

Improving Sustainability and Promoting the Right to Holistic Food: The Role of Agribusiness

Ying Chen

Follow this and additional works at: <https://scholarship.law.ufl.edu/fjil>



Part of the [International Law Commons](#)

Recommended Citation

Chen, Ying () "Improving Sustainability and Promoting the Right to Holistic Food: The Role of Agribusiness," *Florida Journal of International Law*. Vol. 31 : Iss. 1 , Article 6.

Available at: <https://scholarship.law.ufl.edu/fjil/vol31/iss1/6>

This Article is brought to you for free and open access by UF Law Scholarship Repository. It has been accepted for inclusion in Florida Journal of International Law by an authorized editor of UF Law Scholarship Repository. For more information, please contact kaleita@law.ufl.edu.

IMPROVING SUSTAINABILITY AND PROMOTING THE RIGHT
TO HOLISTIC FOOD: THE ROLE OF AGRIBUSINESS

*Dr. Ying Chen**

Abstract

This research provides an advanced interpretation of the right to food, arguing that it should include not only food security and food safety, but also sustainability. It further calls for the international community to replace *the right to food* with *the right to holistic food*. The new term highlights the holistic nature of food production. Monsanto (now Bayer) is used as an example to explain that agribusiness—specifically leading global companies—can play an important role in making the global food system safer, healthier, more productive, and more sustainable, primarily through their daily operations and technological advancements. In particular, agribusiness can make a significant contribution to the improvement of sustainability. Further, this research explores regulatory options for creating a sustainable food production system, suggesting that the U.S. government should incorporate the advanced interpretation of the right to food into legislation. A three-step product authorization test should be developed, and product approval should include the assessment of food safety, food security, and sustainability. Meanwhile, a uniform regulatory and institutional framework at the federal level is also important to bring all states up to standard and improve the sustainability of food production across the country. It is hoped that the case study of the U.S. provides some practical insight to other countries. To conclude, this research re-emphasizes the importance of incorporating sustainability into the interpretation of the right to food. Despite some reasonable efforts made by both the public and private sectors, more work needs to be done. Together, the world can achieve the full realization of the right to holistic food.

INTRODUCTION	145
I. RE-EXAMINE THE RIGHT TO FOOD	148
A. <i>Traditional Interpretation of the Right to Food</i>	148
1. At the International Level	148
2. At the National Level	149
3. Where the Future is Headed	150
B. <i>Modern Interpretation: The Right to Holistic Food</i>	151
II. THE IMPACT OF AGRIBUSINESS ON THE RIGHT TO FOOD	152
A. <i>Positive Impacts</i>	152
B. <i>The Criticism</i>	155

1.	General Comments on the Impact of Agribusiness on the Right to Food.....	156
2.	Seed Issue.....	156
3.	Monopoly Issue.....	157
4.	The Rising Concerns over Sustainability.....	157
5.	Summary.....	158
III.	IMPROVING SUSTAINABILITY AND PROMOTING THE RIGHT TO HOLISTIC FOOD: THE ROLE OF AGRIBUSINESS.....	158
A.	<i>The Commitment from the Agribusiness Sector: Technological Innovation.....</i>	159
B.	<i>The Commitment from the Government: Improving the Regulatory Framework to Strengthen the Role of Agribusiness in Sustainability, a Case Study of the U.S.</i>	162
1.	Why the U.S. is Selected and the Importance of Sustainability.....	162
a.	The Right to Holistic Food in the U.S.—Food Security.....	164
b.	The Right to Holistic Food in the U.S.—Food Safety.....	166
c.	The Right to Holistic Food in the U.S.—The Importance of Sustainability.....	167
2.	A Case Study of the U.S.	168
a.	The Two Key Groups.....	168
b.	Regulating Farming Activities.....	168
c.	Regulating Agribusiness and Their Products.....	170
i.	Pesticide Regulation Regulatory and Institutional Framework.....	170
ii.	Risk Assessment.....	171
iii.	Fertilizer Regulation.....	173
iv.	Seed Regulation.....	173
v.	Recommendations.....	175
C.	<i>A Three-Step Product Authorization Test.....</i>	176
D.	<i>A Uniform Regulatory and Institutional Framework at the Federal Level.....</i>	176
	CONCLUSION.....	177

INTRODUCTION

In October 2016, Monsanto (acquired by Bayer in 2018) was put on “trial” in The Hague for alleged human rights violations.¹ In April 2017, five “judges” sat together to deliver their opinions on the evidence and testimonies presented at the *International Monsanto Tribunal* (hereinafter “the Tribunal”).² According to the “verdict,” Monsanto engaged in practices that had violated a number of human rights, i.e., the right to a healthy environment, the right to food, the right to health, freedom of scientific research, and the crime of ecocide.³ However, the Tribunal was “neither an ordinary court that [fell] within the judicial order of a State, nor a court set up by an international organisation.”⁴ It was only an initiative developed by civil society, specifically, by a group of human rights activists and environmentalists. Thus, the Tribunal was not a real trial in the legal sense and its “verdict” was non-enforceable.⁵

Nevertheless, the Tribunal delivered two meaningful results for the public and for the legal community. The Tribunal was unique, and very few similar Tribunals had been established before.⁶ The concepts and procedures used in the Tribunal were “analogous to that followed by the International Court of Justice under Chapter IV of its Statute.”⁷ The words used by the Tribunal were eye-catching: “*an International Tribunal, “held at the Hague, “to hold Monsanto accountable, “for human rights abuses.*” For the public, these words were misleading, often making people believe this was a “real” Tribunal. However, the positive side is it successfully brought greater public attention to the broader

* Dr. Ying Chen, Lecturer in Law, Chair of International Advisory Group, University of New England (UNE) School of Law, Armidale, NSW2351, Australia. Email: ychen56@une.edu.au. The author would like to thank Professor Mark Perry, Chair of UNE Academic Board, for his exceptional comments on the earlier draft of this article. The author is also grateful to Ms. Carlie Drew for her extremely useful suggestions. The responsibility for any oversights or mistakes remains mine alone.

1. *International Monsanto Tribunal Advisory Opinion*, INT’L MONSANTO TRIBUNAL (Apr. 18, 2017), http://en.monsantotribunal.org/upload/asset_cache/189791450.pdf.

2. *Id.* at 9 (noting that the Monsanto Tribunal is an “Opinion Tribunal,” which is “an ‘extraordinary’ court born out of the determination of civil society that takes the initiative and is actively involved in it. . . . Opinion tribunals are tasked with examining, using a judicial method, the rules of law applicable to highly problematic events or situations which directly affect and are of serious concern to people or groups of people as well as to society as a whole”).

3. *Id.* at 19, 24, 29, 38, 47.

4. *Id.* at 9.

5. *Id.* at 10 (noting that the advisory opinion is “based on legal considerations, grounded in international human rights law and international humanitarian law.” However, given the Tribunal is an “Opinion Tribunal,” its advisory opinion is not binding).

6. See Gwynn MacCarrick & Jackson Maogoto, *The Significance of the International Monsanto Tribunal’s Findings with Respect to the Nascent Crime of Ecocide*, 48 TEX. ENVTL. L.J. 217, 219–20, 223 (2018).

7. *Id.* at 220; see also *cf.* June 26, 1945 I.C.J. Acts & Docs. arts. 65–68, 59 Stat. 1055.

human rights impacts of agribusiness.⁸ As for the legal community, the Tribunal identified a number of pressing human rights challenges. Although the discussion in the “verdict” was brief and overwhelmingly biased against Monsanto, it still encouraged legal scholars to conduct further investigations into these issues.⁹

Particularly, the Tribunal touched upon an emerging human rights concern: the impact of agribusiness on the right to food.¹⁰ This has been an under-researched area as compared to other business-related human rights issues. Yet, it is a topic worthy of in-depth examination. The industrialization of agriculture over the past few decades has radically changed how the vast majority of food is produced worldwide. Large, international agricultural companies have taken control of the global food system and wielded strong influence over the agricultural economy. They have a great potential to change the world and help mitigate or even solve global food problems.

Literature review indicates that existing research has addressed some of the issues relating to the impact of agribusiness on the realization of the right to food, but it primarily focuses on the imbalance of power in the agricultural market. For example, Mr. Olivier De Schutter, the former United Nations Special Rapporteur on the Right to Food (2008–2014), has published a series of reports on this topic.¹¹ He advised, “[p]rivate companies’ sourcing, pricing and wage policies have an important impact on the realization of the right to food;”¹² specifically, the current agricultural market gives agribusinesses, including, e.g., commodity buyers, food processors and retailers, considerable bargaining power in the supply chain.¹³ According to Mr. De Schutter, these companies often pay relatively low prices for crops, but charge high prices to consumers, squeezing the farmers and creating barriers to food access for low-income earning individuals.¹⁴ To correct the imbalance of power and to improve food security, Mr. De Schutter suggested that three areas should be prioritized: protecting workers in the agricultural sector, addressing the specific needs of smallholders, and promoting more equitable value

8. *Successful Monsanto Tribunal and People’s Assembly*, INT’L MONSANTO TRIBUNAL, http://www.monsanto-tribunal.org/main.php?obj_id=1039072492 (last visited Sept. 6, 2019) (noting that French and German TV news programs, newspapers, and radio programs in various countries have covered the Tribunal).

9. For the full text of the “verdict,” see generally INT’L MONSANTO TRIBUNAL, *supra* note 1.

10. *Id.* at 21–26.

11. Olivier De Schutter, *What is the Role of Agribusiness in the Realization of the Right to Food?*, SRFOOD, <http://www.srfood.org/en/agribusiness> (last visited Sept. 6, 2019).

12. *Id.*

13. *Id.*

14. *Id.*

chains.¹⁵ Similarly, Aravind R. Ganesh also examined the conflict between the right to food and buyer power. He observed that “[m]odern global food supply chains are characterized by extremely high levels of concentration in the middle of those chains . . . such concentration leads to excessive buyer power, which harms the consumers and food producers at the end of the supply chains.”¹⁶ However, little research has been conducted to investigate the role of agribusiness in promoting sustainability, as well as its relation to the right to food.

Agribusiness, sustainability, and the right to food are inextricably linked. “Agricultural sustainability rests on the principle that we must meet the needs of the present without compromising the ability of future generations to meet their own needs.”¹⁷ It is a fundamental element to ensure long-term food security and food safety. This research suggests that sustainability should be an essential component of the right to food, although it is yet to be recognized by the international community. Meanwhile, agribusiness, particularly leading global companies such as Monsanto (now Bayer), can play a significant role in promoting sustainability through their daily operations and technological advancements. They have the capacity to make the global food system safer, healthier, more productive, and more sustainable, contributing to the elimination of world hunger and malnutrition.

As such, the issue that needs to be addressed is clear. There exists a gap between sustainability and the right to food. The existing interpretation of the right to food is outdated. The absence of a key component, i.e., sustainability, has resulted in insufficient research on this topic. To bridge the gap, Section II re-examines the definition of *the right to food*, suggesting that the modern interpretation should include not only food security and food safety, but also sustainability. Further, to emphasize the holistic nature of the global food system, this research proposes to replace *the right to food* with *the right to holistic food*.

Although it is acknowledged that agribusiness can influence the realization of the right to food in many ways, this research only investigates the role of agribusiness in improving sustainability. Thus, Section III uses Monsanto (now Bayer) as an example to examine the impact of agribusiness on the right to food and its potential to promote sustainability.

Following the case study, Section IV explores the solutions that could potentially strengthen the role of agribusiness in improving sustainability.

15. *Id.*

16. Aravind R. Ganesh, *The Right to Food and Buyer Power*, 11 GERMAN L.J. 1190, 1190 (2010).

17. Brodt Sonja, Six Johan, Feenstra Gail, Ingels Chuck & Campbell David, *Sustainable Agriculture*, NATURE EDUC., <https://www.nature.com/scitable/knowledge/library/sustainable-agriculture-23562787> (last visited Sept. 6, 2019).

It suggests that commitments from both the agribusiness sector and governments are vital. In particular, this research uses the U.S. as an example, to demonstrate why sustainability of food production is important and how we fill the regulatory gaps in order to promote sustainability. It is hoped that the case study of the U.S. provides some practical insight to other countries.

Section V concludes the research by re-emphasizing the importance of incorporating sustainability into the interpretation of the right to food. Despite some reasonable efforts made by both the public and private sectors, more work needs to be done in order to “end hunger, achieve food security and improved nutrition and promote agricultural sustainability.”¹⁸ The full realization of the right to holistic food is an achievable goal.

I. RE-EXAMINE THE RIGHT TO FOOD

A. *Traditional Interpretation of the Right to Food*

“The right to food” is well defined in many international treaty instruments and national constitutions, although the expression and the emphasis may slightly vary. My previous work, *The Right to Food*, provides a detailed discussion on this topic.¹⁹ While arguing the right to food indeed exists, that research also compiles a list of legal instruments that define the right to food. The following discussion provides an overview of the conceptual development of *the right to food*.

1. At the International Level

At the international level, the right to food is a concept which originated in the mid-1960s.²⁰ Initially, food security was the primary focus of attention. International efforts were mainly placed on solving food supply problems.²¹ For example, the International Covenant on Economic, Social, and Cultural Rights (1967) (ICESCR), and the Universal Declaration on the Eradication of Food, Hunger, and Malnutrition (1974) (UDEFHM) both emphasized the importance of providing people with sufficient food for their survival. The ICESCR interprets the right to food as “the right of everyone to be free from

18. *Sustainable Development Goals, Goal 2: Zero Hunger*, UNITED NATIONS, <https://www.un.org/sustainabledevelopment/wp-content/uploads/2016/08/2.pdf> (last visited Apr. 5, 2019).

19. Ying Chen, *The Right to Food*, 12 EUR. J.L. REFORM 158, 158–208 (2010).

20. International Covenant on Economic, Social and Cultural Rights (ICESCR). Art. 11, G.A.Res.2200 (XXI), 21 UNGAOR Supp. (No. 16) at 50–51, UN Doc. A/6316 (1967).

21. *Chapter2 Food Security: Concepts and Measurement*, FOOD & AGRIC. ORG., <http://www.fao.org/docrep/005/y4671e/y4671e06.htm> (last visited Sept. 6, 2019).

hunger.”²² Similarly, the UDEFHM reaffirms that every individual has “the inalienable right to be free from hunger and malnutrition in order to develop fully and maintain their physical and mental faculties.”²³

Since the 1990s, the scope of the right to food has been broadened to include food safety. For example, the Rome Declaration on World Food Security (1996) (“The Rome Declaration”) declares that everyone has the right to “access to *safe and nutritious food*, consistent with the right to adequate food and the fundamental right of everyone to be free from hunger.”²⁴ Similar statements can also be found in the earlier reports submitted by the United Nations Special Rapporteur on the Right to Food (hereinafter “the Special Rapporteur”). According to the Special Rapporteur, it is of great importance to ensure “*the availability of food in a quantity and quality sufficient. . .*”²⁵ Thus, the right to food is interpreted as the right to have regular, permanent and free access, either directly or by means of financial purchases, to *quantitatively and qualitatively adequate and sufficient food* corresponding to the cultural traditions of the people to which the consumer belongs, and which ensure a physical and mental, individual and collective, fulfilling and dignified life free of fear.²⁶

To date, although the world is still struggling to fight against hunger and malnutrition, the international community has made significant progress in developing the concept of the right to food; from addressing quantity concerns only, to highlighting both quantity and quality issues. The interpretation of *the right to food* has evolved to protect both food security and food safety.

2. At the National Level

At the national level, a constitution is the supreme law for a sovereign State; it establishes the framework and principles of a State as a political entity. Most States reserve people’s fundamental rights under constitutions. However, only 28 out of 198 States in the world explicitly

22. International Covenant on Economic, Social and Cultural Rights, *supra* note 20.

23. *Universal Declaration on the Eradication of Food, Hunger and Malnutrition*, WORLD FOOD CONFERENCE (Nov. 16, 1974); G.A. Res. 3180 (XXVIII) (Dec. 17, 1973); G.A. Res. 3348 (XXIX) (Dec. 17, 1974); *Universal Declaration on the Eradication of Food, Hunger and Malnutrition*, Art. 1, G.A. Res. 3348 (XXIX) (Dec. 17, 1974).

24. *The Rome Declaration on World Food Security*, FOOD & AGRIC. ORG. (Nov. 13–17 1996) (emphasis added), <http://www.fao.org/docrep/003/w3613e/w3613e00.HTM>.

25. UN Econ. & Soc. Council, UN Comm. on Econ., Soc., & Cultural Rights, General Comment No. 12, *The Right to Adequate Food*, 20th Sess., Apr. 26 – May 14, 1999, para. 8, UN Doc. E/C. 12/1999/5 (May 12, 1999) (emphasis added).

26. *Special Rapporteur on the Right to Food*, UNITED NATIONS OFFICE OF HIGH COMM’R FOR HUM. RTS. (emphasis added), <http://www.ohchr.org/EN/Issues/Food/Pages/FoodIndex.aspx> (last visited Sept. 6, 2019).

establish the right to food in their constitutions.²⁷ This does not mean most States disregard this basic human right. Most of them make reasonable efforts to ensure their people have access to sufficient food.²⁸ In fairness, we should not evaluate a State's commitment to the right to food by merely looking at its constitution. However, the lack of constitutional protection often results in the absence of a national standard to measure government actions in the protection of this right.

As for those 28 countries that do provide constitutional protection of the right to food, the scope of the protection is only limited to quantity sufficiency. For example, the Mexican Constitution (2011 Amendment) states, “[e]very person has the right to *adequate food* to maintain his or her wellbeing and physical, emotional and intellectual development. The State must guarantee this right.”²⁹ Likewise, under the South African Constitution, the right to food is described as the right to “have access to . . . *sufficient food* and water.”³⁰ As compared to the protection of the right to food at the international level, there remains room for improvement in national legislation. Comprehensive interpretation of the right to food in national legislation that is consistent with international standards would provide a transparent and predictable regulatory environment for States to design and implement meaningful strategic plans for the progressive realization of the right to food.

3. Where the Future is Headed

The discussion above reveals that food security is a major concern for States, and most States only accept food security as the essential component of the right to food. Whilst, the international community has made important progress by introducing “quality” considerations. The right to food at the international level has been expanded to include not only food security, but also food safety and nutritional balance. Nevertheless, this research recommends a third component, sustainability, be incorporated into the right to food. The full realization of the right to food requires the protection and promotion of food security, food safety, and sustainability. These three elements are inseparable and indispensable.

27. YING CHEN, TRADE, FOOD SECURITY, AND HUMAN RIGHTS: THE RULES FOR INTERNATIONAL TRADE IN AGRICULTURAL PRODUCTS AND THE EVOLVING WORLD FOOD CRISIS 29 (2014).

28. *Id.* at 29–31.

29. CONSTITUCIÓN POLÍTICA DE LOS ESTADOS UNIDOS MEXICANOS [CP] Feb. 5, 1917, art. 4 (emphasis added) (amend, 2011).

30. CONSTITUTION OF THE REPUBLIC OF SOUTH AFRICA, 1996, art. 27, § 1, cl. B (emphasis added).

B. *Modern Interpretation: The Right to Holistic Food*

The international community has gradually recognized the complexities of the right to food. Although sustainability has not been explicitly incorporated into the concept, several human rights documents have briefly addressed the concerns regarding food supply for future generations. For example, the United Nations Committee on Economic, Social and Cultural Rights General Comment No. 12 (General Comment No. 12) paragraph 7 emphasizes that “[t]he notion of sustainability is intrinsically linked to the notion of adequate food or food security, implying food being accessible for both present and future generations.”³¹ Likewise, Mr. Olivier De Schutter also expressed his concerns about sustainability. In the final UN Special Rapporteur report (2014), he presented his conclusions regarding global food issues. Among the conclusions, he specifically acknowledged the importance of “preserving access to food for future generations,”³² suggesting that a shift to an agroecological model is urgent as it is an effective way to “improve the resilience and sustainability of food systems”³³ These statements indicate a promising start to advance the understanding of the right to food. Nevertheless, more efforts are needed to produce meaningful results.

This research proposes that sustainability should be *explicitly incorporated* into the interpretation of the right to food. There are two aspects to this proposal. The first aspect emphasizes the importance of integrating sustainability into the concept. The rationale for the integration is as follows: agriculture provides human beings with essential food; it is fundamental to human survival. Since the end of World War II, modern agriculture, dominated by industrial farming, has dramatically increased global agricultural production. However, despite the remarkable success in crop production, modern agriculture, with the extensive use of synthetic fertilizers and pesticides, has also generated environmental harms.³⁴ The costs of modern agriculture are significantly high, including soil erosion, groundwater contamination, water scarcity, air pollution, loss of biodiversity, and many other environmental issues.³⁵ Environmental degradation resulting from agricultural activities has

31. CESCR General Comment No. 12, *supra* note 25, para. 7.

32. U.N. General Assembly, Olivier De Schutter (Special Rapporteur), *Report of the Special Rapporteur on the Right to Food, Final Report: The Transformative Potential of the Right to Food*, A/HRC/25/57, at 3 (2014).

33. *Id.* at 8.

34. Margaret Rosso Grossman, *Agriculture and the Environment in the United States*, 42 AM. J. COMP. L. SUPP. 291, 291 (1994).

35. John E. Ikerd, *The Need for a Systems Approach to Sustainable Agriculture*, 46 AGRI., ECOSYSTEMS & ENV'T 147, 149 (1993).

posed serious threats to human health and animal welfare.³⁶ Even worse, when agricultural activities degrade the natural resource base, “the ability of future generations to produce and flourish decreases,”³⁷ disturbing sustainable development of the global community. Accordingly, there is an immediate need to improve sustainability and incorporate it into the interpretation of the right to food.

As for the second aspect, the proposal highlights the importance of explicitness. Explicitness removes unnecessary ambiguity and prevents misinterpretation. Most importantly, it creates authority and sends a powerful signal to the global community for further action. From a strategic point of view, explicitness is of great significance for the implementation of the right to food.

Further, this research calls for the international community to rephrase *the right to food* and replace it with *the right to holistic food*. The new term addresses the holistic nature of food systems. In addition to food security and food safety, the right to holistic food also addresses the consequences of agricultural activities on public health, the environment, and human communities as a whole; it seeks to improve the “long-term productivity,” and the sufficient access to safe and healthy food, for both present and future generations.

II. THE IMPACT OF AGRIBUSINESS ON THE RIGHT TO FOOD

A. *Positive Impacts*

In the last half of the 20th century, with policy support and financial assistance from governments, agricultural technologies and farming machines were quickly developed. New synthetic fertilizers, pesticides, and high-yield crops were created and widely used. Human labor was largely replaced by agricultural machinery. As a result of technological advancements, global productivity in agriculture increased dramatically.³⁸ The world was able to produce much larger

36. *Sustainable Agriculture vs. Industrial Agriculture*, FOOD PRINT, <http://www.sustainabletable.org/246/sustainable-agriculture-the-basics> (last visited Mar. 12, 2019) (noting that modern agriculture produces great quantities of food at relatively low prices, but it is able to do so only by implementing practices that threaten the environment, human health, rural communities, and animal welfare).

37. AGRICULTURAL MECHANIZATION AND AUTOMATION: ENCYCLOPEDIA OF LIFE SUPPORT SYSTEMS (Paul McNulty & Patrick M. Grace eds., 2009); see also Gail Feenstra, Chuck Ingels & David Campbell, *What is Sustainable Agriculture?* U.C. DAVIS, <http://asi.ucdavis.edu/programs/sarep/about/what-is-sustainable-agriculture> (last visited Sept. 6, 2019) (arguing that “[w]ater is the principal resource that has helped agriculture and society to prosper, and it has been a major limiting factor when mismanaged. . . . Soil erosion continues to be a serious threat to our continued ability to produce adequate food”).

38. JOHN C. AVISE, THE HOPE, HYPE, AND REALITY OF GENETIC ENGINEERING: REMARKABLE STORIES FROM AGRICULTURE, INDUSTRY, MEDICINE, AND THE ENVIRONMENT 72 (2004).

quantities of food than ever before.³⁹ During this period of time, agribusiness grew rapidly.⁴⁰ In fact, they were the key players for the global industrialization of agriculture; they were the driving forces behind the remarkable growth in crop production.

Taking Monsanto (now Bayer) as an example, its technological innovations have made significant contributions to improvements in agricultural productivity. In the 1970s, Monsanto developed *Roundup*, which is a glyphosate-based herbicide. It is true that in recent times, *Roundup* has been controversial due to its potential health risks to users.⁴¹ However, apart from this concern, *Roundup* is very effective in weed control and it provides a high level of application coverage. *Roundup* helps farmers protect their crops and reduce expenses on weed management, specifically on labor and time.⁴² In the 1980s, Monsanto gradually moved into the biotechnology area; it developed seed varieties that “help farmers have better harvests while using water and other important resources more efficiently.”⁴³ Monsanto’s innovations significantly improved the efficiency of food production.

Moreover, Monsanto developed and engaged in a number of projects specifically promoting global food and nutrition security.⁴⁴ For example, in late 2012, a total of \$13 million was pledged to advance research on

39. *The Right to Adequate Food*, UNITED NATIONS OFF. OF THE HIGH COMMISSIONER FOR HUM. RTS., <https://www.ohchr.org/Documents/Publications/FactSheet34en.pdf> (last visited Apr. 5, 2019) (according to the FAO, the world “produces enough food to feed its entire population”).

40. Shane Hamilton, *Revisiting the History of Agribusiness*, 90 BUS. HIST. REV. 541, 542 (2016) (book review).

41. *E.g.*, Johnson v. Monsanto Co., No. CGC-16-550128, (N.D. Cal. 2016) (ordering Monsanto to pay \$289.2 million in damages for failing to warn consumers that Roundup causes cancer). For more details about the history of the case, see <https://www.courtlistener.com/docket/4182663/dewayne-johnson-v-monsanto-company/>.

42. *Glyphosate and Roundup Brand Herbicides*, MONSANTO, <https://monsanto.com/company/media/statements/glyphosate-herbicide/> (last visited Apr. 26, 2019) (noting that “[t]o help farmers protect their crops from weeds, Monsanto offers a variety of solutions.” One of [the] popular products is called glyphosate, which is the active ingredient in Monsanto’s Roundup® branded agricultural herbicides. “Farmers, as well as homeowners and others, have been using Roundup® and other glyphosate products for more than 40 years”); see also *Roundup*, MONSANTO, <http://www.monsantoglobal.com/global/au/products/Pages/roundup.aspx> (last visited Apr. 26, 2019) (noting that Roundup is “registered in more than 130 countries and are approved for weed control in more than 100 crops,” and “[n]o other herbicide active ingredient compares in terms of number of approved uses”).

43. *Product Overview*, MONSANTO, <http://www.monsantoglobal.com/global/in/products/Pages/default.aspx> (last visited Sept. 6, 2019).

44. *Growing Better Together—2017 Sustainability Report*, MONSANTO, https://monsanto.com/app/uploads/2017/12/Sustainability_2017.pdf, at 32 (last visited Sept. 6, 2019) (“Monsanto has long taken a multi-pronged approach to improving food and nutrition security.”).

how to increase yields in rice and wheat.⁴⁵ This project was created to address two issues: the importance of rice and wheat in improving global food security, and their slower yield improvements as compared to other crops.⁴⁶ Monsanto also worked towards reducing hunger and malnutrition in sub-Saharan Africa.⁴⁷ Along with other partners, such as the Bill and Melinda Gates Foundation, the U.S. Agency for International Development (USAID),⁴⁸ and the African Agricultural Technology Foundation (AATF), Monsanto participated in the *Expanding Water Efficient Maize for Africa* project (the WEMA project).⁴⁹ The goal of the WEMA project was to “improve food security and livelihoods among smallholder farmers in the region by developing maize seed that uses water more efficiently and resists insect pests.”⁵⁰ Furthermore, Monsanto was the co-founder of the Virus-Resistant Cassava for Africa (VIRCA) project,⁵¹ and it also “collaborat[ed] by donating technology to AATF to develop cowpea varieties able to resist . . . pests.”⁵² As a result of these efforts, 1.5 million people in sub-Saharan Africa benefited from improved food security.⁵³

To be fair, the positive changes made by large agribusiness companies

45. *Applications Now Open for Monsanto’s Beachell-Borlaug International Scholars Program*, MONSANTO, <https://monsanto.com/news-releases/applications-now-open-for-monsantos-beachell-borlaug-international-scholars-program/> (last visited Sept. 6, 2019).

46. *What is Monsanto Doing to Help? Improving Lives*, MONSANTO, <http://www.monsanto.com/global/global/ph/improving-agriculture/Pages/improving-lives.aspx> (last visited Apr. 5, 2019) (noting that rice and wheat are two staple crops critical to the food security of billions of people around the world. Together, they feed more than half of the world’s population. However, yield improvements in rice and wheat lag behind other crops. Moreover, as part of the project, Monsanto’s Beachell-Borlaug International Scholars Program was developed. This project “seeks to help advance research in the production of rice and wheat and to develop highly educated rice and wheat plant breeders who can serve as future agricultural leaders”).

47. MONSANTO, *supra* note 44, at 33.

48. *Funding Partners*, WEMA, <https://wema.aatf-africa.org/partners-donors/funding-partners> (last visited Sept. 6, 2019).

49. *Partner Institutions*, WEMA, <https://wema.aatf-africa.org/about-us/partner-institutions> (last visited Sept. 6, 2019).

50. MONSANTO, *supra* note 44, at 33 (“In sub-Saharan Africa, maize (corn) is a main source of food for more than 300 million people. The production of corn in this area has long been a challenge due to drought, ineffective seed varieties and pestilence.”); *see also* Rebecca M. Bratspies, *Biotechnology, Sustainability & Trust*, 18 KAN. J.L. & PUB. POL’Y, 273, 289 (2009).

51. *VIRCA*, DONALD DANFORTH PLANT SCI. CTR., <https://www.danforthcenter.org/scientists-research/research-institutes/institute-for-international-crop-improvement/crop-improvement-projects/virca> (last visited Aug. 18, 2019); MONSANTO, *supra* note 44, at 33 (noting that “[cassava] grows well in East Africa’s dry soil, but is highly susceptible to viral diseases. The VIRCA project, led by the Danforth Plant Science Center, is using biotechnology to improve cassava’s resistance, supported by Monsanto with funding and technical advice”).

52. MONSANTO, *supra* note 44, at 33 (noting that “[c]owpea is a high-protein legume that grows well in Africa’s dry conditions, but is highly prone to disease and pests, such as the Maruca pod borer, which can reduce harvests as much as 80 percent”).

53. *Id.* at 8.

should be recognized. Monsanto and companies alike should be applauded for the important contributions they have made to the advancement of modern agriculture and the improvement of global food security.

B. *The Criticism*

Despite the positive impacts mentioned above, Monsanto courted much controversy in many aspects. Particularly, it was criticized for the violation of the right to food, among many other human rights accusations.⁵⁴ When conducting a simple Google search of the word “Monsanto” on the Internet, the comments are overwhelmingly negative. There are very few objectively assessing the impacts of Monsanto on the global food system. The public tends to believe that Monsanto and agribusiness companies alike are the “evil hand” behind all these food and environmental issues. In the area of the right to food, the criticism primarily centers on three aspects. First, global agribusiness, particularly seed companies, is often blamed for denying small farmers access to seeds.⁵⁵ Meanwhile, as farms have become bigger and more specialized, an increasing number of small farmers are driven out of business, which may financially restrict their access to food.⁵⁶ Second, the public generally believes that a handful of powerful agricultural companies—including Monsanto—practically control global agricultural production, resulting in monopoly and market manipulation.⁵⁷ Third, agrochemical companies are accused of selling products that cause serious environmental harm and reduce the productive possibilities for future generations.⁵⁸

54. See generally INT’L MONSANTO TRIBUNAL, *supra* note 1, at 10–11 (noting that Monsanto was blamed for systematic human rights abuses, including violations of the rights to food, life, livelihood and health, and environmental derogation); see also Terrell E. Hunt & Timothy A. Wilkins, *Environmental Audits and Enforcement Policy*, 16 HARV. ENVTL. L. REV. 365, 404 (1992).

55. INT’L MONSANTO TRIBUNAL, *supra* note 1, at 24–25 (arguing that GMO seeds are not always affordable to small farmers and may only be available to large business entities; the use of GMOs all around the world is undermining the ability of farmers to access seeds and damaging agricultural production by communities).

56. FOOD PRINT, *supra* note 36.

57. For example, Aaron Sternick discussed the impact of agribusiness monopolies on global agricultural economy and the livelihoods of small farmers. See Aaron Sternick, *Food Fight: The Impending Agricultural Crisis and a Reasonable Response to Price Volatility*, 23 VILL. ENVTL. L.J. 145, 145–68 (2012).

58. For example, the International Monsanto Tribunal Advisory Report examines the environmental issues caused by Monsanto practices. See INT’L MONSANTO TRIBUNAL, *supra* note 1.

1. General Comments on the Impact of Agribusiness on the Right to Food

In response to the criticisms above, this research agrees that some of Monsanto's practices have resulted in undesirable consequences. However, to be fair, Monsanto, along with many other agribusinesses, is neither the only reason nor the main reason that millions of people in the world still suffer from hunger and malnutrition.⁵⁹ Global food insecurity is the result of a combination of factors such as poverty, overpopulation, poor governance, declining agricultural resources, expanding biofuel programs worldwide, and distorted international agricultural trade caused by protectionism.⁶⁰ Therefore, solving global food problems is more complicated than it appears to be; it requires enormous efforts from both the public and private sectors.

2. Seed Issue

With respect to seed companies'—including Monsanto—impact on the right to food, it is fair to say that their practices are a “double-edged sword.” Modern seeds, particularly genetically modified (GM) seeds, are “a significant step forward in the production of agricultural crops.”⁶¹ They “have shown the potential to provide tremendous benefits through increased yields, resistance to pests, and additional nutritional value.”⁶² However, it is also true that seeds, particularly GM seeds, are not always available or affordable to small farmers. Furthermore, due to the industrialization of agriculture, many small farmers are forced to leave their land. They and their family may suffer from hunger and malnutrition, and Monsanto and businesses alike, do not offer much assistance to cope in these situations. Nevertheless, it is not agribusiness' sole obligation to ensure farmers have sustainable access to food. Rather, governments bear the fundamental responsibility to feed their people. Good governance in the public sector would make a positive difference in reducing hunger and malnutrition. If governments have effective strategies in place to support the transition from small-scale farming to industrial agriculture, small farmers and their family would not be placed in such a difficult situation.

59. *Zero Hunger*, WORLD FOOD PROGRAMME, <https://www.wfp.org/zero-hunger> (last visited Oct. 2, 2019) (noting that there are still millions of people in the world suffering from hunger and malnutrition).

60. See generally Chen, *supra* note 27, at 35–110.

61. David Kruff, *Impacts of Genetically-Modified Crops and Seeds on Farmers*, PENN ST. LAW (Nov. 2001) https://pennstatelaw.psu.edu/_file/aglaw/Impacts_of_Genetically_Modified.pdf (last visited Sept. 6, 2019).

62. Jason A. Barron, *Genetic Use Restriction Technologies: Do the Potential Environmental Harms Outweigh the Economic Benefits?*, 20 GEO. INT'L ENVTL. L. REV. 271, 285 (2008).

3. Monopoly Issue

As for monopoly, it is arguably a justifiable accusation because the agribusiness sector (agribusiness in general) certainly has the power to manipulate the global agricultural economy. However, it also raises a question in relation to how they have gained the power. My previous work, *Trade, Food Security and Human Rights*, argues that agricultural protectionism is behind the monopoly, and it is not simply a trade or an economic issue, but a political issue reflecting a deep concern of all States for their own domestic food security.⁶³ However, this concern is better addressed in rich developed countries, as they are more financially capable to provide subsidies and other assistance to support their own agricultural producers. As a result, agricultural production and food security in many rich developed countries have been greatly improved. Nevertheless, the downside is that the global agricultural market is no longer wholly market-driven as it is ought to be, particularly when these countries overproduce and dump their surpluses to the international market. Government interventions have heavily distorted international agricultural trade. On the contrary, farmers from poor developing countries do not receive much monetary support. Their products are not as competitive as those undervalued agricultural products dumped by rich developed countries. Some of these farmers are inevitably forced out of the market.⁶⁴

Thus, the discussion above demonstrates that global agribusiness is part of the monopoly game but governments play a critical role in manipulating the game, particularly governments of the rich world. Thus, changes in agricultural policies and trade rules are imperative in order to break down monopoly, and governments bear the primary responsibility for making such changes.

4. The Rising Concerns Over Sustainability

It is widely agreed that industrial agriculture is a major contributor to water, air, and soil pollution, as well as deforestation,⁶⁵ and it undermines “the resilience of agricultural ecosystems and their capacity to feed mankind in the long run.”⁶⁶ Through releasing harmful compounds,

63. CHEN, *supra* note 27, at 181–82.

64. J.M. Greene, *Localization: Implementing the Right to Food*, 14 *DRAKE J. AGRIC. L.* 377, 387 (2009).

65. Jullee Kim, *Applying Sustainable Land Use Development Studies to Sustainable Agriculture: Are the Conditions Ripe for A Successful Movement Toward Sustainable Agriculture?*, 78 *BROOK. L. REV.* 1033, 1033 (2013).

66. Paul C. Struik & Thomas W. Kuyper, *Sustainable Intensification in Agriculture: The Richer Shade of Green. A Review*, 37 *AGRONOMY FOR SUSTAINABLE DEV.* 1, 3 (2017) (discussing the effect industrialized agriculture had on agricultural ecosystems and their ability to feed mankind in the future).

industrial agriculture also causes immediate and long-term health problems in humans and animals. The environmental and health costs of industrial agriculture are extremely high. Meanwhile, as previously noted, the agribusiness sector plays a critical role in driving the industrialization. It is fair to say the third accusation is valid. Although the agribusiness sector has helped the world produce great quantities of food, and some of the companies have realized the importance of sustainability, the reality is there remains much work to be done in order to ensure future generations' access to food.

Agribusiness has great potential to make a positive change. Major global agribusiness has the human, financial, and technical resources required to promote the advancement of agricultural science and technology; these innovations will reshape the agricultural industry and improve food security and food safety, as well as sustainability spontaneously. It is imperative that agribusiness focus on innovations that “[i]ncrease productivity with an environmental approach that promotes sustainability.”⁶⁷

5. Summary

The media and the general public should not biasedly focus on meaningless negative criticism because it only holds back the progress to reduce world hunger and malnutrition. Rather, we, the society as a whole, should concentrate on looking for solutions that could solve our key problem at hand—how best we provide adequate and safe food for both present and future generations. In the early days, despite many unfavorable consequences, agribusiness was extremely successful in developing new technologies to improve agricultural productivity and increase global crop yields. Without the efforts made by the agribusiness sector, more people in the world would have been suffering from hunger and malnutrition. Nowadays, agribusiness still has the capacity to make positive changes. The following discussion examines the two areas that we could focus on in order to promote sustainability, as well as the right to holistic food, i.e. technological innovation and product regulation. Both areas require contributions from the agribusiness sector.

III. IMPROVING SUSTAINABILITY AND PROMOTING THE RIGHT TO HOLISTIC FOOD: THE ROLE OF AGRIBUSINESS

Over the years, governments have been heavily invested in technological innovation in agriculture. Agribusiness has also been providing strong financial support to advance agricultural science and technology. Many agricultural companies have their own research and development teams. They also collaborate with or sponsor other public

67. MONSANTO, *supra* note 46.

or private research institutes to conduct research. The world has generally agreed that science and technology is one of the key factors for success in agriculture, and it is an area that deserves massive investment. Beyond that, it is also widely acknowledged that technological innovation essentially drives sustainable agricultural development, and it is critical to the realization of the right to holistic food. Thus, to promote sustainability, as well as the right to holistic food, it is imperative that both governments and agribusiness continue their contributions to technological innovation. Given that this research focuses on the impact of agribusiness on the right to food, government-supported ag-tech innovation initiatives will not be dealt with in detail. Instead, the discussion below will only examine the commitment from agribusiness in the area of technological innovation.

As for product regulation, this research encourages governments to strengthen the regulatory framework and impose stringent sustainability standards—specifically on agrochemicals and GM seeds—although it is acknowledged that regulatory reforms promoting sustainability is a large-scale comprehensive project requiring more than product regulation. Meanwhile, it must be noted that the role of farmers should not be ignored. Even though farmers only use the seeds, agrochemicals, and other farming supplies in compliance with government regulation, they are the ones who actually cultivate crops and manage the use of agricultural resources; they play a critical role in implementing sustainable agricultural techniques.

A. *The Commitment from the Agribusiness Sector: Technological Innovation*

The environment must be looked after so that food production meets the needs of current and future generations.⁶⁸ Agricultural technology has to be improving in order to ensure food security and food safety in the long term. This research suggests that the agribusiness sector focuses on two main aspects when investing in technological innovation in agriculture: productivity and sustainability, although food quality and safety must always be ensured.

Considering the challenges the global food system has been confronting, particularly those linked to the tension between the growing population and declining agricultural resources, productivity improvement remains a priority.⁶⁹ Only with increased productivity can

68. JOHN E IKERD, CRISIS AND OPPORTUNITY: SUSTAINABILITY IN AMERICAN AGRICULTURE 11 (Charles A. Francis et al. eds., 2008) (“A sustainable agriculture must be capable of meeting the needs of the present while leaving equal or better opportunities for the future.”).

69. Richard B. Flavell, *Greener Revolutions for All*, 34 NAT’L BIOTECH. 1106, 1106 (2016) (discussing that it is challenging to “produce much more food, year on year, on the same land area

the world continuously provide sufficient food for the people. Therefore, agribusiness should continue its effort to increase yield efficiency, such as innovations on seeds and farm chemicals. Each agribusiness has its own specializations, and they should strengthen their strengths. For example, one of Monsanto's specializations before the acquisition by Bayer was genetically modified seeds. Continuing innovation in plant breeding would enable farmers to "grow better harvests using less land, less water and less energy."⁷⁰ Bayer values Monsanto's individual specializations and continues to support its cutting-edge innovation on seeds, among many other products.⁷¹ Bayer is committed to strengthening the existing specializations.

"Technological innovation has successfully refined farming practices, but the increased productivity does not necessarily render a healthy environment."⁷² Mr. Olivier De Schutter, the former UN Special Rapporteur on the right to food, noted, "a narrow focus on improved productivity risks ignoring the wide range of other variables that foresight exercises should take into account."⁷³ De Schutter suggested that "[a]ny prescription to increase yields that ignores the need to transition to sustainable production and consumption, and to reduce rural poverty, will not only be incomplete; it may also have damaging impacts, worsening the ecological crisis and widening the gap between different categories of food producers."⁷⁴ Therefore, technological innovation should "ultimately enhance nature rather than replace nature" and "work with nature rather than attempt to conquer nature."⁷⁵ The agribusiness sector must promote innovation that improves not only productivity but also sustainability; this is central to the realization of the right to holistic food.

Many agricultural companies have gradually acknowledged the importance of sustainability. For example, both Bayer and Badische Anilin- und Soda-Fabrik (BASF) have publicly announced their commitments to sustainability. "For Bayer, sustainability means shaping the future successfully and, as part of our corporate strategy, is an integral part of our day-to-day work routines."⁷⁶ As for BASF, it confirms that

and to keep pace with human proliferation and needs How to achieve this is far from understood or agreed upon").

70. MONSANTO, *supra* note 44, at 2.

71. *It's Time to Grow*, MONSANTO, <https://monsanto.com/company/time-to-grow/> (last visited Sept. 6, 2019).

72. Kim, *supra* note 65, at 1038.

73. *Report of the Special Rapporteur on the Right to Food*, *supra* note 32, at 8.

74. *Id.*

75. Ikerd, *supra* note 35, at 153.

76. *Our Commitment to Sustainability*, BAYER, <https://www.bayer.com/en/sustainability.aspx> (last visited Sept. 6, 2019).

We want to contribute to a world that provides a viable future with enhanced quality of life for everyone. We do so by creating chemistry for our customers and society and by making the best use of available resources. Sustainability is at the core of what we do, a driver for growth as well as an element of our risk management.⁷⁷

Bayer's and BASF's sustainability approaches should be applauded. Nevertheless, sustainability improvement is a collaborative effort. Individual commitment will not save the world. This research calls for all agricultural companies to incorporate sustainability into their corporate strategies. Only if sustainability becomes a core element of corporate strategy, can agribusiness enhance its positive impact on the right to holistic food. Meanwhile, this research also acknowledges that the affordability of new technologies has been a struggle for many farmers, especially smallholder farmers in poor developing countries. This issue is worthy of in-depth exploration but lies beyond the scope of this research, and therefore, will not be examined.

Given that technology is always advancing, and generally, newer innovations are superior to previous ones, this research only discusses a few general principles that may help promote sustainability. First, seed innovation remains a priority as it enables farmers to grow crops with desirable traits while using fewer natural resources. Second, crop protection products and services are particularly important to ensure better harvests. Agricultural companies should continue their work on creating sustainable solutions to help farmers defend their crops against insects, weeds, diseases, and other threats. This approach highlights two points. The *effectiveness of crop protection is to be enhanced. Meanwhile, the negative impacts on the environment are to be minimized.* While developing these solutions, agricultural companies must take into account the following considerations: soil health, biodiversity, climate change, water risks, greenhouse gas emissions, and many other environmental factors. Human and animal health must also be protected. Third, nowadays, data science has becoming increasingly important for agriculture. Farming can be more sustainable through using reliable data, algorithms, simulations, and other digital tools. "With information at their] fingertips, [farmers] can make decisions in real time about how best to apply resources, increasing efficiency."⁷⁸ Finally, training on sustainable farming practices is also vital to protect the health of our planet and the long-term goal of food sustainability. Some training programs offered by Monsanto (now Bayer) set a good example for other

77. *We Create Chemistry for a Sustainable Future*, BASF, <https://www.basf.com/global/en/who-we-are/sustainability.html> (last visited Mar. 7, 2019).

78. MONSANTO, *supra* note 44, at 13.

agricultural companies. In 2017, Monsanto took the initiative to offer training and technical seminars to smallholder farmers globally through sustainability partnerships and as part of its standard business practices.⁷⁹ Over 2.5 million farmers received training on sustainable farming practices.⁸⁰ For example, in India, 240 training sessions and crop demonstrations were held, and 130,000 farmers were reached directly and indirectly.⁸¹ Farmers' knowledge on water management, sustainability, and integrated farming systems were largely expanded.⁸² Meanwhile, in Kenya, training programs "enabled 5,000 smallholder farmers . . . to improve yields, yet conserve natural resources."⁸³ Training programs on sustainable farming practices provide farmers with the necessary knowledge and effective tools to grow crops in a more environmentally and socially responsible way. They bring benefits to the planet and the farming communities, and therefore, should be strongly encouraged.

Technological innovation in agriculture enables farmers to produce safer and more nutritious food with a lower environmental footprint; modern agriculture can make farming more sustainable. This research calls for the agribusiness sector to make further commitment in developing technologies and services that can enhance not only productivity, but also sustainability. These efforts will ultimately contribute to the progressive realization of the right to holistic food.

B. The Commitment from the Government: Improving the Regulatory Framework to Strengthen the Role of Agribusiness in Sustainability, a Case Study of the U.S.

Government plays a vital role in developing a regulatory framework that would improve sustainability. However, the existing regulatory arrangements in many countries are found to be ineffective. This research uses the U.S. as an example to examine why sustainable food production is important and how we fill the regulatory gaps in order to promote sustainability.

1. Why the U.S. is Selected and the Importance of Sustainability

Food is fundamental to human beings, but not all the countries in the world are capable of producing enough food to feed their people. According to the United Nations, Sub-Saharan Africa, South and East Asia, Middle East and North Africa (MENA), and many other regions in the world, are increasingly dependent on food imports due to "the

79. MONSANTO, *supra* note 44, at 34.

80. MONSANTO, *supra* note 44, at 8.

81. *Id.* at 34.

82. *Id.*

83. *Id.* at 35.

challenge of limited land and water resources as well as extreme-weather related issues of climate-change”⁸⁴ Food import has become very common nowadays.

Only a handful of countries excel at agricultural production. China, the U.S., India, and Brazil are the top four countries that produce the most food in the world.⁸⁵ “China always out-produces the U.S., and in some years India produces more food than the U.S.”⁸⁶ Brazil ranks number four in global food production; but its agricultural industry lacks diversity and “tilts heavily towards sugarcane, soybeans and beef.”⁸⁷ Due to large populations, China and India “end up consuming much more of their own products,”⁸⁸ with little left for exporting. As for Brazil, its exports predominantly focus on the few produces mentioned above.

In the U.S., agricultural production “spread[s] across much of the country,” and its productivity is among the highest in the world.⁸⁹ Over the years, agricultural output has increased significantly, but its domestic consumption has not risen as much.⁹⁰ As a result, huge agricultural surpluses are disposed to the international market. Since the 1970s, the U.S. has dominated the global food export market. Unlike Brazil, the U.S. produces and exports a wide variety of agricultural products, including not only grains, soybeans, horticultural products, but also livestock products.

As one of the world’s most successful agricultural producers and exporters, the U.S. plays an important role in feeding people in other countries. However, that also means a major production failure in the U.S. would result in a disruption to global food supply, posing a very real threat to food security across the globe, particularly in countries that heavily rely on American agricultural imports. The ‘Butterfly Effect’ is inevitable. Furthermore, it is true that the realization of the right to holistic food varies in different countries, and different countries may also face different kinds of challenges in agriculture and food production. However, some of the challenges can be common among producers across the world. If a successful producer cannot deal with the common

84. *Poorer Countries Set to be ‘Increasingly Dependent’ on Food Imports, Says UN Food Agency Report*, UNITED NATIONS NEWS (July 3, 2018), <https://news.un.org/en/story/2018/07/1013872>.

85. Sean Ross, *4 Countries That Produce the Most Food*, INVESTOPEDIA (last updated June 25, 2019), <https://www.investopedia.com/articles/investing/100615/4-countries-produce-most-food.asp> (noting that the U.S., China and India “each produce more food than the entire European Union put together”).

86. *Id.*

87. *Id.*

88. *Id.*

89. *Id.* (“Noting that “[n]o country produces food as efficiently as the U.S. . . .”)

90. *Id.* (noting that “the total food production in the U.S. has more than doubled in the post-war period”).

challenges effectively, those who are less productive would, most likely, be unable to do so as well.

As compared to most countries in the world, the U.S., one of the world's most successful agricultural producers, has no major food security issues *yet*; food quality and safety is mostly guaranteed. However, sustainability is an emerging issue that deserves a larger share of our time and attention and needs to be dealt with urgently. In fact, the sustainability of food production is a common challenge faced by the whole world. It is important that we investigate what the U.S. has done right and wrong and how we can improve sustainable food production. This protects food security in the U.S. in the long term; it also helps feed people in food deficit countries. Besides, it is hoped that other countries can learn from the U.S. experience so that together, the world achieves a sustainable future.

a. The Right to Holistic Food in the U.S.—Food Security

According to the recent Food and Agriculture Organization of the United Nations (FAO) Report, in 2018, 821.6 million people (which is about one in every nine people in the world), still suffered from hunger.⁹¹ As for geographical distributions, in Africa, the prevalence of undernourishment (PoU),⁹² in other words, hunger rate, has been steadily increasing; “it reached almost 260 million people (19.9% of its total population) in 2018.”⁹³ In Asia, the PoU has been steadily decreasing in most regions; but there were still 513.9 million people, which was 11.3% of total Asian populations, not having access to sufficient food. Meanwhile, in the Caribbean, the PoU remained 18.4% and 7.8 million people were hungry.⁹⁴ On the contrary, in Northern America and Europe, the PoU was less than 2.5%, meaning that very few people suffered from hunger and malnutrition in those regions.⁹⁵ The table below shows the confronting reality the world is currently facing. As compared to the rest of the world, to date, the U.S. has no major food security issues.

91. Food and Agriculture Organization of the United Nations, *The State of Food Security and Nutrition in the World 2019* (2019), <http://www.fao.org/3/ca5162en/ca5162en.pdf>, at 9.

92. According to FAO, “the prevalence of undernourishment (PoU) is an estimate of the proportion of the population whose habitual food consumption is insufficient to provide the dietary energy levels that are required to maintain a normal active and healthy life. It is expressed as a percentage.” See FAO, *Sustainable Development Goals, SDG Indicator 2.1.1 - Prevalence of undernourishment*, <http://www.fao.org/sustainable-development-goals/indicators/211/en/> (last visited Sept. 6, 2019).

93. Food and Agriculture Organization of the United Nations, *supra* note 90, at 11.

94. *Id.* at 8-9.

95. *Id.*

Prevalence of Undernourishment (PoU) in the World, 2005–2018⁹⁶

Prevalence of Undernourishment (%)						
	2005	2010	2015	2016	2017	2018*
World	14.5	11.8	10.6	10.7	10.8	10.8
Africa	21.2	19.1	18.3	19.2	19.8	19.9
Northern Africa	6.2	5.0	6.9	7.0	7.0	7.1
Sub-Saharan Africa	24.3	21.7	20.9	22.0	22.7	22.8
Eastern Africa	34.3	31.2	29.9	31.0	30.8	30.8
Middle Africa	32.4	27.8	24.7	25.9	26.4	26.5
Southern Africa	6.5	7.1	7.8	8.5	8.3	8.0
Western Africa	12.3	10.4	11.4	12.4	14.4	14.7
Asia	17.4	13.6	11.7	11.5	11.4	11.3
Central Asia	11.1	7.3	5.5	5.5	5.7	5.7
Eastern Asia	14.1	11.2	8.4	8.4	8.4	8.3
South-eastern Asia	18.5	12.7	9.8	9.6	9.4	9.2
Southern Asia	21.5	17.2	15.7	15.1	14.8	14.7
Western Asia	9.4	8.6	11.2	11.6	12.2	12.4
Western Asia and Northern Africa	8.0	7.1	9.2	9.5	9.8	9.9
Latin America and The Caribbean	9.1	6.8	6.2	6.3	6.5	6.5
Caribbean	23.3	19.8	18.3	18.0	18.0	18.4
Latin America	8.1	5.9	5.3	5.5	5.7	5.7
Central America	8.4	7.2	6.3	6.1	6.1	6.1
South America	7.9	5.3	4.9	5.3	5.5	5.5
Oceania	5.5	5.2	5.9	6.0	6.1	6.2
Northern America and Europe	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5	< 2.5

Source: FAO (<http://www.fao.org/3/ca5162en/ca5162en.pdf>)96. *Id.* at 8.

b. The Right to Holistic Food in the U.S.—Food Safety

Food safety regulation in the U.S. started in the early 1900s when a number of foodborne illness outbreaks sparked the need for new laws and enforcement mechanisms to manage food processing, handling, and distribution.⁹⁷ Over the next century, the U.S. passed a list of laws to regulate the food industry in an effort to ensure food safety and prevent foodborne illness. These laws include, for example, the Federal Food, Drug, and Cosmetic Act (1938),⁹⁸ the Poultry Products Inspection Act (1957),⁹⁹ and the Food Safety Modernization Act (2011).¹⁰⁰ These pieces of legislation demonstrate the multilateral approach taken by numerous federal and government agencies to address the complex challenge of assuring food safety.¹⁰¹ Three federal and two state governmental agencies are primarily responsible for ensuring food safety within the U.S., i.e. the Food and Drug Administration (FDA), the Food Safety and Inspection Service (FSIS), the Centers for Disease Control and Prevention (CDC), the State Department of Public Health, and the State Department of Agriculture.¹⁰² These government agencies work collaboratively to ensure the safe supply of food to American consumers. Furthermore, the U.S. also has an effective food recall and alert system to minimise the impact of contaminated food, and potentially dangerous food, on public health.¹⁰³ It is true that food safety is a hot topic that often makes headlines in the U.S., and lapses and failures in food safety policies and practices occasionally result in contaminated food and foodborne illness. However, as compared to other countries, it is fair to say the U.S. has an effective food safety management system in place. There are fewer and less serious food safety issues in the U.S. than in many other countries in the world.

97. Richard A. Merrill & Jeffrey K. Francer, *Organizing Federal Food Safety Regulation*, 31 SETON HALL L. REV. 61, 78–79 (2000).

98. 21 U.S.C.A. §§ 301–397

99. Poultry Products Inspection Act, Pub. L. No. 85-172, 71 Stat. 441 (codified at 21 U.S.C. §§ 451–470 (1994)).

100. Food Safety Modernization Act, 21 U.S.C. § 350h (2011).

101. NDSU, *US Agencies Involved with Food Safety*, <https://www.ndsu.edu/pubweb/~saxowsky/aglawtextbk/chapters/foodlaw/USagencies.html> (last visited Sept 6, 2019).

102. FoodSafety.gov, *About Foodsafety.gov*, <https://www.foodsafety.gov/about> (last visited Sept. 6, 2019).

103. For more details regarding food recalls in the U.S., see Foodsafety.gov., *Recalls and Outbreaks*, FOODSAFETY.GOV, <https://www.foodsafety.gov/recalls-and-outbreaks> (last visited Sept. 6, 2019).

c. The Right to Holistic Food in the U.S.—The Importance of Sustainability

In his book *Crisis and Opportunity*, Prof. John E. Ikerd suggested, “[the] industrialization of American agriculture resulted in the most efficient agriculture in the world, [...] a more efficient agriculture made it possible for this nation to build the strongest economy and the most affluent society in the world.”¹⁰⁴ This led him to suggest that “the objectives of industrialization have been achieved.”¹⁰⁵ Nevertheless, as he further noted, industrialization is now at its final stage,¹⁰⁶ and “American agriculture is at a time of crisis.”¹⁰⁷

Agricultural production requires four key elements: seeds, land, water, and human resources. However, American agriculture is struggling in all four areas. First of all, GM seeds are quickly replacing traditional seeds; farmers cannot save their own seeds for the next year’s harvest.¹⁰⁸ As for the other three key elements, they are decreasing at a fast rate. Rapid urbanization has accelerated farmland transfer resulting in “much prime farmland . . . being taken out of production.”¹⁰⁹ According to Ikerd, “[t]he United States has been converting agricultural land to non-agricultural uses at the rate of about three million acres per year-of which about one million acres is from the cropland base.”¹¹⁰ As for water resources, despite the enforcement of the Clean Water Act,¹¹¹ the pollution of waterways caused by agriculture remains one of the intractable environmental problems in the U.S.¹¹² The National Water Quality Assessment conducted by the Environmental Protection Agency (EPA) shows that “agricultural nonpoint source (NPS) pollution is the leading source of water quality impacts on surveyed rivers and streams, the third largest source for lakes, the second largest source of impairments to wetlands, and a major contributor to contamination of surveyed estuaries and ground water.”¹¹³ If agricultural water pollution continues

104. IKERD, *supra* note 68, at 25–26.

105. *Id.*

106. *Id.* at 5.

107. *Id.* at 2.

108. Daryl Lim, *Living with Monsanto*, 2015 MICH. ST. L. REV. 559, 559 (2015).

109. Truman Temple, *Protecting America’s Farmland*, 7 EPA J. 32, 32 (1981).

110. *Id.*

111. 33 U.S.C. §§ 1251–1387 (2006).

112. Jan G. Laitos; Heidi Ruckriegle, *The Clean Water Act and the Challenge of Agricultural Pollution*, 37 VT. L. REV. 1033, 1033 (2013). Noting that “there are many sources of agricultural pollution, including fertilizers and pesticides applied to row fields, animal waste from livestock operations, and sediment loading from tree farms.”

113. EPA, *Nonpoint Source: Agriculture*, <https://www.epa.gov/nps/nonpoint-source-agriculture> (last visited Sept. 6, 2019). For more details regarding the National Water Quality Assessment, see EPA, *Water Quality Assessment and TMDL Information*, https://ofmpub.epa.gov/waters10/attains_index.home (last visited Sept. 6, 2019).

indefinitely, it would ultimately harm the sustainability of food production in the U.S. Meanwhile, as farms are becoming more specialized, more technically advanced, larger, and fewer, rural communities are drying quickly.¹¹⁴ Today, only less than 2 percent of Americans are farmers, and “about half of those consider something other than farming as their primary occupation.”¹¹⁵ Human and social resources have been significantly withdrawn from agriculture.¹¹⁶ With the development of agricultural science and technology, we may not need as much land, water and human resources as traditional agriculture, but we certainly cannot produce food without them. The sustainability of food production is at risk if the U.S. does not take these issues seriously.

It is acknowledged that many considerations should be taken into account in order to improve the sustainability of food production in the U.S. However, this research only focuses on one aspect: product regulation. Specifically, it argues that there exists a regulatory gap in the areas of agrochemicals and GM seeds. To bridge the gap, a series of recommendations are proposed. Improved regulation in these areas will help prevent powerful agribusiness from harming the environment and abusing the public trust. It is hoped that the U.S. continues producing sufficient safe and healthy food for both current and future generations. It is also hoped that the U.S. experience provides some practical insight to other countries.

2. A Case Study of the U.S.

a. The Two Key Groups

Agricultural sustainability requires “a holistic approach to farm planning and management.”¹¹⁷ Such holistic approach involves farmers who grow the crops, agribusiness that provide farmers with seeds, crop protection products and machineries, and possibly other individuals that are directly or indirectly participated in the production process. Farmers and agribusinesses are the two key groups that can contribute to a sustainable future; together they play a critical role in that effort. It is necessary to have a closer examination of existing regulation affecting these two groups before recommendations are proposed.

b. Regulating Farming Activities

As discussed above, farmers cultivate crops and manage the use of agricultural resources; they are the key players in the implementation of sustainable farming techniques. Only if they engage in sustainable

114. IKERD, *supra* note 68, at 5.

115. *Id.* at 25-26.

116. *Id.* at 5.

117. Ikerd, *supra* note 35, at 155.

farming, can the environment be preserved. In the U.S., farming is relatively well-regulated.

There are laws and policies governing farmers and agricultural activities at the federal, state and local levels. For example, at the federal level, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)¹¹⁸ sets up the system of pesticide regulation to protect not only applicators, but also consumers and the environment.¹¹⁹ Meanwhile, the Conservation and Recovery Act “[c]ontrols hazardous waste from the cradle-to-grave,”¹²⁰ and that includes how farmers should manage the waste from their daily agricultural activities. At the state and local levels, there are also numerous laws that govern farming operations. For example, the California Environmental Quality Act¹²¹ is the key foundation for the state’s environmental protection efforts in all aspects. In the area of farming activities, the Act protects, for example, agricultural farmland and water resources.¹²² Similarly, in Texas, the Water Code Chapter 26¹²³ addresses the importance of farmers protecting water resources; it requires proper management of agricultural waste.¹²⁴

Governments at all levels have also established a comprehensive system to ensure the effective implementation of the laws. At the federal level, the EPA is primarily responsible for protecting environmental health. At the state and local levels, various governmental agencies have been established to minimize the negative environmental impact of farming activities. A complete list of such environmental agencies can be located on the EPA website.¹²⁵

It is fair to say that the U.S. government at all levels have made reasonable efforts to regulate farming activities and minimize their negative impact on the environment. There are no obvious regulatory failings to be addressed, although some research advocates to re-define “agricultural waste” so that more toxic or potentially toxic byproducts

118. Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. §§ 136–136y (1996).

119. Errett Deck, *Regulated Use of Chemicals in Agricultural Production*, 28 FOOD DRUG COSM. L.J. 628, 629 (1973).

120. UNITED STATE ENVIRONMENTAL PROTECTION AGENCY, SUMMARY OF THE RESOURCE CONSERVATION AND RECOVERY ACT, 42 U.S.C. § 6901 et seq. (1976), <https://www.epa.gov/laws-regulations/summary-resource-conservation-and-recovery-act>.

121. Cal. Pub. Res. Code § 21000 (CEQA.)

122. CAL. DEP’T California Department of Conservation, CALIFORNIA ENVIRONMENTAL QUALITY ACT (LAND PROTECTION), [https://www.conservation.ca.gov/dlrp/Pages/CA-Environmental-Quality-Act-\(CEQA\)-.aspx](https://www.conservation.ca.gov/dlrp/Pages/CA-Environmental-Quality-Act-(CEQA)-.aspx) (last visited Sept. 6, 2019).

123. TEX. WATER CODE ANN. § 26 (2019).

124. *Id.*

125. EPA, *Health and Environmental Agencies of U.S. States and Territories*, <https://www.epa.gov/home/health-and-environmental-agencies-us-states-and-territories> (last visited Sept. 9, 2019).

can be subject to intense regulatory scrutiny.¹²⁶ Besides, it must also be noted that farmers need to receive regular training on sustainable practices so that their knowledge and technical skills on farming can be updated. Training programs should include not only farm waste management, but also sustainable farming practices such as planting of cover crops, reducing or eliminating tillage, and adopting agro-forestry practices. Also, permaculture, as a type of agriculture that “do[es] not undermine the capacity for successful crop production in the future,”¹²⁷ should be encouraged. It makes agriculture more sustainable through restoring soil, conserving water, and redirecting waste streams.¹²⁸

c. Regulating Agribusiness and Their Products

On the contrary, there is much room for improvement in the regulation of agribusiness and their products. Specifically, synthetic pesticides and fertilizers as well as GM seeds are often criticized for their negative (or potentially negative) impact on the environment and human and animal health. Although the U.S. government has realized the importance of sustainability, and the existing legal framework has addressed some aspects of the issues, regulatory loopholes still exist. More effort is required to close these gaps. The following discussion describes the existing regulatory and institutional framework, identifies the gaps in the system, and proposes two recommendations for the U.S. government with a goal to improve sustainability.

i. Pesticide Regulation Regulatory and Institutional Framework

The EPA exercises primary jurisdiction over pesticide control. A series of federal statutes provide a regulatory framework for the EPA to exercise its power and ensure the safe and correct use of pesticides. FIFRA gives the EPA the authority to regulate the registration, sale, distribution, and use of pesticides (including imported pesticides).¹²⁹ The Federal Food, Drug, and Cosmetic Act (FFDCA) allows the EPA to set tolerances (i.e., limits) on the amount of “pesticide residues allowed in or on human food and animal feed.”¹³⁰ These two statutes form the

126. Laitos & Ruckriegle, *supra* note 111, at 1033–70. Laitos and Ruckriegle argue that agricultural nonpoint sources of pollution is a major environmental issue, but it is essentially excluded from federal regulation). It is important to regulate agricultural nonpoint sources of pollution.

127. LeGene Quesenberry, *Ecotourism: A Hyperbolic Sustainable Development Technique*, 9 DICK. J. ENVTL. L. & POL’Y 473, 498 (2001).

128. Lia Helena Monteiro de Lima Demange, *The Principles of Resilience*, 30 PACE ENVTL. L. REV. 695, 793 (2013).

129. EPA, *About Pesticide Registration*, <https://www.epa.gov/pesticide-registration/about-pesticide-registration> (last visited Mar. 18, 2019).

130. *Id.*

foundation of pesticide control. Moreover, the Food Quality Protection Act of 1996 (FQPA)¹³¹ amended FIFRA and FFDCFA by increasing the safety standards for a new product used on foods. Only if a pesticide poses a reasonable certainty of no harm, can it be registered for use on human food or animal feed.¹³² Furthermore, the Endangered Species Act (ESA) requires the EPA to evaluate the risk of pesticides to listed threatened or endangered species and their habitats.¹³³

Along with the EPA, various other agencies also contribute to the safe use of pesticides. Together, they protect the environment, as well as human and animal health. The Department of Health and Human Services' Food and Drug Administration (FDA) and the Department of Agriculture (USDA) help ensure food safety.¹³⁴ The Department of Interior Bureau of Land Management (BLM) and the Fish and Wildlife Service "assess the risks of pesticides to wildlife and the environment."¹³⁵ The EPA also works collaboratively with state agencies to ensure the enforcement of pesticide laws, including "[r]eviewing pesticide safety data and [r]egistering pesticide products, [e]ducating professional applicators, [m]onitoring compliance, and [i]nvestigating pesticide problems."¹³⁶

ii. Risk Assessment

The framework above determines that pesticides are subject to intense regulatory scrutiny. By law, the EPA must conduct a thorough risk assessment before a new product can be approved for registration and sale. The assessment examines "the ingredients of the pesticide, the particular site or crop where it is to be used, the amount, frequency, and timing of its use, and storage and disposal practices."¹³⁷ It also evaluates "a wide variety of potential human health and environmental effects" associated with use of the pesticide.¹³⁸ We must acknowledge that the EPA is committed to the safe and effective use of pesticide, ensuring that it helps protect crops, and it has minimal or no adverse effect on humans, animals and the environment. Nevertheless, in practice, the EPA has a more detailed protection mechanism for human health than for

131. Food Quality Protection Act of 1996, Pub. L. No. 104-170, 110 Stat. 1489 (1996).

132. EPA, *supra* note 129.

133. *Id.*

134. National Pesticide Information Center, *Federal Pesticide Regulation*, <http://npic.orst.edu/reg/regstate.html> (last visited Mar. 10, 2019).

135. *Id.*

136. *Id.*

137. EPA, *supra* note 129.

138. *Id.*

environmental health. The protection over environmental health is yet to be strengthened.

To protect public health, three main factors are emphasized in the EPA assessment including: (a) aggregate risks, which is non-occupational exposure from the pesticide through food, drinking water, and residential uses; (b) cumulative risks “from exposure to pesticides that have a common mechanism of toxicity”;¹³⁹ and (c) occupational risks to those applying the product during their work.¹⁴⁰ That means the EPA protects the safety of not only pesticide applicators, but also the public. In addition, the EPA examines both short-term toxicity and long-term health effects, such as cancer and reproductive system disorders. Although the health effects of some pesticides remain controversial, for example, the safety concerns with respect to *Roundup* and *Chlorpyrifos*,¹⁴¹ the EPA has established a relatively comprehensive mechanism to protect human health. Ultimately, the biggest challenge facing the EPA is how to provide convincing scientific evidence and analysis to prove the safety of a product.¹⁴² In many cases, it is very difficult for governments to “show that a particular threat to health, for example, was serious enough to amount to a compelling interest.”¹⁴³

On the contrary, the protection over environmental health is inadequate, and yet to be improved. The EPA fails to address the diverse array of environmental problems associated with the use of pesticides. Existing regulation tilts heavily towards the protection of ground water and endangered and threatened species.¹⁴⁴ For example, the EPA has begun to “emphasize work on ground water contamination by pesticides” since 1979.¹⁴⁵ As for endangered and threatened species protection, the EPA has developed an Endangered Species Protection Program (ESPP) to carry out its responsibilities under the FIFRA in compliance with the Endangered Species Act (ESA).¹⁴⁶ Nevertheless, other environmental problems, such as damage to the soil, and damage to general biodiversity

139. *Id.*

140. *Id.*

141. Brady Dennis, *Federal Appeals Court Orders EPA to Ban Controversial Pesticide*, WASH. POST (Aug. 9, 2018), https://www.washingtonpost.com/energy-environment/2018/08/09/federal-appeals-court-orders-epa-ban-controversial-pesticide/?utm_term=.08ce339a0409.

142. *Id.*

143. Samuel R. Wiseman, *The Dangerous Right to Food Choice*, 38 SEATTLE U. L. REV. 1299, 1301 (2015).

144. For more information, see EPA, *Protecting Endangered Species from Pesticides*, <https://www.epa.gov/endangered-species>, (last visited July 11, 2019).

145. S. Z. Cohen, S. Cohens. M. Creeger. R. Creegerr. F. Carsel & C. Carselc. G. Enfield, *Potential Pesticide Contamination of Groundwater from Agricultural Uses*, in RAYMOND F. KRUEGER & JAMES N. SEIBER, TREATMENT AND DISPOSAL OF PESTICIDE WASTES 297 (1984).

146. EPA, *About the Endangered Species Protectionprotection Program*, <https://www.epa.gov/endangered-species/about-endangered-species-protection-program> (last visited July 11, 2019).

(other than endangered and threatened species), have not been effectively dealt with.

Furthermore, although sustainability is a priority interest for the EPA in a general sense, and it is a guiding influence for all of its work,¹⁴⁷ the term *sustainability* has not been explicitly stated in the risk assessment procedure. The lack of explicitness undermines the fundamental importance of sustainability; it also indicates that more work is to be done by the EPA in order to acknowledge the holistic nature of environmental issues.

iii. Fertilizer Regulation

Different from pesticide, fertilizers are mainly regulated at the state level. Each state has its own fertilizer laws; most states control the sale, distribution, labelling, and use of fertilizers through their own Department of Agriculture.¹⁴⁸ The Association of American Plant Food Control Officials (AAPFCO) attempts to achieve uniform consensus across the country in the area of fertilizer regulation.¹⁴⁹ To date, the AAPFCO has “developed a degree of uniformity on a number of topics.”¹⁵⁰ However, the AAPFCO is only an independent organization made up of fertilizer control officials from each state, and the documents produced by the AAPFCO are only guidelines for states, therefore, they are not legally binding.¹⁵¹ Due to the absence of a uniform regulatory framework, various standards are applied in different states. The environmental impact of fertilizers is either inadequately or unequally addressed in different states. The piecemeal nature of fertilizer regulation has impeded the effectiveness of fertilizer control, posing risks to human and environmental health. A uniform regulatory framework is necessary; it would bring all states up to standard, improving sustainability in agriculture.

iv. Seed Regulation

Traditional seeds have been used by humans for thousands of years. They are developed using natural methods, and planted according to the soil, climate, and context. It is commonly agreed that traditional seeds cause minimal or no harm to the environment. Thus, regulation on traditional seeds predominantly focus on the quality of the seed, including, for example, seed purity and germination. On the contrary, GM

147. EPA, *Sustainability*, <https://www.epa.gov/sustainability> (last visited Mar. 21, 2019).

148. TSG, *Chemical Compliance (TSCA)*, <https://www.tsgconsulting.com/geography/chemical-compliance-tsca/> (last visited Sept. 6, 2019).

149. The Association of American Plant Food Control Officials, *AAPFCO - The Model for Fertilizer Regulation in North America*, <http://www.aapfco.org/> (last visited Mar. 21, 2019).

150. TSG, *supra* note 148.

151. *Id.*

seeds are created in a lab through a series of biotechnological processes, such as isolating genes from an organism or inserting DNA into the genome of an organism.¹⁵² It has been a highly controversial topic, specifically in relation to the impact on the environment. Although GM technology reduces the use of agrochemicals in farming, toxicity remains a major concern given that agrochemicals are commonly incorporated into GM organisms themselves (including GM seeds). Meanwhile, scientists also worry that GM organisms may affect the “genetic diversity of a population through crossbreeding or uncontrolled growth.”¹⁵³ Being labelled as “one of the most intractable environmental challenges of the 21st century,” GM organisms “trigger almost universal objections from members of the sustainable food movement.”¹⁵⁴

Despite the controversy, GM technology has many valuable attributes. In particular, it rapidly and accurately develops the specific desirable traits which might not natively exist in the natural environment, contributing to yield increases and higher food availability. The undeniable truth is GM organisms has become an irresistible trend. As Richard B Flavell suggested,

Those who seek to perpetuate the GMO controversy and actively prevent use of new technology in crop breeding are not only on the wrong side of the debate, they are on the wrong side of the evidence. If they continue to uphold beliefs against evidence, they will find themselves on the wrong side of history.¹⁵⁵

Thus, it is meaningless to continue the debate on whether we should adopt GM technology. Rather, how to deal with the undesirable impact of GM seeds on the environment and human and animal health should be considered as an immediate priority. Given that farmers only “cultivat[e] varieties that [have] cleared all regulatory requirements for safety,”¹⁵⁶ high expectations are placed upon regulatory agencies. Quality assurance remains one of the most fundamental components of GM seed regulation. In the meantime, risk assessment that ensures the safety of GM organisms to humans, animals and the environment has become increasingly important.

152. Marsha A. Echols, *Food Safety Regulation in the European Union and the United States: Different Cultures, Different Laws*, 4 COLUM. J. EUR. L. 525, 535 n.48 (1998).

153. Heather Landry, *Challenging Evolution: How GMOs Can Influence Genetic Diversity*, HARV. U. SCH. OF ARTS & SCI.: BLOG (Aug. 10, 2015), <http://sitn.hms.harvard.edu/flash/2015/challenging-evolution-how-gmos-can-influence-genetic-diversity/> (last visited Mar. 25, 2019).

154. Stephanie Tai, *The Rise of U.S. Food Sustainability Litigation*, 85 S. CAL. L. REV. 1069, 1095 (2012).

155. Richard B Flavell, *supra* note 69, at 1109.

156. A. Bryan Endres, *Coexistence Strategies, the Common Law of Biotechnology and Economic Liability Risks*, 13 DRAKE J. AGRIC. L. 115, 127 (2008).

In the U.S., the Federal Government plays a main role in overseeing the introduction of genetically engineered plants,¹⁵⁷ and it has established *the Coordinated Framework for Regulation of Biotechnology*.¹⁵⁸ Under the Coordinated Framework, three federal regulatory agencies share the responsibility of agricultural biotechnology regulation; they work collaboratively to ensure the safe use of GM organisms.¹⁵⁹ The EPA has regulatory oversight of pesticide, and that includes pesticides used on GM seeds.¹⁶⁰ Within the Department of Agriculture, the Animal and Plant Health Inspection Service (APHIS) protects agricultural health; it “regulates organisms and products that are known or suspected to be plant pests or to pose a plant pest risk, including those that have been altered or produced through genetic engineering.”¹⁶¹ Meanwhile, the FDA focuses on food safety, “seek[ing] to ensure the safe consumption of foods derived from genetically engineered crops.”¹⁶²

Given GM seeds are subject to the EPA’s risk assessment on pesticide, it ultimately faces similar challenges that pesticide regulation has been facing. That is, the EPA fails to address the diverse array of environmental problems associated with the use of pesticides. However, as compared to pesticide regulation, it is worth noting that the Coordinated Framework attains a higher level of protection over biodiversity. The APHIS evaluates a diverse range of issues to reduce the negative impact of GM seeds on biodiversity, including, for example, “the expression of gene products, new enzymes, or changes to plant metabolism; [...]; effects on non-target organisms; and the potential for gene transfer to other types of organisms.”¹⁶³

v. Recommendations

Although sustainability has become increasingly important in the U.S., it remains an area that needs further regulation. This research proposes two reforms in response to the regulatory gaps discussed above. The first emphasizes the necessity to establish a three-step product authorization system. The second highlights the importance of

157. *Id.* at 125.

158. *Id.* at 119–20.

159. Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23,302, 23,302 (1986).

160. EPA, *EPA’s Regulation of Biotechnology for Use in Pest Management*, <https://www.epa.gov/regulation-biotechnology-under-tsca-and-fifra/epas-regulation-biotechnology-use-pest-management> (last visited Mar. 25, 2019).

161. United States Department of Agriculture Animal and Plant Health Inspection Service, *Coordinated Framework*, https://www.aphis.usda.gov/aphis/ourfocus/biotechnology/sa_regulations/ct_agency_framework_roles (last visited Mar. 14, 2019).

162. Endres, *supra* note 156, at 124.

163. United States Department of Agriculture Animal and Plant Health Inspection Service, *supra* note 161.

developing a uniform regulatory and institutional framework at the federal level.

C. *A Three-Step Product Authorization Test*

A three-step product authorization test sets up a system that integrates the three key elements of the right to holistic food into product assessment. For any product to be approved for sale and use, three elements: food security, food safety, and sustainability, must be assessed individually. Food security testing ensures productivity and protects crop health. Food safety testing prevents safety risks and protects human and animal health. Sustainability testing decreases the environmental footprint of agriculture without decreasing yield. The three-step product authorization test sets clear parameters for relevant agencies to determine if a product is ready for the market.

Moreover, sustainability testing must be of equal importance as the other two tests. Given that the EPA is primarily responsible for environmental protection and sustainability, this research further recommends reforming relevant laws to emphasize two key objectives: holism and explicitness.

Existing laws have addressed a number of environmental issues, but not all. For example, in the area of pesticide, existing regulation mostly focuses on groundwater contamination, and endangered and threatened species, while other environmental problems have not been adequately addressed. Similarly, in the area of GM seeds, biodiversity is the major concern, while other environmental issues are not effectively dealt with. There is an urgent need to address all aspects of environmental problems, including any emerging environmental challenges associated with the use of pesticides, fertilizers, and GM seeds. It is critical to adopt a *holistic* approach to *environmental issues* instead of tackling them in a piecemeal manner. Furthermore, this research also suggests that sustainability must be explicitly integrated into the EPA assessment procedure. This would confirm sustainability is not merely a desired behavior, but a duty to perform. Together, the two objectives ensure a holistic approach to a sustainable future. Furthermore, one must also acknowledge that further research on the environmental impact of pesticides, fertilizers, and GM seeds is central to improving sustainability in agriculture; it provides scientific evidence and analysis for relevant government agencies to take necessary action to mitigate environmental risks.

D. *A Uniform Regulatory and Institutional Framework at the Federal Level*

Under federal law, the USDA, the FDA, and the EPA have a shared responsibility in regulating various aspects of pesticides and GM seeds.

Although overlapping roles and functions exist in some areas, the coordinated work carried out by the three agencies have been relatively efficient. The primary responsibility of each agency is rather clear. The USDA protects crop health and promotes increased productivity. The FDA ensures food safety. The EPA promotes sustainability and reduces the negative environmental impact of agriculture. Their work is also supported by state and local governments. Such institutional arrangement brings clarity and stability to pesticide and GM seeds control; it also ensures uniformity across the country. On the contrary, the regulation of fertilizer takes place mainly at the state level, and different standards are applied in different states. The environmental impact of fertilizer has not been equally or adequately addressed. The regulatory framework governing pesticides and GM seeds sets a good example for fertilizer control. The co-operation of the USDA, the FDA, and the EPA based on uniform laws at the federal level leads to consistency and continuous improvement. Further, in terms of the institutional arrangement, the shared responsibilities of the three government agencies is also central to the success of the regulatory reform.

The proposed reform would bring uniformity to fertilizer regulation; it would also clarify the roles and responsibilities of relevant agencies in creating a sustainable agricultural system. Ultimately, these changes would contribute to the protection and promotion of the right to holistic food.

CONCLUSION

Industrial agriculture still dominates the global food system, but the world has come to realize that monocultures and heavy use of agrochemicals have resulted in widespread, long-lasting and severe environmental harm.¹⁶⁴ One of the most important challenges facing the world is how we produce sufficient, safe and nutritious food for the present generation while sustaining the planet for future generations. This forces us to rethink and rework our plans regarding the protection and promotion of the right to food. Nowadays, solving global food problems is not only about optimizing food production and improving food safety, but also about promoting well-being, resilience, and sustainability.¹⁶⁵ These elements are equally important to the full realization of the right to holistic food.

The protection and promotion of the right to holistic food requires enormous commitment and continuing coordination from various sectors. The agribusiness sector plays an important role in reshaping the global food system for a healthier and sustainable future, particularly through

164. De Schutter, *supra* note 32, at 5.

165. *Id.* at 13.

technological innovation and collaboration that advance modern agriculture. Advancements in agricultural science and technology are no longer just optional, but imperative to improving global food security and food safety, as well as sustainability.¹⁶⁶ Meanwhile, government bears the responsibility for creating a framework that would effectively regulate agribusiness and their products. In the areas of pesticides, fertilizers, and GM seeds, it is important that all new products pass a series of rigorous and comprehensive assessments before they reach the market. A three-step product authorization test is recommended as it sets clear criteria for product approval, ensuring that they meet stringent productivity, safety, as well as environmental and social standards. A uniform regulatory and institutional framework at the federal level also improves the efficiency of government control over pesticides, fertilizers, and GM seeds.

To date, how to solve global food problems is still far from agreed upon. However, “[t]here is inadequate momentum and much needs to be done.”¹⁶⁷ This research acknowledges that the improvement of sustainability is a large-scale comprehensive project requiring more than addressing the issues discussed above. A complete review of existing regulation would assist the authorities in identifying scope for further improvements. Moreover, we must admit that agricultural science and technology alone will not save the environment or long-term food production. Farmers and farm workers will still need to adopt sustainable farming practices and land management.¹⁶⁸ To build extensive support for sustainability, public awareness of the problems also needs to be improved. “Collectively, consumers can be a powerful market force,”¹⁶⁹ and that helps create a robust market for sustainable foods.¹⁷⁰ To conclude, the full realization of the right to holistic food is an achievable goal, and the world must work collaboratively to improve not only food security and food safety, but also sustainability.

166. Flavell, *supra* note 69, at 1106.

167. *Id.*

168. Brooke Borel, *When the Pesticides Run Out*, 543 NATURE 302, 304 (2017).

169. Margot J. Pollans, *Farming and Eating*, 13 J. FOOD L. & POL’Y 99, 109 (2017).

170. FOOD PRINT, *supra* note 36.