environmental protection and farmers' economic profitability,[19] has the potential to transform modern agriculture into a system that

> produces abundant food without depleting the earth's resources or polluting its environment[;] . . . follows the principles of nature to develop systems for raising crops and livestock that are, like nature, self-sustaining[; and] is the agriculture of social values, one whose success is indistinguishable from vibrant rural communities, rich lives for families on the farms, and wholesome food for everyone.[20]

Although this seems promising, little federal or state legislation has been passed to specifically direct sustainable agricultural practices.[21] Instead, legislation has mostly emphasized the need for research and "the exchange of scientific and practical information on sustainable agriculture."[22] Sustainable agriculture will not replace conventional practices based on research alone. Therefore, governments must implement regulations[23] and creatively strategize how to move agriculture toward a sustainable system.

When implementing a proposal for land use, the Supreme Court has emphasized the importance of a comprehensive and integrative land use *plan* since 1972.[24] The recent, initial steps of environmental groups to develop

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[17] Ruhl, *supra* note 1, at 293, 307.

[18] RICHARD EARLES, SUSTAINABLE AGRICULTURE: AN INTRODUCTION 1 (2005), *available at* https://attra.ncat.org/attra-pub/summaries/summary.php?pub=294.

[19] Neil D. Hamilton, *The Role of Law in Promoting Sustainable Agriculture: Reflections on Ten Years of Experience in the United States*, 3 DRAKE J. AGRIC. L. 423, 425 (1998).

[20] EARLES, *supra* note 18, at 1.

[21] Connard, *supra* note 4, at 137-40.

[22] For example, in California and Iowa, agricultural research funding has been appropriated through state universities to identify environmental impacts and develop economically viable farming systems that integrate ecologically sound practices. *Id.* at 138-40.

[23] *Id.* at 140.

[24] In *Golden v. Planning Bd. of Ramapo*, a land use development case involving a challenge to the amendment to a local zoning ordinance, the court emphasized the importance of integrating "infrastructure and land use planning" in a land use scheme. DAVID L. CALLIES ET AL., CASES AND MATERIALS ON LAND USE 692 (4th ed. 2004) (discussing 285 N.E.2d 291 (1972)).

proposals that urge ecologically mindful farming techniques[25] will be able to flourish by learning from the experience of land use planning—that is, with the support of an attentive planning process and new infrastructure. Similar to land use planning, an effective change to the agrarian systems requires the physical, social, and economic resources to be comprehensively preserved.[26] Both land use plans and sustainable agriculture share the goal of balancing environmental concerns with realistic economic viability.[27] In order to take the next step and implement these proposals, governments should rely on the expertise of natural resource management, land development, and community development scholars who have laid the groundwork with studies for successful land use plans. These frameworks can serve as a constructive resource in developing sustainable agriculture plans and providing a tested set of applicable studies.[28]

This note will argue that a new agricultural approach mandating specific sustainable techniques is necessary to ensure the future availability of farming land and resources. A land use planning process that is attentive to the needs of both the environment and the economic well-being of the agricultural community can be of tremendous value to the success of implementing a sustainable agricultural system. Part I of this note will present an overview of the environmental harms

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[25] *See* discussion *infra* Part IV.

[26] Hamilton, *supra* note 19, at 425; *see also* Brent Schoradt, *Sustainable Communities Strategies Will Be Essential to the Success of SB 375*, 36 ECOLOGY L.Q. 611, 614 (2009) (arguing that protecting natural resources in an economically feasible manner requires a strategic sustainability-oriented planning process).

[27] Hamilton, *supra* note 19, at 425-26, 429-30.

[28] For instance, discussions on the Smart Growth Movement—which encourages fiscally resourceful, competitively wise, and environmentally sound land use developments—identified the features necessary for a land use design that efficiently uses public money and resources while protecting environmental quality. *See* CALLIES ET AL., *supra* note 24, at 681-82. A second example is the movement of families toward rural outskirts of the cities, known as "urban sprawl." The movement ignored the community's best interest in planning decisions, causing valuable resources to be wasted. *Id.* at 678-81. In response to the wasteful trend, the U.S. Department of Agriculture's 1981 National Agriculture Lands Study (NALS) explored the consequences of changing land historically used for agriculture to property for residential communities. In order to effectively halt the trend, the NALS identified the essential elements for administrative and legislative programs: "(1) farmer participation from the onset; (2) adequate technical and financial support; (3) strong local leadership; (4) patience; and (5) timing—start[ing] before development pressures become too strong." *Id.* at 748. Alterations to the way in which land is used required an integrated community effort, pulling from local support and collaborative planning. Literature on land use planning likewise references or incorporates analogous factors as necessary preconditions to successful land use designs. *Id.* at 748-49. Relying on these tested planning preconditions, recent proposals in environmental law to integrate sustainable agriculture can be critically assessed. *See infra* Part IV.

caused by conventional agricultural practices and the regulatory loopholes the agricultural industry enjoys. Part II will explore the possibilities for sustainable techniques to mitigate these harms. Part III will discuss land use planning frameworks and identify the necessary preconditions for these frameworks to succeed, with a focus on sustainable land use. Part IV will import the necessary preconditions for successful land use to analyze the viability of sustainable agricultural legislation and comment on the methods that will most effectively bring about sustainable agriculture.

## I. ENVIRONMENTAL HARMS AND REGULATORY FAILINGS

Agriculture necessarily involves man-made modifications to the natural state of land. Industrialization has developed agriculture into a practice that includes "conversion of undeveloped land into agricultural fields, intensive water use for irrigation, fertilizer use, pesticide use, growing crops in monocultures, and tilling soils."[29] This "impact[s] natural resources, wildlife and biodiversity, ecosystem services, and human health, and significantly contribute[s] to climate change."[30] The current progression toward industrialized agriculture has resulted in a variety of unaddressed environmental costs—stripping vast amounts of land[31] of its nutrients and degrading the environment.[32] This toxic process is permitted and encouraged on a substantial amount of land in the United States,[33] which, in turn, creates endless implications for world ecosystems and human health. All the while, the current regulatory framework intended to protect the nation's land, air, water, and biodiversity fails to adequately address agriculture's specific impacts on the environment.

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[29] Angelo, *supra* note 2, at 603.

[30] *Id.*

[31] The National Agricultural Statistics Service reported a four percent increase in the number of farms in the United States since 2002, based on the 2007 Census of Agriculture's findings of over 2 million farms. NAT'L AGRIC. STATISTICS SERV., 2007 CENSUS OF AGRICULTURE: FARM NUMBERS 1 (2007), *available at* http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/Fact_Sheets/Farm_Numbers/farm_numbers.pdf. This accounts for 922,095,840 acres of land. NAT'L AGRIC. STATISTICS SERV., 2007 CENSUS OF AGRICULTURE: U.S. AGRICULTURE BY WATERSHEDS 2 (2007), *available at* http://www.agcensus.usda.gov/Publications/2007/Online_Highlights/Fact_Sheets/Geographic/watersheds.pdf.

[32] Connard, *supra* note 4, at 125, 128-29.

[33] Adelman & Barton, *supra* note 15, at 5.

### *A. Effect on Soil and Land*

Current farming practices are detrimental to soil and land, causing concern over the availability of nutritious soils in the future. In the United States, agriculture is the leading cause of soil erosion, whereby the soil matter on a given swath of land is lost.[34] When transitioning the use of land to suit agricultural needs, the organic matter of soil is depleted and the possibility of soil erosion increases.[35] This directly impacts the land's utility and productivity.[36] Even when farmers use "good farming" practices—for example, techniques that retain the moisture and temperature levels of the soil—and improved soil management technology, modern agriculture still causes erosion at twelve times the rate that soil is replenished.[37]

In addition to erosion, irrigation salinizes farming soil, which damages the land for future agriculture.[38] To reduce salinity, farmers filter out the salts by flushing soils with water that is of a higher quality than generally necessary for crops.[39] But this remedy instead causes downstream harm to the environment: these filtered salts return to imbedded irrigation waters and absorb into water runoff, eventually affecting aquatic systems and reducing the yields of almost a quarter of irrigated land in the United States.[40] As current "good farming" practices have proved ineffective, there is a growing need for sustainable practices to curb the rate of soil declination.

Technological innovation has successfully refined farming practices, but the increased productivity does not necessarily render a healthy environment. Agrochemicals used to increase agricultural yield alter the chemical composition and remain in the soils.[41] The chemicals are absorbed into the soils and, later, into the adjacent air and water environments through discharges and surface water runoff.[42] While

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[34] Ruhl, *supra* note 1, at 277.

[35] *Id.*

[36] *Id.* at 274-79.

[37] *Id.*

[38] Salinization occurs when water is added to soil and it drains "salts and other minerals from the soil" that, in turn, accumulate and slow down plant development. *Id.* at 281.

[39] *Id.*

[40] This process is called salinization. *Id.* at 281-82.

[41] Agrochemicals include insecticides, herbicides, and fungicides. *Id.* at 282-83.

[42] *Id*. Of the commonly used chemicals, dichlorodiphenyltrichloroethane (DDT) can remain for decades and continually affect the environment, while organophosphates and carbamates are rather quickly eliminated, but are severely toxic. *Id.* at 283.

agriculture accounts for 80 percent of pesticide use in the nation, many of these pesticides are not even effective pest eliminators.[43] The chemicals cause severe environmental risks and become integrated with daily human activities with minimal consideration of the effect on future resources.

Despite the serious harms on land and soil from heavy irrigation and pesticide use, federal environmental laws do not adequately regulate and curtail these practices. The Clean Water Act (CWA) and the CAA do not require responsible disposal of farming pesticides and fertilizers.[44] FIFRA, the regulatory framework most suitable for pesticide control, merely requires farms to employ certified persons to apply pesticides according to label instructions.[45] Similarly, the Toxic Substances Control Act (TSCA) does little more than require chemicals in fertilizers to be registered before manufacture.[46] Even disclosure-forcing regimes such as in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Emergency Planning and Community Right-to-Know Act (EPCRA) exclude the agriculture industry from reporting requirements.[47] In order to effectively combat pervasive soil erosion, salinization, and agrochemical application, the agricultural industry must acknowledge and address the detrimental consequences of its practices.

### *B. Effect on Air and Climate Change*

Chemical air pollution also poses a multitude of threats to the health of crops, humans, and ecosystems as a whole.[48] Fertilizers emit greenhouse gases[49] that cause acidification,[50] eutrophication, and alteration of species diversity and their symbiotic relationships.[51] Animal waste creates hydrogen sulfide and ammonia nitrogen; wind erosion alters aerosol contents; and

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[43] *Id.* at 282-83.

[44] *See id.* at 309.

[45] *See id.* at 309-10.

[46] *See id.* at 311-12.

[47] *Id.* at 312-13.

[48] *Id.* at 292.

[49] The three greenhouse gases are carbon dioxide, nitrous oxide, and methane. Ruhl, *supra* note 1, at 291-92.

[50] Acidification is "a concept that covers the harmful effects to the environment and public health from emissions depositions of acid and acidifying substances, such as sulfur dioxide ($SO_2$), nitrogen oxides ($NO_x$), and ammonia ($NH_3$)." William J. Shapiro, *Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone*, 11 COLO. J. INT'L ENVTL. L. & POL'Y 208, 209 n.11 (2000) (citation omitted).

[51] For an explanation of eutrophication, see *infra* text accompanying note 86.

pesticide dispersion causes "fumigants, wind erosion of pesticide-laden soil particles, and aerial drift from spraying."[52] These atmospheric pollutants are detrimental to air quality.[53]

Agricultural activities also rely on fossil fuels for production of fertilizers and synthetic pesticides, and to power heavy machinery and transportation. These activities account for twenty percent of national fossil fuel consumption and fifteen percent of international greenhouse gas emissions.[54] Continued use of fossil fuels in commodity crop agriculture, which produces highly subsidized crops (that is, corn, cotton, rice, soybeans, and wheat), will accelerate climate change as the greenhouse gas levels are compounded.[55]

While livestock nutrition has historically depended on open field grazing, with the scientific innovation of crop hybridization during the "Green Revolution" in the 1960s, a market of heavily subsidized, cheaper grains and corns entered the agricultural industry.[56] Consequently, mass corn production allows large livestock populations to exist in small feedlots, also known as Concentrated Animal Feeding Operations (CAFOs), because tremendous amounts of feed have replaced the need for grazing.[57] CAFOs require large amounts of fossil fuels for cultivation and transportation of corn feedstock, and CAFO waste creates massive amounts of methane emissions,[58] which are "twenty times more powerful than carbon dioxide" in contributing to the greenhouse gas effect.[59] The compounded

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[52] Ruhl, *supra* note 1, at 292.

[53] *Id.*

[54] Angelo, *supra* note 2, at 612.

[55] William S. Eubanks II, *Paying the Farm Bill*, 27 ENVTL. F. 56, 66, 72 (2010). Nitrogen fertilizers created from natural gas are used in the industrial production of commodity crops, which represents almost a third of national energy consumption. Some examples of the energy intensive processes in commodity crop agriculture are: tractors and electricity for maintenance, crop collection, transportation, irrigation pumps, and other farming technology. Agricultural tilling accelerates soil erosion and increases carbon emissions. When the soil absorbs carbon dioxide and then large machines till the land, a new topsoil layer is exposed into the atmosphere, causing erosion and the release of carbon dioxide. *Id.* at 66, 69.

[56] Angelo, *supra* note 2, at 606-07. The "Green Revolution" occurred during the 1960s, tripling the grain production due to the scientific innovation in crop hybridization, which artificially bred crops that were able to produce increased yields. Eubanks, *supra* note 55, at 58 & n.23.

[57] Eubanks, *supra* note 55, at 65.

[58] *Id.* at 69. "[Sixty six] percent of the current corn crop in the United States . . . grown with water-polluting fertilizers and pesticides [are] fed to livestock in CAFOs solely for the production of meat." *Id.* at 65.

[59] Angelo, *supra* note 2, at 600, 613. Methane is a naturally occurring gas produced from animals, but modern agricultural practices in the form of confined feeding operations multiplies the quantity of the emissions. *Id.* at 613.

concentrations of methane irreversibly pollute the air and contribute to climate change.

Even in light of these grave impacts on air quality and climate change, the CAA does little to curb harmful agricultural practices. The volume of pollutants discharged by the farming industry generally meet the CAA's "de minimis discharge exception[]," which leaves states with the responsibility to develop plans to meet federal air quality standards.[60] States, however, do not actively make such efforts.[61] While there is no explicit agricultural exemption within the CAA, the EPA has used its discretion to limit the CAA's reach in regulating accidental releases and requiring "risk management plan[s]."[62] This federal regulatory approach must be adjusted to prevent increased damage to air quality.

### *C. Effect on Water Consumption and Water Pollution*

Current farming practices negatively impact water consumption and water pollution. Agricultural irrigation is the "largest use of fresh water" in the United States.[63] Water is diverted across vast distances to support production of federally subsidized crops in less than optimal farming locations—that is, lands that lack favorable conditions for agricultural use and therefore impose a greater demand on water resources.[64] The United States' fixation on market success encourages the use of environmentally demanding industrial practices and overlooks the damage to nature's resources and ecosystems.[65] Irrigation also exacerbates the struggle between limited water resources and increasing

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[60] Ruhl, *supra* note 1, at 305. States may propose State Implementation Plans (SIPs), detailing how they plan to meet the air quality standards set by the federal government. *Id.* at 305-06.

[61] *See id.* at 306. For a discussion on EPA efforts to "actively dissuade" states from regulating farm emissions and creating plans addressing farms to meet the national air quality standards see *id.* at 306 n.454.

[62] *Id.* at 307.

[63] Agricultural irrigation constitutes "more than one-third of all U.S. usage at a withdrawal rate of more than 135 billion gallons a day." Eubanks, *supra* note 55, at 62.

[64] *See id.* at 62-63. Spray irrigation, where much of the water is evaporated, also contributes to the inefficient use of water. Angelo, *supra* note 2, at 604. Farming practices also cause "water table drawdown, land subsidence, desertification, destruction of natural springs and associated wildlife habitats, and saltwater intrusion." Ruhl, *supra* note 1, at 280. While utility of old surface water reservoirs diminishes, new reservoirs are difficult to find. *Id.*

[65] Eubanks, *supra* note 55, at 62-63.

competition for water[66] among urban users, agricultural users, and natural resource and habitat needs.[67]

Perhaps more concerning is the fact that agriculture contaminates and pollutes the remaining water supply. Agricultural chemicals are absorbed into the groundwater and reach the surface water, making it inappropriate for human consumption.[68] The utility of water systems is further reduced by sediment carried by wind or water,[69] while suspended particles from agricultural practices affect both wildlife nutrition and reproduction mechanisms.[70] Field and livestock runoffs release large quantities of pollutants into neighboring bodies of water, accounting for 65 to 75 percent of all pollution in the most polluted waters of the United States.[71] While crop diversification would prevent the loosening of soils, the Green Revolution prefers mass-scale production of monoculture crops, ignoring the environmental ramifications.[72]

In addition to a "passive" entry of harmful pollutants into the waters, direct discharge of animal wastes significantly impacts water quality and the ability to nurture healthy ecosystems. CAFOs typically create massive waste[73] and

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[66] Ruhl, *supra* note 1, at 280.

[67] Angelo, *supra* note 2, at 604; *see also* Eubanks, *supra* note 55, at 62-63.

[68] Once the soil's capacity to absorb water is reached, water flows as runoff and carries the pollutants into the surface water, carrying pesticide and fertilizer-infused sediments. Angelo, *supra* note 2, at 605-06. The soil, along with its nutrients and pollutants, combines into runoff from non-point sources and "pollutes 34% of impaired estuarine waters" while also threatening groundwater. Ruhl, *supra* note 1, at 291. The toxic composition of farm runoff—which includes "fertilizers, animal wastes, pesticides, sediments, and bacteria"—directly increases nitrate concentrations in surface waters, remotely impacts coastal regions and surface waters, and further affects plankton production and aquatic vegetation. *Id.* at 288-91.

[69] Ruhl, *supra* note 1, at 277-78.

[70] Nutrient and chemical wastes from farming become absorbed into the eroded sediments, which enter bodies of water and contribute to water pollution. *Id.* at 278. The eroded sediments suspended in the waters can clog shallow waters and affect the light available to submersed plants. Angelo, *supra* note 2, at 606.

[71] Ruhl, *supra* note 1, at 287-88. Further intensifying the consequences, excessive nutrient pollution from fertilizer use affects the ecological systems as a whole. *Id.* at 290. Inappropriate application or excessive use of fertilizers can cause chemicals to be absorbed into waterways, create excessive plant growth, and result in natural bodies of water taking on toxic levels of the excess nutrients, which acutely affects aquatic species. *Id.* at 284-85. The resulting enhanced and overgrown excess algae "depletes oxygen, . . . reduces sunlight penetration," affects the composition of aquatic habitats, and causes "dead zones," which are areas of low "fish and aquatic organism productivity." Angelo, *supra* note 2, at 606. The additional harms from dangerous levels of phosphorous and ammonium nitrate—materials used to construct explosives—subvert natural soil processes, cause public health risks and water pollution, and damage aquatic habitats. Eubanks, *supra* note 55, at 63.

[72] *See* Eubanks, *supra* note 55, at 64.

[73] Angelo, *supra* note 2, at 606-07.

significantly contribute to water pollution.[74] Larger CAFO's with poor sanitation are prone to waste spills, cause public health emergencies,[75] and affect nearby aquatic habitats and species.[76] Even with proper waste management, waste-related pollutants discharged into the environment make habitats toxic for the natural population of the creeks and streams adjacent to farms.[77] A plan that sets forth efficient use of water resources, while balancing environmental protection with profitability, is increasingly necessary to protect natural bodies of water from depletion and pollution.

Federal water regulations in the CWA provide a general prohibition on the "discharge of any pollutant by any person."[78] Even though agricultural wastes are included in the definition of a "pollutant," this regulation fails to reach "discharges of agricultural wastewater, stormwater, and fill material" through its other provisions.[79] The CWA's National Pollutant Discharge Elimination System (NPDES) program, which regulates discharges of pollutants in accordance with technology- and water-quality-based criteria, exempts agricultural irrigation waters from regulation and permit requirements.[80] The CWA Water Pollutant Discharge Permitting Program also exempts discharges from "normal farming."[81] Furthermore, the CWA lacks an enforcement mechanism to regulate nonpoint water pollution—that is, water pollution that occurs indirectly when contaminants are carried through the ground by water runoff and into a larger body of water, which includes much of the water pollution from agriculture.[82] The current regulatory

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[74] *Id.* at 607. Livestock waste, accounting for "1.8 million metric tons of wet manure" in the United States, is applied as fertilizer, accidentally spilled, or illegally discharged and ends up in surface water. Ruhl, *supra* note 1, at 285.

[75] Ammonia from dairy farms, phosphorous from chicken manure, and nitrate and ammonia nitrogen from hog farms release toxic emissions into drinking waters and the atmosphere. Ruhl, *supra* note 1, at 286-87.

[76] Eubanks, *supra* note 55, at 65; Ruhl, *supra* note 1, at 285-86. While waste once served as fertilizer on the open land upon which the livestock grazed, now the concentrated amount of waste has become a source of significant pollution. Angelo, *supra* note 2, at 607.

[77] Ruhl, *supra* note 1, at 286.

[78] 33 U.S.C. § 1311(a) (2006).

[79] Ruhl, *supra* note 1, at 293-94 (discussing the limitations of the Clean Water Act).

[80] The CWA specifically exempts "return flows from irrigated agriculture" from the definition of a "point source," and prohibits the EPA from requiring permits "for discharges composed entirely of return flows from irrigated agriculture." Effectively, this exemption also excludes agricultural stormwater runoff from the stormwater NPDES program. *Id.* at 294-95.

[81] *Id.* at 287, n.137, 296-97.

[82] *Id.* at 303.

approach fails to control the continuing environmental impacts on the quality of the nation's waters.

### *D. Effect on Biodiversity*

Land use converted to suit agricultural needs has substantially reduced the number of undisturbed lands and pastures, consequentially modifying and even eliminating habitats.[83] Wetlands are the "heart of an ecosystem," with "over 80 percent of species us[ing] aquatic habitats at some point in their life cycle." But by 1997 (after the height of the Green Revolution), 115 million acres of wetlands had been converted for commodity crop production.[84] While these alterations have generally already occurred, there is continual loss of habitat that causes many wildlife species to become more susceptible to predators.[85] Farming practices that integrate predominantly monoculture crops, regular agrochemical application, and consolidation of land use to specific areas have reduced the diversity of habitats, wildlife populations, and species reliance on farmland habitats.[86]

Agriculture also indirectly affects other remote habitats. Harmful gases released from farming activities and fertilizer applications can reach past the immediate confines of the farming operation. Chemicals can also seep into adjacent land and waters.[87] This can negatively impact unintended recipients of the chemical application, such as public drinking water and populations of nontarget species.[88] Agriculture is the cause of 84

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[83] *Id.* at 275-76.

[84] The destruction of wetlands has affected both aquatic and land species, by fragmenting habitats, affecting rates of reproduction, changing patterns of food sources, and threatening species viability. Eubanks, *supra* note 55, at 58 n.23, 67.

[85] Ruhl, *supra* note 1, at 275-76.

[86] *Id.* at 276. Sedimentation harms aquatic organisms, fertilizer runoff causes eutrophication, killing plants and animals, and pesticides bio-accumulate in the food chain when predators are exposed to pesticides in contaminated food sources. Angelo, *supra* note 2, at 608.

[87] When harmful gases that are released from farming activities travel to adjacent land and water ecosystems, they create fertilizer deposits, causing "acidification, eutrophication, shifts in species diversity, and effects on predator and parasite systems," as well as affecting salt and mineral concentrations, erosion rates, and aquatic habitats' lifespans. Ruhl, *supra* note 1, at 276-77. Pesticides are not only toxic to targeted species, but they are also dangerous to wildlife that are not the target of application. The pesticides either accidently kill species directly or decrease food production by contaminating the species' habitats, drinking water, and aquatic ecosystems. Eubanks, *supra* note 55, at 64.

[88] Agrochemicals reduce species diversity and create "complex effects on ecosystem processes and trophic interactions." Ruhl, *supra* note 1, at 284.

percent of endangered or threatened species nationwide,[89] yet Congress rewards profitable commodity crops and structures incentives to support monoculture crops.[90]

As discussed above, federal environmental regulations fail to curtail agriculture's use of pesticides and chemicals. The Endangered Species Act and Wetlands Preservation approaches are limited by "the constitutional property rights . . . and the complexity of assessing the property's ecological significance to a species' survival."[91] The Endangered Species Act requires species to be listed as endangered before the Act will enforce any protective measures, and meager support and inadequate funding have limited the Wetlands Reserve Program and Water Quality Incentives Program.[92]

The continuing abuse of the environment, coupled with the lack of a regulatory check on the detrimental effects of agriculture, is accelerating the depletion of the nation's valuable natural land, water, air, and biodiversity. A thoughtful plan that allocates resources efficiently and encourages ecologically sound agricultural practices will help to mitigate existing damage and prevent unnecessary future abuse of the environment.

## II. MITIGATION OF HARMS THROUGH SUSTAINABLE AGRICULTURE

Despite the problems listed above, developing agricultural techniques that minimize the dependency on natural resources has the potential to mitigate or halt the harmful effects of the current industrial practices. A sustainable agricultural system would enhance the health of the environment by transitioning society's focus from pure economic efficiency toward a more holistic focus on decreasing consumption habits, integrating species and organisms, increasing biodiversity, maintaining production levels at an appropriate scale, and integrating renewable energy sources.[93] A realistic solution to mend the current lack of regulatory control on the agricultural industry is to persuade local government and

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[89] This is caused by pesticide use and "agriculture-driven habitat destruction and fragmentation that . . . make species survival nearly impossible." Eubanks, *supra* note 55, at 66-67.

[90] *See* Schneider, *supra* note 16, at 943.

[91] Adelman & Barton, *supra* note 15, at 26.

[92] *Id.* at 27-28.

[93] Leo Horrigan et al., *How Sustainable Agriculture Can Address the Environmental and Human Health Harms of Industrial Agriculture*, 110 ENVTL. HEALTH PERSP. 445, 446 (2002).

community leaders to advocate for farming practices that avoid harmful impacts on land, air, water, and biodiversity.

Sustainable techniques could offer benefits both to the health of land and soils, and to the well-being of the agricultural community. By treating soil as a beneficial living component within an ecosystem and reducing synthetic modifications to the soil's composition,[94] farmers would treat land and soil as an integral part of nature that must be actively protected. Some practices that are in tune with this vision include natural sources of fertilization from animal waste "rotational grazing"—that is, alternating the grazing location of animals[95]—and ground cover through "sustainable soil management"—that is, using crop and crop residue to rotate on-farm nutrients, which replaces dependency on artificial fertilizers and the use of tillage.[96] Limiting application of nutrients and chemical pesticides to necessary uses and effective amounts is not only environmentally sound, but could also reduce environmental cleanup costs incurred in the future.[97] Further, tailoring farming methods to the unique diversity and characteristics of the soil based on soil tests that can help ensure that soil will be fertile for future generations of farmers.[98]

Sustainable farming practices must be implemented to prevent further deterioration of the environment. Reduced reliance on fossil fuels through the use of bioenergy and efficient energy practices can help minimize agriculture's effect on climate change.[99] Direct reduction in Greenhouse gas (GHG) emissions can also be achieved through strategies "such as changes in tillage, fertilizer application, livestock diet formulation, and manure management."[100] The quality of the air itself would improve from limiting pesticide use and, instead, using preemptive approaches to pest management—that is, by

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[94] EARLES, *supra* note 18, at 3; Horrigan et al., *supra* note 93, at 446.

[95] Horrigan et al., *supra* note 93, at 452.

[96] EARLES, *supra* note 18, at 3.

[97] *See* Horrigan et al., *supra* note 93, at 452-53 (introducing farming methods that increase sustainability, and then placing the comparison between industrial and sustainable methods through the lens of a costs-benefit analysis).

[98] EARLES, *supra* note 18, at 3-4.

[99] Smith, *supra* note 6, at 499-500.

[100] *Id.* at 499. For a comprehensive overview of practices and technologies that mitigate GHGs, see *id.* at 499, 505-11 (explaining cropland management, grazing land management, pasture improvement, management of organic/peaty soils, restoration of degraded lands, livestock management, manure management, and bioenergy).

maintaining "biologically active soil" and habitats.[101] This would "restore and enhance pest-predator balances" and decrease reliance on pervasive chemical interventions.[102] Incorporating these practices, which minimize the GHG emissions and artificial chemicals released into the air, into a comprehensive plan that endorses sustainable agriculture would better equip famers to farm in an ecologically responsible manner.

Farming techniques that minimize massive water consumption and the movement of chemical contamination and sediment into larger bodies of water can promote increased water quality. Nutrient-absorbing crops, known as "catch crops" or "cover crops," can prevent nutrients from being leached into surrounding soils.[103] Perennial crops can buffer the farming area to prevent water runoff and erosion.[104] Irrigation methods can be structured to optimize nutrient absorption and prevent leaching into surrounding areas.[105] Using nature's available protective mechanisms and focusing on the "biologically active humus complex"[106] can reduce water consumption and pollution without requiring artificial intrusions to the ecosystem's integrative mechanisms.

Since the nature of agriculture is context-specific, sustainable strategies must be adapted to the individual characteristics of an agricultural system—namely, the location, social context, and traditional land management—to evaluate the appropriate management system.[107] An increased effort to integrate and attract a variety of organisms in a certain location could better maximize biodiversity.[108] Further, reserving specified lands for "permanent plantings or long-term rotations" and replacing monocrops with planting arrangements that integrate diverse crops will ensure that biodiversity is maintained.[109] Individual populations of valuable organisms can be supported through the use of "hedgerows, insectary plants, cover crops, and water reservoirs."[110] A detailed planning process addressing the distinctive needs of the farm's

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[101] EARLES, *supra* note 18, at 4.
[102] *Id.*
[103] *Id.*
[104] *See id.*
[105] *See id.*
[106] *Id.*
[107] *See* Smith, *supra* note 6, at 499.
[108] *See* EARLES, *supra* note 18, at 5.
[109] *Id.*
[110] *Id.*

neighboring ecosystems would produce better practices that curb the negative impacts of current industrial agriculture.

The intrusive modifications to natural resources and ecosystems are causing severe environmental repercussions to the earth's natural processes.[111] Due to the large-scale consumption of resources that are nonrenewable or that are being consumed at a rate faster than regeneration allows, these agricultural practices cannot last.[112] Regulating entities must encourage the agricultural industry to integrate available sustainable techniques in the manner that is most beneficial and appropriate for its site-specific context. The continually expanding and evolving list of environmental harms calls for an urgent transformation in farming practices tailored to each unique farming community.

## III. PRECONDITIONS FOR SUCCESSFUL SUSTAINABLE PLANNING

Land use and land development have recognized the growing need for sustainability. In what became known as the "[S]mart [G]rowth [M]ovement"—a reaction to urban sprawl[113]—municipalities began to recognize that current development strategies are "fiscally wasteful, competitively unwise, environmentally damaging, and racially and socially divisive."[114] Therefore, they began to engage in a process to strategically develop more efficient uses of available land.

> Land use planning refers to a branch of public policy that encompasses various disciplines that seek to order and regulate the use of land[,] . . . [and] "means the scientific, aesthetic, and orderly disposition of land, resources, facilities and services with a view to securing the physical, economic and social efficiency, health and well-being of urban and rural communities."[115]

Generally, land use planning involves zoning decisions by local governments regarding permissible uses of land, existing

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[111] *See* Ruhl, *supra* note 1, at 274 (listing the following environmental harms: "(1) habitat loss and degradation; (2) soil erosion; (3) water resources depletion; (4) soil salinization; (5) chemical releases; (6) animal waste disposal; (7) water pollution; and (8) air pollution.").

[112] *See* Horrigan et al., *supra* note 93, at 445-46.

[113] CALLIES, *supra* note 24, at 677, 681.

[114] *Id.* at 681.

[115] ALBERTA URBAN MUNICIPALITIES ASS'N, SUSTAINABLE LAND USE PLANNING ANALYSIS AND RECOMMENDATIONS 3 (2007) (quoting Canadian Inst. of Planners, *About Planning: What Planners Do*, http://www.cip-icu.ca/english/aboutplan/what.htm (last visited Apr. 30, 2007)) [hereinafter AUMA, SUSTAINABLE LAND USE PLANNING].

infrastructure, and open space with both economic and environmental considerations. A well-created comprehensive plan that considers a variety of techniques and designs could produce communities successful in implementing an efficient development model.[116]

Studies on land use planning have recently focused on sustainability—that is, research into techniques and conditions necessary for successful sustainable land use and development. A sustainable land use plan requires the participants in the zoning decision-making process to recognize that natural resources are finite and to balance the various land uses within this limit.[117] In the case of the farming industry, a sustainable land use plan has the potential to remedy the inefficient and irresponsible use of farmland and to prevent future use from falling into the same problems.[118]

Land use planning can promote sustainable development by incorporating a thorough analysis within the planning stages.[119] The general requirements important to a comprehensive sustainable land use plan will be applied to sustainable agriculture in Part IV. Maria Manta Conroy and Philip R. Berke's study of sustainable development plans provides a useful framework, identifying the key preconditions necessary for a successful execution: the planning process, integrating sustainable development into the plan's organization, and a state-planning mandate.[120]

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[116] *See* CALLIES, *supra* note 24, at 713 (citing Golden v. Planning Bd. of Town of Ramapo, 285 N.E.2d 291 (N.Y. 1972)).

[117] AUMA, SUSTAINABLE LAND USE PLANNING, *supra* note 115, at 3.

[118] *See* Edward J. Jepson Jr., *The Conceptual Integration of Planning and Sustainability: An Investigation of Planners in the United States*, 21 ENV'T & PLAN. C: GOV'T & POL'Y 389, 406-07 (2003) (discussing the degree of uncertainty to which a planner's dedication to sustainable elements affects the ultimate success of sustainable goals, but "[t]o the extent that this recognition—of the need for planning to combine the widespread participation of an educated and informed citizenry with the substantive contribution of planning professions—continues and grows, sustainable development stands to become an increasingly important force for change among US communities.").

[119] Maria Manta Conroy & Philip R. Berke, *What Makes a Good Sustainable Development Plan? An Analysis of Factors that Influence Principles of Sustainable Development*, 36 ENV'T & PLAN. A 1381, 1382 (2004) (land use planning can involve analyses of optimal participatory forms, how resources are allocated and used, the collaboration with other local plans, and the "the role of state planning mandate designs.").

[120] *Cf.* DEUTSCHE GESELLSCHAFT FÜR INTERNATIONALE ZUSAMMENARBEIT (GIZ) GMBH, LAND USE PLANNING: CONCEPTS TOOLS AND APPLICATIONS 107 (Babette Wehrmann ed., 2011), *available at* http://www2.gtz.de/dokumente/bib-2011/giz2011-0041en-land-use-planning.pdf [hereinafter GIZ, LAND USE PLANNING] (listing the following preconditions: "[f]reedom of assembly, opinion and expression; [e]xisting need and demand for land use planning; [p]olitical will to define land uses in a transparent and participatory way; [w]illingness of all stakeholders to discuss together the

### *A. The Planning Process*

Given the growing demands on finite resources and significant environmental harms, it has become increasingly crucial to consider new approaches to land use planning.[121] To successfully implement sustainable development schemes that efficiently use natural, cultural, and economic resources without heightening "vulnerability to natural disturbances," developers must engage in a coordinated planning process.[122] Conroy and Berke emphasize the role of the community in a process where both planners and citizens collaborate.[123] The ideal approach involves a "genuine exchange of needs, ideas, responsibilities, and control in the planning process."[124] All stakeholders and decision makers who are involved in or affected by the plan must be identified[125] and engaged in a "dialogue about the community's vision, core values, and goals."[126] This stage requires local political support, participation effort, and resource commitment to ensure that the needs of all involved parties are adequately addressed and that those parties will continue to be involved in implementing the plan.[127]

#### 1. Local Political Support

Local political support for sustainable development during the planning stages is directly correlated to the public reaction to the resulting plan.[128] To gather approval for sustainable development, sustainability must be emphasized as one of the plan's broad concepts during the planning process.[129] Accountability tied to a specific department is crucial to

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optimum sustainable use of land and other resources, including high-ranking politicians, public authorities and private investors; [l]egal security and rule of law to ensure that all parties stick to the land use plan; [i]ntegration of land use planning into official institutions and structures, resulting in legally binding land use plans").

[121] AUMA, SUSTAINABLE LAND USE PLANNING, *supra* note 115, at 32.

[122] *Id.*

[123] Conroy & Berke, *supra* note 119, at 1382.

[124] *Id.*

[125] AUMA, SUSTAINABLE LAND USE PLANNING, *supra* note 115, at 10.

[126] ALBERTA URBAN MUNICIPALITIES ASS'N, COMPREHENSIVE GUIDE FOR MUNICIPAL SUSTAINABILITY PLANNING 6 (June 2006) [hereinafter AUMA, MUNICIPAL SUSTAINABILITY PLANNING].

[127] Conroy & Berke, *supra* note 119, at 1384-86.

[128] *Id.* at 1384; *see also* Jepson, *supra* note 118, at 389 (arguing that "local authorities" must be involved in the planning process to ensure success).

[129] Conroy & Berke, *supra* note 119, at 1384.

prevent ambiguous control and organization.[130] When multiple departments are responsible for planning, there is weaker coordination, conflicting decisions, and slow progress.[131] This limits the opportunity for citizen participation and affects accountability for the planning decisions.[132] The local leaders must fully understand and commit to their responsibilities to resolve problems that arise, and also allocate adequate financial support and personnel for implementation.[133] Therefore, the local government should consult citizens at each stage of the process and form a group of community leaders to assist in gathering resources and implementing the plan.[134]

2. Participation

Similarly, early public participation must encompass a wide range of interests to guarantee public support for the ensuing plan.[135] Citizen involvement in the planning process translates into support for the plan, increasing the likelihood that specific provisions relating to sustainability will be successful.[136] Identification of the planning and decision-making criteria can facilitate dialogue among various interest groups and the development of common goals and options.[137] An engaged community that has the opportunity to develop a vision or provide feedback will be more likely to agree to, embrace, and own the plan.[138] Continued community engagement must also be maintained to ensure compliance with a bottom-up approach to the sustainability model, requiring equal empowerment and full information.[139] The planner's goal must be to facilitate community planning and

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[130] Tüzin Baycan-Levent & Peter Nijkamp, *Planning and Management of Urban Green Spaces in Europe: Comparative Analysis*, 135 J. URB. PLAN. & DEV. 1, 8 (2009).

[131] *Id.* at 9.

[132] *Id.*

[133] AUMA, MUNICIPAL SUSTAINABILITY PLANNING, *supra* note 126, at 13.

[134] *See id.* at 5.

[135] Conroy & Berke, *supra* note 119, at 1385.

[136] Baycan-Levent & Nijkamp, *supra* note 130, at 9; *see also* ROBERT H. FREILICH ET AL., FROM SPRAWL TO SUSTAINABILITY: SMART GROWTH, NEW URBANISM, GREEN DEVELOPMENT AND RENEWABLE ENERGY 48 (2d ed. 2010) ("Public involvement is essential. It will often prevent the kind of planless implementation too often found in communities when action is precipitated without participation from the landowners and the public.").

[137] AUMA, SUSTAINABLE LAND USE PLANNING, *supra* note 115, at 11-12.

[138] AUMA, MUNICIPAL SUSTAINABILITY PLANNING, *supra* note 126, at 27.

[139] Conroy & Berke, *supra* note 119, at 1385.

action rather than to act as the lone decision maker, with the consequential outcome representing the community's interests.[140]

While sustainability requires an international effort to limit national levels of resource consumption, effective planning and action at the local level must address the difficulty of eliminating overconsumption and committing to sustainable development goals.[141] As David Satterthwaite argues in his study with the World Health Organization on Sustainable Development, "there is little evidence of national governments setting up the regulatory and incentive structure to ensure that the aggregate impact of the economic activities within their boundaries and their citizens' consumption is not transferring environmental costs to other nations or to the future."[142] But broader, localized participation can create a positive impact and increase support for sustainable aspects of the plan as long as the participation represents all stakeholders and is balanced.[143] Community self-determination is required "since centralised decision-making structures have difficulty in implementing decisions which respond appropriately to such diversity."[144] Collaboration between the local community, businesses, authorities, and volunteer groups can assist in furthering sustainability initiatives.[145]

3. Resource Commitment

Adequate and appropriate resources must be committed for the longevity of the plan. The difficulty with sustainable development plans is that sustainability requires long-term goals, during which resources are often exhausted.[146] By focusing on the local needs and desires of the community, the involved members can engage in long-term sustainability planning with an improved understanding of sustainability issues and create more viable solutions.[147]

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[140] *Id.* (explaining that interests will be based on *who* participates ("breadth") and the *extent* to which participants can affect the final outcome ("depth") through a participatory process).

[141] David Satterthwaite, *Sustainable Cities or Cities that Contribute to Sustainable Development?*, 34 URB. STUD. 1667, 1683, 1685 (1977).

[142] *Id.* at 1684.

[143] *See* Conroy & Berke, *supra* note 119, at 1394; *see also* GIZ, LAND USE PLANNING, *supra* note 120, at 106-08 (arguing that participation in land use planning increases both investment in the development and participation in the execution phase).

[144] Satterthwaite, *supra* note 141, at 1683.

[145] Baycan-Levent & Nijkamp, *supra* note 130, at 9.

[146] Conroy & Berke, *supra* note 119, at 1386.

[147] *See id.*

For sources of local resources and support, an assessment of existing land use, economic, social, and biophysical conditions can reveal accessible supplies.[148] Information and financial resources are required to integrate sustainability into local planning.[149] While affluent communities have more resources to execute sustainable plans, research shows that the income level does not determine whether a plan is actually sustainable.[150] Instead, some affluent communities can be exclusive and negatively affect sustainability.[151] Further, population growth due to development pressures has a greater influence on sustainable development.[152] The resources existing in the community should be evaluated without regard to the affluence of the community.

### *B. Integrating Sustainable Development into the Plan's Organization*

Once the focus on sustainability is integrated into the broad scheme of the plan, the community can become familiar with the concept and acknowledge sustainability as the goal.[153] As planners are insufficiently familiar with the practical implementation of broad concepts, incorporating sustainability can be an insignificant factor.[154] Idealistic standards serve as a good starting point, but are ineffective when too abstract and imprecise.[155] Nonetheless, once the concept is commonly

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[148] AUMA, SUSTAINABLE LAND USE PLANNING, *supra* note 115, at 15.

[149] Conroy & Berke, *supra* note 119, at 1387; *see also* TERRESTRIAL CARBON GRP., PRECONDITIONS TO PROMOTING THE SUSTAINABLE USE OF LAND: ENGAGING THE PRIVATE SECTOR: BRIEFING PAPER FOR THE UNITED NATIONS' SECRETARY GENERAL'S HIGH LEVEL PANEL ON GLOBAL SUSTAINABILITY 4 (Jan. 2011), *available at* http://www.heinzctr.org/TCG_files/TCG%203B%20Private%20Sector%20and%20Sustainable%20Land%20Use%20110201.pdf (considering the relevant market preconditions necessary for sustainable land use: "Ongoing returns more than sufficient to outweigh initial investments[,] [u]nderstanding of how to deliver sustainable land use[,] [c]lear, long term demand[,] [a] rightful and credit worthy counterparty[,] [e]nforceable sale and purchase contracts[,] [s]table operating environment[,] [c]onsistent land use regulatory requirements and [c]lear mechanism for implementation and trade—including rights to trade.").

[150] Conroy & Berke, *supra* note 119, at 1388.

[151] *Id.*

[152] *Id.*

[153] *Id.* at 1387.

[154] *Id.* at 1393; *see, e.g.*, Jepson, *supra* note 118, at 389 (noting that the level of integration of sustainability goals depends on "the planners' academic background, the state public policy context in which they work, and their general level of support for the concept.").

[155] Ellie Carroll, *Twenty-Five Years in the Making: Why Sustainable Development has Eluded the U.N. and How Community-Driven Development Offers the Solution*, 32 HOUS. J. INT'L L. 545, 583 (2010).

understood,[156] a "vision-led process" in which the goal of sustainability is endorsed can invoke community energy, enthusiasm, and contribution of time and effort.[157]

Accordingly, in land use controls, development proposals must be predictable, and developers' intentions must be transparent and understood by the community.[158] Because sustainability is a broadly interpreted concept, the community may have a difficult time grasping the overarching scheme without specific, comprehensible development criteria.[159] Instead of proposals for a sudden, complete change of the system,[160] the transition should be an ongoing progression that involves an engaged community. Specific decision-making problems can be targeted through a process called "backcasting"—brainstorming the desired outcome of sustainability and then identifying how to achieve that outcome.[161] While prioritizing certain criteria in a planning process facilitates effective implementation, standards should be tailored specifically to the local community[162] and should depend on its norms and values.[163]

Sustainability efforts must incorporate "social, cultural, environmental, economic, and governance" dimensions—also known as the five dimensions of sustainability—and emphasize two necessary goals: "governance structures that are participative and inclusive" and "economic sustainability."[164] If a strong governance system is not possible, the development must exercise the community's wealth and knowledge in "inclusive decision making processes" to emphasize participation and prevent feelings of exclusion and resentment.[165] Economic contributions must also integrate the five dimensions of sustainability and meet all social needs, a culture that fosters creativity and innovation, and a respect for "natural laws and

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[156] AUMA, MUNICIPAL SUSTAINABILITY PLANNING, *supra* note 126, at 26.

[157] *Id.* at 13.

[158] Julian Conrad Juergensmeyer & Thomas E. Roberts, *Growth Management and Smart Growth*, *in* LAND USE PLANNING AND DEVELOPMENT REGULATION LAW 473-74 (2d ed. 2007).

[159] Daniel R. Mandelker, *Fred Bosselman's Legacy to Land Use Reform*, 17 J. LAND USE & ENVTL. L. 11, 17 (2001).

[160] *Id.*

[161] AUMA, MUNICIPAL SUSTAINABILITY PLANNING, *supra* note 126, at 13.

[162] Baycan-Levent & Nijkamp, *supra* note 130, at 9.

[163] Holger Wallbaum et al., *Prioritizing Sustainability Criteria in Urban Planning Processes: Methodology Application*, 137 J. URB. PLAN. & DEV. 20, 25-26 (2011).

[164] AUMA, MUNICIPAL SUSTAINABILITY PLANNING, *supra* note 126, at 11. The *Alberta Urban Municipalities Association Guide for Sustainable Municipal Planning* provides a comprehensive framework for land use development that considers effects on the environment.

[165] *Id.* at 12.

environmental constraints."[166] Emphasis on sustainability in this regard ensures the practical applicability of a "development that meets the needs of the present without compromising the ability of future generations to meet their own needs."[167]

Sustainability must continually be integrated, not only at the planning stages, but also throughout the execution of the plan. The planner can play a crucial role in public policy development by implementing a reporting system to ensure they are notified about condition changes and to identify appropriate responses.[168] Still, leaders should maintain staff and citizen involvement with educational opportunities and participation by empowering citizens to contribute in decision-making processes.[169] Continued support can be maintained by highlighting achievements in annual reports and newsletters that are transparent, complete, and material.[170]

### *C. State Planning Mandate*

States that mandate local planning produce higher quality local plans.[171] In fact, a state planning mandate is the most significant factor in determining the likelihood of success of sustainable development plans.[172] By creating minimum standards of sustainability, specific plan elements and local plan content can be analyzed and fashioned to suit those standards, and they can ensure the local political agenda considers and implements sustainability-related policies.[173] Regulating land use at the national and regional levels is less effective, since land use is generally context-specific.[174]

Local experimentation has proved inefficient. Evaluations and revisions of traditional land use laws only occur sporadically, staff and funds necessary to incorporate new

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[166] *Id.*

[167] *Id.* at 11.

[168] Jepson, *supra* note 118, at 393.

[169] AUMA, MUNICIPAL SUSTAINABILITY PLANNING, *supra* note 126, at 44; *cf.* Peter Laban, *Accountability and Rights in Right-based Approaches for Local Water Governance*, 23 WATER RESOURCES DEV. 355 (2007) (discussing the need for accountability in development projects and introducing a "right to water" to empower community action to engage in water resource management).

[170] AUMA, MUNICIPAL SUSTAINABILITY PLANNING, *supra* note 126, at 44.

[171] Conroy & Berke, *supra* note 119, at 1387.

[172] *Id.* at 1394.

[173] *Id.*

[174] *See* Sara C. Bronin, *The Quiet Revolution Revived: Sustainable Design, Land Use Regulation, and the States*, 93 MINN. L. REV. 231, 248 (2008) (discussing the futility of local attempts in the green building context).

technology are insufficient, and interest groups have been successful in maintaining current local laws that maximize their profits.[175] Using a piecemeal approach instead of developing comprehensive rules creates ambiguity and inconsistency, and it serves as an obstacle to actualizing sustainable designs.[176] Haphazardness creates "problems of coordination and internal consistency, but is inevitable in a political system that often fragments responsibility and avoids extreme centralization."[177] Instead, state regimes are highly suitable to address sustainable design because states have the power to reform land use laws through their unexercised authority to impose land use regulations.[178] Comprehensive state reform can eliminate "ambiguous, unfavorable, and selectively interpreted land use regulation at the local level" that allows private actors to avoid sustainable designs.[179]

Moreover, state planning mandates seem to guide policies, highlight sustainability as the planning ideal, and serve as a scapegoat for unpopular policies.[180] Clear standards for review can simplify the process for developers required to adhere to those regulations,[181] and common language for larger scale initiatives can facilitate plan coordination and future assessment.[182] A state plan can give guidance to decision makers and "provide a framework and priorities for the administration of the program."[183] Research shows, however, that state planning mandates alone are ineffective, and local commitment is still necessary to achieve sustainability.[184] An effective approach involves "top-down state mandates in conjunction with bottom-up local participation."[185] Because the land use revolution cannot be successful unless local autonomy is protected, local participation is necessary regardless of whether it produces undesirable results.[186]

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[175] *Id.* at 249-60.
[176] *Id.* at 234.
[177] Mandelker, *supra* note 159, at 17.
[178] *Id.* at 268.
[179] *Id.* at 248.
[180] Conroy & Berke, *supra* note 119, at 1394.
[181] Bronin, *supra* note 174, at 253-54 (discussing the zoning board review of green building technologies).
[182] AUMA, SUSTAINABLE LAND USE PLANNING, *supra* note 115, at 13.
[183] Mandelker, *supra* note 159, at 22.
[184] Conroy & Berke, *supra* note 119, at 1394.
[185] *Id.* at 1393.
[186] Bronin, *supra* note 174, at 270.

Supporters of sustainable land use desire a radical change, but "the planning profession is by its nature concerned with charting a course that balances change and stability, future vision and present conditions."[187] Incorporating the vision of both groups can bring a well-rounded approach to charting the most effective way to implement sustainable agriculture. Sustainability requires a system-wide, holistic approach that recognizes agriculture as a facet within a social and economic context. Thus, proposed techniques must not only consider the implications of new techniques on the physical environment, but also on the relevant community that supports the farming business.

## IV. APPLICATION OF THE SUSTAINABLE LAND USE PLANNING STUDIES TO SUSTAINABLE AGRICULTURE

A movement toward "ecology-based approaches" and an emphasis on "farming with nature"[188] will require a comprehensive effort. The scientific community must engage in "rigorous monitoring and experimentation" of environmental studies and hypotheses,[189] while the legal community will need to be creative rather than simply apply traditional rules of environmental regulation.[190] But any effort is incomplete without including the stakeholders who will put theory into practice—that is, the individual farmers who make the ultimate decision on which agricultural practices to use.[191] By applying the tested criteria from sustainable land use planning studies, the effort toward implementing sustainable land use in the agricultural setting will guarantee farmer participation and thus will have a greater likelihood of success.

In addition to the emerging "soil conservation laws, public concern for environmental protection, and research and education on sustainable agriculture,"[192] proper agricultural methods can minimize and prevent future environmental

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[187] Jepson, *supra* note 118, at 391.

[188] EARLES, *supra* note 18, at 2. Sustainable agriculture is "variously called natural, organic, low-input, alternative, regenerative, holistic, Biodynamic, biointensive, and biological farming systems." *Id.*

[189] A. Dan Tarlock, *Is There a There There in Environmental Law?*, 19 J. LAND USE & ENVTL. L. 213, 220 (2004).

[190] *Id.* at 215-16.

[191] Horrigan et al., *supra* note 93, at 453.

[192] Hamilton, *supra* note 19, at 426.

harms.[193] Moreover, research has shown the potential for effectively mitigating broad environmental harms through sustainable practices if implemented on a wide scale. But research alone is not enough, and states must go further.[194] This is especially important considering the inadequacy of legislation encouraging land stewardship[195] and government subsidization of large, ecologically harmful farms through subsidy programs.[196]

To contour sustainable land use plans to agricultural uses, planners must recognize the need to minimize environmental degradation that can reach even remote but interconnected ecosystems.[197] Agriculture is not an industry fenced-off from adjacent land users; the harmful effects of farming seep into both neighboring and remote properties.[198] Agricultural development must aim to "reduce its export of waste (entropy) into, and its import of material from (negentropy), that [ecosystem]" in order to mitigate current damage and prevent further harms to the environment.[199] Converting the specific use of a piece of land requires proper planning because choosing one use can prevent alternative present and future uses. These impacts can be controlled by incorporating in the planning process an analysis of uses and their effects on the land, and tailoring the application of regulations.[200] A comprehensive study must consider the status quo position of the farming industry, the affected community, and local government to understand how far society is from achieving the goals of sustainable agriculture. The next step, then, is to examine the role of the legal community in influencing the necessary change.

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[193] These methods include crop choice diversification, pesticide alternatives, organic material soil fertilizer, soil erosion mitigation techniques, livestock integration in cropping lands, and sustainable tillage systems. *See* Connard, *supra* note 4, at 136; *see also supra* Part II.

[194] Connard, *supra* note 4, at 127.

[195] *See id.* at 141-42 (discussing 7 U.S.C. § 3101(17) (2000)).

[196] Horrigan et al., *supra* note 93, at 453.

[197] *See* Jepson, *supra* note 118, at 392.

[198] *See supra* Part I.

[199] Jepson, *supra* note 118, at 392.

[200] *Id.*

### *A. Status Quo—How Far Are We from Meeting the Preconditions?*

The currently expanding public interest in sustainability and the new surge of interest in farming in the younger generation provide a promising outlook in the movement toward sustainable farming.[201] As the current farming population ages, the potential for a new influx of agricultural leaders places an even greater importance on endorsing environmentally sound practices.[202] In contrast to the traditional farming industry's view of environmental issues as an obstacle to profitability, farmers of the current generation tends to have "an enlightened attitude to resource conservation and sustainability and are interested in embracing environmental stewardship."[203] Local and state governments can serve a critical role by providing an adequate support system as the new farmers transition into their positions as leaders of the agricultural industry. Together, these forces must participate in the planning process to create an appropriate and defined goal, and to develop a state planning mandate.

#### 1. The Planning Process

The seeds of an effective planning process are already planted. With the growing interest in sustainability and farming, a community of participants will be willing to support the planning activities and engage in dialogue with interested parties. Sustainable agriculture can import cooperative federalism techniques of federal environmental law by enlisting states to develop local plans to implement federal policies. This includes states' authority "to allocate burdens of compliance" so the CAA's National Ambient Air Quality Standards are met and "to develop comprehensive plans for land use and resource protection . . . in return for federal funding assistance" in the Coastal Zone Management Act.[204]

While the greater challenge will be in gaining effective local political support and resource commitment, here, as well there are some preliminary efforts to build upon. Political

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[201] Neil D. Hamilton, *America's New Agrarians: Policy Opportunities and Legal Innovations to Support New Farmers*, 22 FORDHAM ENVTL. L. REV. 523 (2011).

[202] *Id.* at 553-54.

[203] *Id.* at 527.

[204] Ruhl, *supra* note 1, at 342.

support varies based on the community, but local initiatives for increased research regarding sustainability and community concern about environmental impacts can be powerful influences on a political stance. Increased knowledge can enlighten the citizenry about the need to move toward an agricultural industry that mitigates severe environmental harms.

Further, advocates of sustainable agriculture can creatively tap into funds for conservation programs to provide adequate resources for the farming community. The Farm Security and Rural Investment Act of 2002 authorized the Environmental Quality Incentives Program to assist farmers financially and technically to restructure farming operations with conservation-minded practices.[205] The Act also authorized the Conservation Security Program to provide rewards and incentives to adopt conservation methods.[206] Due to fiscal constraints, however, state funding is limited, and there are financial risks involved with altering farming practices.[207]

In addition to purely financial support, the Natural Resources Conservation Service (NCRS), an agency of the United States Department of Agriculture, is responsible for providing "conservation-based sustainable agriculture programs" and technical assistance for farmers seeking to integrate conservation practices.[208] Further, the 2008 Farm Bill requires the Secretary of Agriculture to ensure technical advice, while conservation resources, transitioning assistance for farmers through subsidies, technical assistance, and research funding are available for producers.[209] Sustainability supporters can tap into these preexisting resources through effective local engagement and participation.

2. Defined Goal

The current, broad definition of sustainability can create unrealistic and ambiguous expectations.[210] The federal statutory definition of sustainable agriculture is as follows:

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[205] DAYTON LAMBERT ET AL., CONSERVATION-COMPATIBLE PRACTICES AND PROGRAMS: WHO PARTICIPATES? 7 (2006).

[206] *Id.* at 8.

[207] *Id.* at 28.

[208] Nat'l Agric. Law Ctr., *Sustainable Agriculture—An Overview*, NATIONALAGLAWCENTER.ORG, http://www.nationalaglawcenter.org/assets/overviews/sustainableag.html (last visited Jan. 19, 2012) [hereinafter NALC, *Sustainable Agriculture*].

[209] *Id.*

[210] Connard, *supra* note 4, at 143.

> [A]n integrated system of plant and animal production practices that will: (A) satisfy human food and fiber needs; (B) enhance environmental quality and the natural resources base upon which the agriculture economy depends; (C) make the most efficient use of non-renewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls; (D) sustain the economic viability of farm operations; and (E) enhance the quality of life for farmers and society as a whole.[211]

This fails to provide a clear vision of a feasible community goal to work toward. While the purpose of research is to develop practices that comply with statutory definitions, it is difficult to move past the research stage into implementation because practices must satisfy the strict requirements of the federal legislative definition to be implemented.[212] Research regarding effective sustainable methods can offer accurate and reasonable goals that inform the agricultural industry and local government, who must work together to better refine the definition of sustainable agriculture.[213] This will illuminate a greater understanding of required planning steps, mitigation schemes, and future expectations.[214]

### 3. State Planning Mandate

States must have a comprehensive and integrative land use plan that establishes the relevant state goal, gathers sufficient information regarding the state's unique physical characteristics, and implements the plan in accordance with the state goal.[215] Several states have already adopted mandates requiring the use of natural resources to achieve conservation efforts.[216] Wisconsin specifically addresses conservation of agricultural lands and South Carolina highlights agricultural land protections.[217] In New Jersey, the state recommends that local governments "incorporate farmland preservation in their

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[211] 7 U.S.C. § 3103(18) (2006).

[212] Connard, *supra* note 4, at 141, 143.

[213] *Id.* at 143-44.

[214] *See id.*

[215] Jess M. Krannich, *A Modern Disaster: Agricultural Land, Urban Growth, and the Need for a Federally Organized Comprehensive Land Use Planning Model*, 16 CORNELL J.L. & PUB. POL'Y 57, 90 (2006).

[216] Patricia E. Salkin, *Sustainability and Land Use Planning: Greening State and Local Land Use Plans and Regulations to Address Climate Change Challenges and Preserve Resources for Future Generations*, 34 WM. & MARY ENVTL. L. & POL'Y REV. 121, 127-28 (2009).

[217] *Id.*

comprehensive plans."[218] Recent proposals also offer regulatory tools from a variety of approaches, including the use of incentives, the free market, and community-driven developments.[219] States can continue toward further sustainability goals in agricultural uses through their enabling acts and by including sustainable land use elements.[220]

In welcoming the "social and legal responsibility" of natural resource protection, the new generation of farmers willing to develop a new method of agricultural land use—one focused on sustainability—offers hope for a productive planning process.[221] Recent research and legislative efforts to encourage sustainable agriculture indicate that the preconditions for a successful sustainable land use plan are underway, if not yet met. Once all stakeholders participate in such planning initiative, a larger-scale transition to sustainable agriculture can be realized.

### *B. The Necessity for Legal Reform to Enforce Sustainable Agriculture*

Careful integration of legal mechanisms to support the sustainable agriculture movement can curtail the prevalence of environmentally detrimental farming practices. While law and policy are effective tools to push for agricultural reform, there has been a lack of implementation thus far. As discussed above, current federal environmental laws are insufficient to enforce sustainability goals. With integration of sustainable land use planning criteria, a new regulatory framework is also necessary at the state and local levels to encourage and regulate sustainable agriculture practices. While a step in the right direction, changing attitudes to farming are not enough to bring about true change. A systematic approach that ensures the basic preconditions for successful sustainable land use are satisfied is necessary to address the negative environmental impacts that the farming industry poses. This is especially important in light of the economic incentives to maintain the status quo of mass production agriculture.

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[218] *Id.* at 128.

[219] For an example of a free market approach, see Harvey S. James, Jr., *Sustainable Agriculture and Free Market Economics: Finding Common Ground in Adam Smith*, 23 AGRIC. & HUM. VALUES 427 (2006). For an example of an incentives-oriented approach, see Adelman & Barton, *supra* note 15, at 4. For an example of a community-driven approach, see Carroll, *supra* note 155, at 545.

[220] Salkin, *supra* note 216, at 129.

[221] Hamilton, *supra* note 201, at 527.

The first step in promoting sustainable agriculture depends on a "common, understandable definition" of sustainable agriculture that will provide law, policy, research, and education with a clear and defined goal.[222] This is important in setting an cognizable agenda for community collaboration in the planning process and a feasible goal to work toward. Additionally, a clear definition can foster better accountability within the responsible departments and transparency in the process for public knowledge. A specified and tuned definition developed by the agricultural, legal, and scientific communities will push the sustainability effort forward more powerfully and efficiently.

Second, sustainable agriculture's economic and social effects on communities must be recognized.[223] Interested groups and institutions, such as the "research and education sector, farm groups, input suppliers, farm lenders, and landowners," can serve as important players that either assist or prevent acceptance.[224] This is important to appropriately allocate control and responsibility throughout the process. A farming community's success depends on the practical factors relating to an agricultural system. This involves the community's willingness to invest, ability to experiment, costs and resource efficiency, and availability of local leaders and institutions able to claim and defend the rights of farmers and approve and stimulate innovation.[225] Comprehensively involving the local population and focusing on achieving an affirmative perception of the plan can ensure that interested groups and institutions serve as "allies in promoting sustainability."[226]

Education and research are also necessary to provide the foundation for sustainable agriculture.[227] The concept of sustainability must be transformed into a practical method for implementation, and farmers must be educated on these sustainable practices that are both productive and profitable.[228] Therefore, research must focus on both the environment and the market.[229] Sustainable agriculture requires flexibility so

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[222] *Id.* at 424-25.

[223] *Id.* at 427.

[224] *Id.*

[225] ILEIA, *Chapter 3: Is Agricultural Intensification Ecologically Sustainable?*, 14 ILEIA NEWSL.: LEISA IN PERSPECTIVE: 15 YEARS 17-21 (Sept. 1998), *available at* http://www.agriculturesnetwork.org/magazines/global/15-years-ileia/chapter-3-is-agricultural-intensification.

[226] Hamilton, *supra* note 19, at 427.

[227] *Id.*

[228] *Id.* at 427-28.

[229] *Id.* at 428.

that programs can evolve their techniques as more is learned from working with natural systems.[230]

It is important that sustainable practices financially support the farming community and allow for the continuation of a successful business. Public participation is empty without the ability of participating members to maintain financial support and afford necessary resources. The agrarian system is not simply the farmer. It also consists of the cultural structure, the farmers families, and rural communities.[231] Because the population with a personal and economic stake in the quality of land is the community as a whole, the social and human needs must be jointly considered in the framework.[232] To be sustainable, the industry must be profitable and "able to provide a healthy family income and a good quality of life."[233]

Farmer profitability can be improved by decreasing "dependence on off-farm resources and distant markets," which has previously shifted the "the profitability of agriculture . . . from the farmer to the industries that supply the inputs and market the outputs."[234] Techniques that mitigate environmental harms can also provide "profit potential" to farmers and industry, and stimulating the economy and job opportunities.[235] By highlighting the potential financial gains in sustainable methods, planners can encourage higher farmer support.

Finally, lawyers must identify the "legal and institutional biases that influence agricultural practices."[236] The existing regulatory and industrial structure ultimately affects the viability of a new agricultural plan, since agriculture is also

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[230] *Id.* at 429.

[231] *Id.* at 428-29.

[232] *Id.*

[233] EARLES, *supra* note 18, at 2.

[234] Horrigan et al., *supra* note 93, at 453.

[235] Annise Maguire, *Shifting the Paradigm: Broadening Our Understanding of Agriculture and Its Impact on Climate Change*, 33 SPG ENVIRONS ENVTL. L. & POL'Y J. 275, 310 (2010). Farmers can benefit from "lower input costs, decrease reliance on nonrenewable resources, capture high-value markets and premium prices, and boost farm income." *Id.* at 308-09. Since sustainable agriculture requires more labor, transitioning to this new farming can also create jobs. A 2006 study in UK found "organic farming provides 32% more jobs per farm, than conventional agriculture." *Id.* at 310 (using organic farming and sustainable agriculture interchangeably).

[236] Hamilton, *supra* note 19, at 428 ("[I]nfluences that help determine how and why agriculture functions[] . . . include: the impact of land tenure practices, such as short-term leases that lock producers into exploitive land practices; the lending practices of agricultural financiers that may hinder the adoption of alternative methods of production or crop diversification; the attitudes of farmland owners who may desire a short-term maximization of returns rather than longer term stewardship of the land; and governmental programs that may encourage production of certain crops rather than more balanced systems.").

a business. The importance of sustainable agriculture to consumers can be enforced through the emerging food system concept, which involves questions relating to "opportunities for local food production, food access for the poor and hunger assistance, farmland protection, the public understanding of agriculture, and promotion of alternative markets."[237] At the moment, "food system" references are new and lack a specific definition, yet the idea "reflects the values participants bring to the discussion as well as the context of its use."[238] Overall, sustainability should be the theme and standard to review performance of agriculture because it is not separate from other agricultural policy issues, such as "price, income support, and international trade."[239]

## CONCLUSION

In light of the environmental harms agriculture poses to all areas of the environment—land, water, air, and biodiversity—sustainable agriculture must replace the current industrial techniques to ensure that agricultural resources remain available in the future. While increased interest in sustainability and the farming industry may serve as a catalyst for change in the industry's environmentally detrimental practices, the movement must not lose sight of the potential of law and policy to promote sustainable agriculture and reinforce the importance of a sustainable plan. Efforts at the state and local levels can engage local support and participation through a comprehensive plan that provides clear and defined goals. The legal community must refocus agricultural policy and regulation to center on sustainability goals. Most importantly, initiatives toward sustainable agriculture must embrace all participants and the environmental, social, and financial aspects of sustainability in order to ensure its long-term success.

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[237] *Id.* at 430.

[238] *Id.*

[239] *Id.*

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