Pace International Law Review

Volume 30
Issue 1 *Winter 2017*

Article 1

December 2017

GMOs, International Law and Indigenous Peoples

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Casandia Bellevue*

ABSTRACT

This Article sprung from a desire to discover why—despite scientific uncertainty and the oft-cited precautionary principle in international law—genetically modified organisms are still allowed to spread via international trade and natural ecological cycles. While exploring this topic, it did not take long to come across the environmental justice impacts of genetically modified crops, and their particularly disparate impact upon indigenous peoples across the globe. Not only are GMOs threatening biodiversity and our planet, but also the very existence and cultural foundations of many indigenous groups.

This Article seeks to answer the following questions: What are the international agreements that can be used to protect indigenous peoples against GMOs encroaching on their food security and food sovereignty? Why have these agreements, especially the precautionary principle, thus far failed to restrict the spread of GMOs, and protect the food sovereignty of indigenous peoples? Moving forward, how can international treaties, declarations, and conventions be enforced with regard to international GMO promulgation?

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INTRODUCTION

Genetically modified organisms ("GMOs") are a contentious scientific and economic venture. Genetically modified ("GM") crops are often hailed as the food of the future, a way to feed a growing population.[1] Others, however, consider the imperfections of GMOs to be unnerving. These organisms are entering and altering our ecosystems in potentially problematic ways. In 2014, The World Health Organization observed that "it is not possible to make general statements on the safety of all GM foods."[2] While there are still scientists and investors who insist that GMOs are harmless and will solve the world's food security issues, this claim is rebuffed by many in the scientific community.[3]

GM crops seem to have overwhelmingly disparaging effects on indigenous peoples and other minority groups. Indigenous peoples have a unique tie to their lands and crops that infiltrates the very fiber of their cultures and traditions. Moreover, GMOs threaten plant and overall biological biodiversity by selecting and breeding out certain traits and inserting foreign genes into organisms to "improve" or create different traits within the organism.[4] This synthetic selection, due to the high likelihood of cross-pollination, threatens to homogenize plant species, thereby jeopardizing the integrity of crops crucial to many indigenous peoples throughout the world.[5] Over time, this manner of genetic selection will also serve

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[1] *See generally Growing Better Together: Monsanto 2016 Sustainability Report,* MONSANTO, https://monsanto.com/app/uploads/2017/05/2016-sustainability-report-2.pdf (last visited September 20, 2017) (hereinafter MONSANTO).

[2] *Frequently Asked Questions on Genetically Modified Foods*, WHO (May 2014), http://www.who.int/foodsafety/areas_work/food-technology/faq-genetically-modified-food/en/ (hereinafter WHO).

[3] *See* Jessica A. Knoblauch, *New Report Finds GE Crops Don't Increase Yields but Do Increase Herbicide Use*, EARTHJUSTICE BLOG (Nov. 1, 2016), http://earthjustice.org/blog/2016-october/new-report-finds-ge-crops-don-t-increase-yields-but-do-increase-pesticides; *see also* MONSANTO, *supra* note 1.

[4] WHO, *supra* note 2.

[5] *See What Is Happening to Agrobiodiversity?*, U.N. FOOD & AGRI. ORG., http://www.fao.org/docrep/007/y5609e/y5609e02.htm (hereinafter U.N. FOOD & AGRI. ORG.).

to reduce overall global biodiversity.[6] Genetic selection is not only an issue integral to irresponsible GMO promulgation, but also an issue of food sovereignty and security for indigenous populations worldwide.

This Article will address these problems in four parts. Part I will define GMOs and describe their history, biology, and the pitfalls involved. Part II will focus on a particular sector of the world population to be the most adversely affected by GMOs: indigenous peoples. Within this part, indigenous' right to food security and traditional agricultural practices will be explored, using a comparative study between the struggles that Native Hawaiians and indigenous peoples of the Amazon are facing. Part III will discuss international agreements to which the United States is a party, and its role in the GMO discussion. This Part will focus on a norm of international law: the precautionary principle. Though the precautionary principle seems to give us the tools to challenge the propagation of GMOs, it has thus far been ineffective for several reasons discussed in Part III. Part IV will present other international treaties, their application to indigenous peoples, and the legal challenges that can be brought to oppose the promulgation of GMOs. It will also briefly analyze the potential role of the 2030 Sustainable Development Goals in obtaining indigenous food security.

I. GENETICALLY MODIFIED ORGANISMS

A. The History and Science

The precursor to genetic modification was selective breeding. Early on, humankind discovered ways to increase the size, yield, and resistance of certain plants. Archaeobotanists and paleoethnobotanists estimate selective breeding to have developed independently in different parts of the world beginning in about 10,000 B.C.E.[7] Millenniums later, driving forces in the agricultural

[6] *See id.*

[7] *History of Agriculture*, NEW WORLD ENCYCLOPEDIA, http://www.newworldencyclopedia.org/entry/History_of_agriculture (last updated Oct. 26, 2015, 7:04 PM).

and technological industries claim to have found ways to further improve yield and strain resistance using technology, all in the name of science and food security. Thus, genetically modified crops were invented.

GM crops are created in laboratories when scientists insert foreign genetic material into a chosen plant's DNA to bring about a desired change, or to enhance the plant's existing desirable traits.[8] A scientist must first identify the gene in a plant that causes the sought-after trait.[9] The subsequent step is to integrate the new material into the recipient plant's cells,[10] a process that can currently be achieved in a variety of ways. One method of gene incorporation, known as the recombinant DNA method, uses biological vectors, such as viruses or plasmids, to transmit the foreign genes into the recipient cell's nucleus.[11] The bio-ballistics method entails using a small metal projectile covered in the foreign genetic material, and shooting it into the receiving organism's cell.[12] Microinjection, as it sounds, is the method in which pores or small holes are created in the recipient cell membrane to facilitate a foreign material's entry, allowing "the new genetic material [to be] injected directly into the cell."[13] Often times, however, these insertion techniques kill the receiving cell, or the cell does not uptake the new DNA.[14] In an effort to ensure uptake, it is common practice for scientists to insert multiple copies of that desired foreign DNA into the recipient cell, which, in itself, may lead to further negative repercussions.[15]

The uses for GMOs have been claimed to be increasing herbicide and pesticide resistance, and controlling gene expression of certain traits, all factors which can alter nutritional values and reproductive cycles of the crops.[16] Increasing herbicide resistance,

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[8] Sophia Kolehmainen, *Precaution before Profits: An Overview of Issues in Genetically Engineered Food and Crops*, 20 VA. ENVTL. L.J. 267, 269 (2001).
[9] *Id.* at 271.
[10] *Id.*
[11] *Id.*
[12] *Id.*
[13] *Id.*
[14] *Id*.
[15] *Id.* at 272.
[16] *Id.* at 273.

however, is problematic due to its inclusion of powerful toxic chemicals in the DNA of a plan that then enter the human food chain.[17] Previously, topical application of herbicides and pesticides was the norm, and to an extent, a consumer could wash off the toxins before consuming their produce. With the advent of GMOs, we can no longer simply "wash off" these toxins; they are now imbedded in the very DNA of our foods. This issue is especially alarming considering that, to a certain degree, what we eat becomes part of our own genetic material via epigenetics.[18] Even more alarming is the fact that this epigenetic concern pales in comparison to the more serious drawbacks that are inseparable from GMOs.

B. The Pitfalls in Science

One of the major issues with genetic editing and insertion is the unknown, and perhaps unknowable, ways in which the alteration causes negative gene expressions within the plants.[19] It is also worth noting that there are many environmental factors, such as toxicity, water availability, temperature, soil quality, and species interaction that go into the nurturing of a plant. As such, while genetic engineering may yield desirable results in a laboratory, placing that plant into a natural environment can have unintended and undesirable consequences. In the natural world, there are multitudes of variables at play that cannot be predicted or accounted for, and results may be calamitous to ecosystem health.[20]

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[17] *Eat the Peach, Not the Pesticide*, CONSUMER REPORTS (Mar. 19, 2015), https://www.consumerreports.org/cro/health/natural-health/pesticides/index.htm; *see generally* Michael C.R. Alavanja, *Pesticides Use and Exposure Extensive Worldwide*, 24 REV. ENVTL. HEALTH 303, 303–05 (2009).

[18] *See* Juan C. Celedón et al., *Principles of complex trait genetic*, UPTODATE (Dec. 5, 2012), http://ultra-medica.net/Uptodate21.6/contents/UTD.htm?10/44/10950?source=related_link ("Epigenetic mechanisms — Epigenetic mechanisms influence the expression of a gene without changing any DNA sequence. Such mechanisms may be heritable or post-natal . . . . Environmental or behavioral exposures may lead to human disease through epigenetics.").

[19] Steven H. Yoshida, *The Safety of Genetically Modified Soybeans: Evidence and Regulation*, 55 FOOD & DRUG L.J. 193, 205 (2000).

[20] Kolehmainen, *supra* note 8, at 277.

The fact that GM seeds have herbicides and pesticides included in their very DNA promotes the use of monocultures, seeing as many farmers believe it would be much easier and more profitable to simply grow one type of crop at a time.[21] Having pesticides imbedded in the seeds leads to the belief that using the old way of crop rotation to dissuade pests is no longer necessary, or even obsolete. Indeed, "the majority of American farmland is dominated by industrial agriculture—the system of chemically intensive food production developed in the decades after World War II, featuring enormous single-crop farms and animal production facilities."[22] Similar patterns of agriculture have become prevalent across the world in different regions, including Southeast Asia, Europe, and Latin America.[23] Brazil, for example, has also seen a large boom in the practice of single-crop, genetically modified farming.[24]

In actuality, monocultures leave the stands of crops even more susceptible to any kind of change in average growing conditions.[25] A disease outbreak, variations in hydrology, an extreme weather occurrence (i.e., climate change disturbances), or pest invasions can wipe out acres upon acres of monocultures.[26] By contrast, genetic diversity lends to more resistant crop, seeing as it creates a likelihood that some crops will survive a disturbance because of slightly different genes, while others succumb due to their inability to adapt. Not only have studies shown that

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[21] *Industrial Agriculture: The outdated, unsustainable system that dominates U.S. food production*, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/our-work/food-agriculture/our-failing-food-system/industrial-agriculture#.WJo3-PkrJm8 (last visited Oct. 19, 2017) (hereinafter UNION OF CONCERNED SCIENTISTS).

[22] *Id*.

[23] Paulo Prada, *Fateful Harvest: Why Brazil has a big appetite for risky pesticides*, REUTERS (Apr. 2, 2015, 2:50 PM), http://www.reuters.com/investigates/special-report/brazil-pesticides/.

[24] *Id.*

[25] *Biodiversity and Agriculture*, HARV. T.H. CHAN SCH. OF PUB. HEALTH, http://www.chge.hsph.harvard.edu/biodiversity-and-agriculture (last visited Oct. 19, 2017).

[26] *Id.*

monocultures actually attract certain pests and weeds, but the overuse of monocultures, as well as the overuse of pesticides and herbicides, has developed even more resistant generations of pests and weeds.[27] Monsanto—a multibillion-dollar agrochemical biotechnology corporation leading the charge on generating and disseminating GMOs—created a popular herbicide, Roundup, which it marketed as an effective weed-killer.[28] There was, however, a major drawback. Roundup has bred pernicious super weeds that are proving themselves devastating to many farming communities.[29] This new method of farming also depletes soil nutrition, stripping the earth of the components necessary to sustain life.[30] Aside from the terrestrial repercussions, the massive amounts of fertilizer and pesticides that are being sprayed onto these plants end up running into our hydrological systems and, ultimately, into our drinking water.

The most concerning threats to ecosystem health caused by GMOs impact two interdependent aspects of nature: pollinators and pollination. One of the most important insects in our ecosystems are the pollinator bees. The ecosystem services they provide by simply going about their daily routine of pollinating flowers are of incalculable value to the food chain. GM crops, however, have posed a massive threat to these bees. The heavy use of GM crops also entails the heavy use of pesticides, insecticides, and herbicides. Corn, the crop using up most of North America's farming land, is a perfect example.[31] Almost all of the corn planted in the United States is sprayed with neonicotinoid insecticide.[32] This particular

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[27] UNION OF CONCERNED SCIENTISTS, *supra* note 21.
[28] *Id*.
[29] *Id.*
[30] *Id.*
[31] Christian H. Krupke et al., *Multiple Routes of Pesticide Exposure for Honey Bees Living Near Agricultural Fields*, 7 PUB. LIBR. SCI. ONE 1, 1 (2012).
[32] *Id.*

insecticide has been studied extensively and has shown to have links to bee deaths and causing bee colonies to collapse.[33]

The pollen itself is a bee's primary protein source, which nurse-bees customarily feed to larvae.[34] The introduction of pesticide-infected pollen to developing larvae can be fatal, and has the potential to destroy a new generation of bees and increase the possibility of colony collapse.[35] In a study conducted in 2012 by Krupke and fellow scientists, it was discovered that "the amount of the insecticide found in and around corn fields is near the range known to kill honey bees, and dead bees collected near treated fields contained insecticide residues."[36]

Another devastating effect of insecticides was witnessed long before scientists began noticing their effects on bees. After World War II, bald eagles fell victim to dichlorodiphenyltrichloroethane ("DDT") poisoning, which weakened their egg shells to the point that they could not sustain life.[37] At the time, DDT was being sprayed indiscriminately to control the mosquito population. DDT dealt a severe blow to the population of the bald eagle and, before protective measures were implemented, the United States ("U.S.") faced the possibility that it

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[33] Doug Gurian-Sherman, *Genetically Engineered Crops in the Real World – Bt Corn, Insecticide Use, and Honey Bees*, UNION OF CONCERNED SCIENTISTS BLOG (Jan. 10, 2012, 6:01 PM), http://blog.ucsusa.org/doug-gurian-sherman/genetically-engineered-crops-in-the-real-world-bt-corn-insecticide-use-and-honeybees-2?_ga=1.8938800.446030725.1486320825; *see also* Krupke et al., *supra* note 31, at 2-3. France has taken measures to phase out the use of neonicotinoid pesticides by 2018 in order to protect bee populations. In general, the EU has imposed restrictions on the use of neonicotinoids, but not an outright ban. *See* Beyond Pesticides, *France on Track to Ban All Neonicotinoid Pesticides by 2018*, ORGANIC CONSUMERS ASS'N (July 1, 2016), https://www.organicconsumers.org/news/france-track-ban-all-neonicotinoid-pesticides-2018.

[34] Krupke et al., *supra* note 31, at 5.

[35] *Id.*

[36] Gurian-Sherman, *supra* note 33; *see also* Krupke et al., *supra* note 31, at 2.

[37] *Bald Eagle Fact Sheet: Natural History, Ecology and History of Recovery*, U.S. FISH & WILDLIFE SERV. (2007), https://www.fws.gov/midwest/Eagle/recovery/biologue.html.

could very well lose its symbol of freedom.[38] While the bald eagle was an easy mascot to rally behind, bees are arguably an even more important species that face a very similar danger due to the agricultural biotech forces, yet no significant action has been taken within the U.S. to save these keystone species.

Aside from the ecosystem threat of losing our pollinators, there is also the threat from pollination itself. While we need our pollinators, such as bees and butterflies, to continue supporting farms and other plant fertilization functions in the larger ecosystem, cross-pollination is posing a problem to those who want nothing to do with GM crops. Organic, non-GMO farmers are finding it impossible to keep their crops from being pollinated with GM crop pollen due to both the movement of pollinators and wind carrying pollen from neighboring GM farms.[39] Cross-pollination is especially dangerous to wild flora in that the aggressive tendency for GM plants to homogenize will eventually spread to wild plants and reduce biodiversity in ecosystems at large. This phenomenon has already led to instances of hybridization and homogenization of plants, which leads to a loss of overall biodiversity.[40] A study done by the Food and Agricultural Organization of the United Nations discovered that "[s]ince the 1900s, some 75 percent of plant genetic diversity has been lost as farmers worldwide have left their multiple local varieties and landraces for genetically uniform, high-yielding varieties."[41]

The creation of genetically engineered crops not only affects the ecosystem, but also poses a threat to the human anatomy. It is difficult (and often unethical) to test on human subjects. This difficulty is partly attributed to the many variables humans interact with on a daily basis that interfere with consistent or reliable results. The effects of GMOs have been studied using other mammals,

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[38] *Id.*

[39] Documentary: FOOD, INC. (Robert Kenner, 2008) (hereinafter FOOD, INC.).

[40] Maria Alice Garcia & Miguel A. Altieri, *Transgenic Crops: Implications for Biodiversity and Sustainable Agriculture*, 25 BULL. SCI., TECH. & SOC'Y 337, 339 (2005).

[41] U.N. FOOD & AGRIC. ORG., *supra* note 5.

however, and have yielded some worrisome results. A 1999 study on the effects of GMOs showed that rats fed genetically altered potatoes exhibited immunodeficiency and stunted growth.[42] Another study conducted by researchers for the University of Nebraska's Department of Food Science and Technology, along with Pioneer Hi-Bred International and the University of Wisconsin-Madison, found a link between individuals with brazil nut allergies and allergies to GM soybeans.[43] The nutritional value of soybeans is often enhanced by inserting brazil nut proteins into the soybean DNA.[44] Thus, by association, those with existing allergies to brazil nuts could also develop allergies to GM soybeans.[45] An Environmental Defense Fund senior scientist, Dr. Rebecca Goldburgh, commented: "Since genetic engineers mix genes from a wide array of species, other genetically engineered foods may cause similar health problems. People who are allergic to one type of food may suddenly find they are allergic to many more."[46] GM food providers do not disclose what foreign DNA is used, so those who have secondary allergies will be left blindly picking food off store shelves, unaware of potential dangers. Humankind has made numerous scientific discoveries that set us apart as a species. Nonetheless, we would be mistaken to believe that we are not part of the ecosystem, or that what we consume from it will not deeply affect us.

C. The Pitfalls in Implementation

There is a major gap between the power and influence of agricultural biotech monopolies, such as Monsanto, and the resources available to consumers and small farmers. These agro-biotech companies modify a wide variety of organisms, patent them,

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[42] Kolehmainen, *supra* note 8, at 276 (citing Martin Enserink, *Preliminary Data Touch Off Genetic Food Fight*, 283 SCI. 1094 (1999)).

[43] Julie A. Nordlee et al., *Identification of a Brazil-Nut Allergen in Transgenic Soybeans*, 334 NEW ENG. J. MED. 688, 688 (1996).

[44] *Id.*

[45] *Id.*; Warren E. Leary, *Genetic Engineering of Crops Can Spread Allergies, Study Shows*, N.Y. TIMES (Mar. 14, 1996), http://www.nytimes.com/1996/03/14/us/genetic-engineering-of-crops-can-spread-allergies-study-shows.html.

[46] Leary, *supra* note 45.

and sell them to farmers and industries under the guise and protection of intellectual property rights, also known as IPRs. Regardless of who purchases the GMOs, these companies still "own" the seeds.[47] The disparity between patent-holders and farmers has created a situation in which these corporations are given free reign over the agricultural sector, threatening the viability and way of life of small farmers. The financial and political influence of these oligarchic corporations is astounding.[48] There have been reports of these corporations using intimidation and scare tactics on small farmers who save seeds, an activity that is considered in violation of the companies' patents.[49] There have also been reports of Monsanto testing the seeds of organic farmers to ensure those farmers' seeds have not been cross-contaminated by Monsanto seeds, in which case Monsanto could press charges under its patents.[50] In the case that this does occur, Monsanto puts the onus on the farmer to prove that he or she is not in violation of its patents.[51] In addition, Monsanto is known to drag out attempts at in-court litigation by, or against, small farmers.[52] The wealth of these companies gives them the ability to outlast the limited funding of the average farmer until she or he is forced to settle or drop the case entirely.[53]

The power dynamic between large agri-tech businesses and the average small farmer and consumer is startling. While most small farmers are negatively affected, the imbalance of power is

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[47] FOOD, INC., *supra* note 39.

[48] A Bayer-Monsanto merger would consolidate the market even further, especially considering two other mergers—Dow-DuPont and Syngenta-ChemChina—are also being negotiated. This would allow these companies an almost complete monopoly of the agri-biotech market in the U.S. It also means that Monsanto stocks, and therefore its political influence, is bound to skyrocket. *See* Dana Varinsky, *Trump could approve a giant merger that's scaring American farmers*, BUSINESS INSIDER (Feb. 5, 2017), http://nordic.businessinsider.com/bayer-monsanto-merger-trump-farmers-worried-2017-2/.

[49] FOOD, INC., *supra* note 39.

[50] *Id.*

[51] *Id*.

[52] *Id*.

[53] *Id.*

even more skewed between indigenous peoples and these agri-tech corporations. The history of disenfranchisement and political subjugation of indigenous interests in most nations across the world has put these populations in a significantly more disadvantaged position.[54]

II. INDIGENOUS PEOPLES

A. Indigenous Sentiment Toward IPR and GMOs

The proliferation of GM crops is not only a concern for farmers and informed consumers, but it is also most certainly an indigenous issue. Undoubtedly, other minorities have also borne the brunt of GM proliferation and its associated practices. However, the effect of these factors on indigenous peoples, and the role of indigenous peoples in the pushback against GMOs, is often overlooked. Victoria Tauli-Corpuz, former Chairperson of the United Nations Permanent Forum on Indigenous Issues, succinctly described this relationship when she wrote: "The appropriation of indigenous knowledge on plants and plant uses, along with the destruction of indigenous sustainable resource management and agro-forestry practices, is also facilitated by biotechnology."[55]

In indigenous communities across the world, the overall sentiment toward GMOs and intellectual property patents is a

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[54] *See* G.A. Res. 61/295, United Nations Declaration on the Rights of Indigenous Peoples pmbl. (Sept. 13, 2007) ("Concerned that indigenous peoples have suffered from historic injustices as a result of, inter alia, their colonization and dispossession of their lands, territories and resources, thus preventing them from exercising, in particular, their right to development in accordance with their own needs and interests."); *see generally* Victoria Tauli-Corpuz, *Genetic Engineering, Biosafety and Indigenous Peoples, in* BIOSAFETY FIRST - HOLISTIC APPROACHES TO RISK AND UNCERTAINTY IN GENETIC ENGINEERING AND GENETICALLY MODIFIED ORGANISMS 303, 304-06 (Terje Traavik and Lim Li Ching eds., 2007).

[55] Tauli-Corpuz, *supra* note 54, at 312.

negative one.[56] The idea that a person can reduce a complex life-form to a set of trademark genes to be controlled in labs away from a natural growing environment is abhorrent to most people who share a deeper connection to the earth, both ancestrally and spiritually.[57] This type of manipulation also serves to set humans further apart from nature, which can lead us into an illusion that we know best and can "beat nature" at its own gene selection process that it has been refining for millennia. For indigenous peoples, GMOs pose a particular threat to the very foundation of many tribes. Not only is it a health issue, but it is also a sovereignty issue. Former Chairperson Victoria Tauli-Corpuz, who also happens to be an indigenous leader from the Kankanaey Igorot people of the Cordillera Region in the Philippines, had this to say on the intersection of sovereignty and biotechnology:

> We indigenous peoples all agree that the protection of biodiversity and cultural diversity cannot be effectively guaranteed if our rights to our ancestral territories are not recognized and respected. Therefore, protests against biotechnology cannot be separated from the call for the recognition and respect of indigenous peoples' rights to territories, right to own their lands and resources, including genetic resources, and the right to their intellectual and cultural heritage.[58]

What makes indigenous peoples such valuable leaders in the battle against homogenizing wildlife is that they have never truly lost their connection to nature. Their deep respect for Mother Earth,

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[56] *See id.* at 309; *see* Global Struggle, *Native Americans Denounce Genetically Engineered Foods*, NW RESISTANCE AGAINST GENETIC ENGINEERING (2002), http://nwrage.org/content/native-americans-denounce-genetically-engineered-foods.

[57] Tauli-Corpuz, *supra* note 54, at 309-10.

[58] *Id.* at 320-21.

Gaia, the Corn Mother—however one may call it—is so entrenched in their cultures that they are much warier about altering life-forms and the effects it may have on the web of life. In other words, aspects of the precautionary principle are built into their belief systems and culture. The following examples from Hawai'i and Brazil explore this deeper connection.

i. GMOs and Indigenous Peoples: A Native Hawaiian Case Study

Currently, a major battleground on the issue of GMOs involves an archipelago in the middle of the Pacific Ocean that is home to an abundance of biodiversity and rich indigenous culture: Hawai'i. Due to its lush soil and tropical climate, the Hawaiian Islands are seen by many as fertile ground for agriculture. At the moment, Hawai'i has the largest number of experimental GM crop trials than any state in the U.S., and hospital records are reflecting that fact.[59] On O'ahu, Maui, Moloka'i, and Kaua'i alone, GM crops take up about 23,728 acres of arable land.[60] As a result, there has been a rise in reports of increased asthma in children and hospitalization of school children near GM farms—and even workers from the GM fields—due to pesticide exposure.[61] In 2006, 60 students and a number of teachers from Waimea Canyon Middle School complained of "headache[s], dizziness, nausea, or vomiting" after a regular spray operation of a nearby Syngenta Seeds, Incorporated GM field.[62] Reports indicate that "[a]t least 10

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[59] Jessica Knoblauch, *Pesticides in Paradise*, EARTHJUSTICE QUARTERLY MAGAZINE, Spring 2015.

[60] Letter from Earthjustice In Re Complaint Under Title VI of the Civil Rights Act of 1964, 42 U.S.C. § 2000d, 40 C.F.R. Part 7, and 7 C.F.R. Part 15 to Lilian Dorka, Acting Director, Off. of C.R., Joe Leonard, Assistant Secretary, Off. of the Assistant Secretary for C.R., and Daria Neal, Deputy Chief, Fed. Coordination and Compliance Section – C.R. Div. 5 (Sept. 14, 2016) (on file with author) (hereinafter Letter from Earthjustice to Lilian Dorka).

[61] Knoblauch, *supra* note 59; *see also* Letter from Earthjustice to Lilian Dorka, *supra* note 60, at 8 ("[O]n January 20, 2016, fieldworkers for Syngenta Seeds, Inc. were exposed to pesticides and taken to Kaua'i Veterans Memorial Hospital. The fieldworkers walked onto a field that had been sprayed with the neurotoxic organophosphate pesticide chlorpyrifos.").

[62] Letter from Earthjustice to Lilian Dorka, *supra* note 60, at 9.

children were treated at an emergency room, several were put on a nebulizer to relieve respiratory distress, and one was given an anti-vomiting medication intravenously."[63] A similar incident occurred in Brazil that resulted in the hospitalization of over 30 children and schoolteachers in 2013.[64] Respiratory distress, vomiting, and headaches, however, are just mild side effects. Exposure to pesticides in utero could result in developmental deficiencies causing children to be born premature, underweight, with an abnormal central nervous system, cleft pallet, decreased intelligence quotient ("IQ"), attention deficit disorder ("ADD"), limb defects, and so on.[65] Other side effects include a higher risk of developing brain tumors and leukemia, as well as reduced sperm count in males.[66]

Most concerning, however, is how these GM fields are having a disproportionately negative impact on Native Hawaiians. A majority of Hawai'i's GM produce, requiring intense pesticide usage, is grown in areas with higher-than-average populations of indigenous Hawaiians.[67] Malia Chun, a Native Hawaiian, Kekaha resident, and member of The MOM Hui, a grassroots organization, said during an interview:

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[63] *Id.*

[64] Prada, *supra* note 23.

[65] Joint Fact Finding Study Group, *Appendix 2: Attachment 5: Human Health, in* PESTICIDE USE BY LARGE AGRIBUSINESS ON KAUA'I 146, 242-44 (2016).

[66] *Id.* at 244, 246.

[67] Letter from Earthjustice to Lilian Dorka, *supra* note 60, at 23 ("HDOA and ADC's discriminatory actions and inactions with respect to pesticides and the resulting adverse impacts disproportionally harm Native Hawaiians in West Kaua'i and on Moloka'i. The majority of the state's pesticide-intensive production occurs in these particular regions, which are also home to large populations of Native Hawaiians. Kaua'i bears the burden of more than half of the state's seed production (56% or 13,299 of 23,728 acres), and the great majority (78.1%) of this production is found on the West Side in the Kekaha- Waimea (5,455 acres) and Kaumakani-Hanapepe (4,932 acres) regions. The Native Hawaiian populations in the Kekaha-Waimea (37.2%) and Kaumakani-Hanapepe (28.8%) regions are proportionally the second and third largest on the island and significantly exceed the island-wide (23.9%) and statewide (21.3%) percentages.").

> I live in a community that is home to the largest population of pure blooded Native Hawaiian, native speakers in Hawai‘i, what many would consider an endangered race and a wealth of cultural knowledge. We also happen to be a community that is inundated daily by exposure to industrial use pesticides. When you consider the danger of frequent, long-term exposure to industrial pesticides, some may consider this to be a form of genocide.[68]

The statistics show that Ms. Chun's sentiments are not overblown. For example, Kaua‘i produces over half of the state's seeds, but that agriculture is concentrated on the West Side of the island in Kekaha Waimea and Kaumakani Hanapepe, 5,455 and 4,932 acres respectively.[69] Those regions also contain the highest number of Native Hawaiian residents on the island.[70] As discussed, where there is agricultural activity in Hawai'i, there is high fertilizer and pesticide usage causing serious health concerns in the local community—communities that often consist of an overwhelming number of minorities. While this strategic placement may be partly due to cheaper land prices, it is also just as likely due to the knowledge that Native Hawaiians have less political clout than those in affluent neighborhoods who are often of non-native decent.[71]

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[68] Mike Coots, *Native Hawaiians Bring Civil Rights Complaint Against State Agencies on Pesticide Use*, EARTHJUSTICE (Sept. 14, 2016), http://earthjustice.org/news/press/2016/native-hawaiians-bring-civil-rights-complaint-against-state-agencies-on-pesticide-use.

[69] Letter from Earthjustice to Lilian Dorka, *supra* note 60, at 23.

[70] *Id.*

[71] Coots, *supra* note 68.

ii. GMOs and Indigenous Peoples: An Amazonian Indigenous Case Study

Another region of the world where indigenous populations are fighting against the massive influence of agro-biotech companies is in the Brazilian Amazon basin. The differences between Native Hawaiians and the Amazonian indigenous, however, are stark. The plight of indigenous peoples in the Amazon is much more dire and goes beyond fighting for the right to health, food security, and freedom from severe discrimination. The Amazonian indigenous are not only fighting for their lands and their ways of life, but also their cultures and their right to live.[72]

In order to fully comprehend the struggle of Amazonian indigenous peoples against mono-cropping and genetically modified soy, one must first analyze a brief history of Brazil's political structure and agriculture. Chapter VIII of the Brazilian Constitution guarantees that indigenous peoples "shall have their social organization, customs, languages, creeds and traditions recognized, as well as their original rights to the lands they traditionally occupy, it being incumbent upon the Union to demarcate them, protect and ensure respect for all of their property."[73] The Constitution goes on to afford "Indians" further protections, such as the right to the resources of their tradition lands and protections against exploitation of those lands by outsiders, exceptions only to be granted with indigenous consent by the National Congress.[74] Other protections include safety from forced removal and occupation, and standing to sue in their own defense.[75] Although on paper these rights seem even more protective than the American Constitution—which only mentions Native Americans for tax and commerce purposes—in practice this chapter of the Brazilian Constitution is largely ignored.

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[72] *See generally* VIOLENCE AGAINST INDIGENOUS PEOPLES IN BRAZIL – 2014 DATA (Patrícia Bonilha ed., Maíra Mendes Galvão trans., Missionary Council for Indigenous People 2014).

[73] CONSTITUIÇÃO FEDERAL [C.F.] [CONSTITUTION] [TEMPORARY CONSTITUTIONAL PROVISIONS ACT] art. 67 (Braz.).

[74] CONSTITUIÇÃO FEDERAL [C.F.] [CONSTITUTION] art. 231, paras. 2-6 (Braz.).

[75] *Id.* art. 231, para. 6, art. 232 (Braz.).

For example, Article 67 of the Brazilian Temporary Constitutional Provisions Act demanded that the government demarcate all indigenous lands by 1993.[76] By the time that deadline arrived, the government had met only half of its demarcation mandate.[77] From 1995 to 2008, the Indigenous Lands Project, under management of the National Indian Foundation—a government agency—took initiative and had 106 indigenous lands demarcated and 81 of the 106 officially registered.[78] Since then, however, the Executive Branch has been recalcitrant to demarcate indigenous lands.[79] It was not until pressure from large indigenous protests erupted in the nation's capital in 2015 did former Brazilian President Dilma Rousself ratify only three of the demarcated indigenous land areas.[80] This type of tactic by the Brazilian government serves to invalidate the basis upon which indigenous peoples, especially those of the Amazon, can bring legal challenges for their lands. Meanwhile, individuals and agricultural interests are traversing indigenous lands on "repossession raids," appropriating assets, and committing acts of violence on indigenous peoples.[81]

In 2016, Global Witness (a non-governmental organization dedicated to the intersection between human rights abuses,

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[76] CONSTITUIÇÃO FEDERAL [C.F.] [CONSTITUTION] [TEMPORARY CONSTITUTIONAL PROVISIONS ACT] art. 67 (Braz.).

[77] Ariel BenYishay et al., *Indigenous Land Rights and Deforestation: Evidence from the Brazilian Amazon* 8 (AidData, Working Paper No. 22, 2016), http://aiddata.org/sites/default/files/wps22_indigenous_land_rights_and_deforestation.pdf.

[78] *Id.*

[79] Cleber César Buzatto, *Demarcation shutdown, racist discourse and fundamentalist court rulings: A trail of violence against the indigenous peoples*, *in* VIOLENCE AGAINST INDIGENOUS PEOPLES IN BRAZIL – 2014 DATA 11 (Patrícia Bonilha ed., Maíra Mendes Galvão trans., Missionary Council for Indigenous People 2014).

[80] *Id.*; Lise Alves, *Rousseff to Sign Demarcation of Indigenous Lands in Brazil*, THE RIO TIMES (Apr. 20, 2015), http://riotimesonline.com/brazil-news/rio-politics/rousseff-to-sign-demarcation-of-indigenous-lands-in-brazil/.

[81] Buzatto, *supra* note 79, at 11; *see generally* GREENPEACE, EATING UP THE AMAZON (Greenpeace Int'l ed., 2006), http://www.greenpeace.org/international/Global/international/planet-2/report/2006/7/eating-up-the-amazon.pdf (hereinafter GREENPEACE).

environmental exploitation, and corruption[82]) named Brazil "the world's most dangerous country to take a stand against environmental destruction."[83] This statement was in the wake of a string of murders of indigenous peoples who vocalized opposition to environmental destruction by cattle ranches as well as soy, palm oil, and eucalyptus plantations.[84] Of the indigenous territories recognized by the Brazilian government, 98.5% are in the Amazon.[85] This leads to a situation of pure dependency between the indigenous peoples and the Amazon forest. When they are ousted from their ancestral homes, tribes suffer culturally, socially, politically, and in the health of their members. Without indigenous peoples, the Amazon loses one of its strongest protectors and most intimate allies. In the words of Davi Kopenawa, shaman and spokesman of the Yanomami tribe of the Amazon: "You have schools, we don't, but we know how to look after the forest."[86]

One of the largest contributors to Amazon deforestation is agriculture.[87] While deforestation rates dropped after the Save the Rainforest Movement began some years ago, an increase in soy demand has, in the recent decade, contributed to a resurgence of deforestation.[88] Since early 2000, Brazil has maintained its position as the second largest soy producer in the world, totaling today about

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[82] *About Us: Mission*, GLOBAL WITNESS, https://www.globalwitness.org/en/about-us/ (last visited Oct. 31, 2017).

[83] Press Release, Global Witness, *Olympics Host Brazil Is the Most Dangerous Country in the World for Environmental Activism* (Aug. 4, 2016) (on file with the author).

[84] *Id.*; *see also* U.N. DEP'T OF INT'L ECON. & SOC. AFFAIRS, STATE OF THE WORLD'S INDIGENOUS PEOPLES, at 226, U.N. Doc. ST/ESA/328, U.N. Sales No. 09.VI.13 (2009).

[85] *Brazilian Indians*, SURVIVAL INT'L, http://www.survivalinternational.org/tribes/brazilian (last visited Sept. 25, 2017) (hereinafter SURVIVAL INT'L).

[86] *Id.*

[87] Hiroko Tabuchi et al., *Amazon Deforestation, Once Tamed, Comes Roaring Back*, N.Y. TIMES (Feb. 24, 2017), https://www.nytimes.com/2017/02/24/business/energy-environment/deforestation-brazil-bolivia-south-america.html.

[88] *Id.*

86.8 million tons of soy a year.[89] Its numbers are second only to the U.S.[90] Three of the biggest culprits pushing the demand for deforested land are American agricultural giants Archer Daniels Midland ("ADM"), Bunge, and Cargill.[91]

The state of Mato Grosso is the largest soybean producer in all of Brazil.[92] Part of this soy expansion is, most alarmingly, genetically modified, presenting yet another danger to an already sensitive region under attack.[93] Approximately half of Mato Grosso's land mass is part of the Amazon biome.[94] Due to this geographic disposition, Mato Grosso's territory is a biological hotspot with over 55,000 different plant species, over 400 documented mammalian wildlife, and multiple endemic species.[95] This diversity of biota, and the people who depend on it, are at risk.

In 2003, the World Wildlife Fund's Forest Conservation Initiative released a report in which it stated that "Mato Grosso is leading in deforestation with the loss of 795,000 hectares in 2002. In the last 20 years, 30 million hectares [over 74,131,614 acres] of forest and cerrado [Brazil's tropical savannah] have been replaced by plantations."[96] In many instances, soy cultivation has deforested indigenous reserves, such as the Xingú National Park, simultaneously contaminating the earth and water sources with pesticides and fertilizers.[97] To make matters worse, aircrafts are

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[89] ULRIKE BICKEL & JAN MAARTEN DROS, THE IMPACTS OF SOYBEAN CULTIVATION ON BRAZILIAN ECOSYSTEMS 4 (2003); James Karuga, *10 Countries with Largest Soybean Production*, WORLD ATLAS (last updated Apr. 25, 2017), http://www.worldatlas.com/articles/world-leaders-in-soya-soybean-production-by-country.html.

[90] Karuga, *supra* note 89.

[91] GREENPEACE, *supra* note 81, at 8.

[92] BICKEL & DROS, *supra* note 89, at 14; Press Release, Geospatial Data Analysis Corp., GDA 2015-16 Soybean Map for Mato Grosso, Brazil (Jan. 2016) (on file with author).

[93] GREENPEACE, *supra* note 81, at 21.

[94] BICKEL & DROS, *supra* note 89, at 16; GREENPEACE, *supra* note 81, at 13.

[95] BICKEL & DROS, *supra* note 89, at 16.

[96] *Id.* at 17.

[97] *Id.*

used to spray pesticides indiscriminately on crop lands below.[98] In so doing, soy producers also overspray the surrounding areas and kill beneficial insects while further contaminating waters and destroying the economic value of organic plantations.[99] All of these factors serve to destabilize indigenous communities that rely on the land and the genetic integrity of the crops the land yields.

GMO cultivation was banned from Brazil until 2003; however, even before 2003, Monsanto seeds had already found their way illegally into the southern farmlands of Piauí, Brazil.[100] These seeds were trafficked from areas of Brazil where Monsanto had been operating plantations in Balsas, Maranhão and Barreiras, Bahia, sans license.[101] Now that the GM ban has been lifted in Brazil, soy monocultures that quickly deplete soil fertility have taken reign, and as soil quality decreases, farmers abandon the lands and forge deeper into the Amazon and, consequently, into indigenous lands.[102] Along with this use of GM seeds comes heavy use of pesticides, which is especially problematic considering Brazil's lax pesticide regulations.[103] Not only is the health of indigenous peoples threatened by these issues, but their cultural ways of life—the subsistence practices and seed integrity of their basic food sources—are also at risk by the intrusion of GMOs.

Along with agriculture comes habitat fragmentation coupled with the appropriation and occupation of indigenous lands. The combination of these factors has had devastating effects on the psyche of tribal people, namely youth. In response to the killing of leaders and displacement of her tribe, the Guarani, Rosalino Ortiz, said in a statement to Survival International: "[I]n the old days, we were free. Now we are no longer. So our young people think there is nothing left. They sit down and think, they lose themselves, and then commit suicide."[104] Another member of the Guarani tribe,

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[98] *Id.* at 18.
[99] *Id.*
[100] *Id.* at 11.
[101] BICKEL & DROS, *supra* note 89, at 11.
[102] *Id.*; GREENPEACE, *supra* note 81, at 21.
[103] *Id.*
[104] SURVIVAL INT'L, *supra* note 85.

Marcos Veron, describes his attachment to the forest as: "This here is my life, my soul. If you take the land away from me, you take my life."[105] The illegal expansion of agricultural interests into the Amazon cannot be discussed without simultaneously discussing violence against indigenous peoples and the appropriation of indigenous lands. Dispossessing these people of their traditional lands infringes on their rights guaranteed by the Brazilian Constitution, and leads directly to the loss of cultural diversity and, in some cases, even tribal breakdown.[106]

There are numerous cases across the globe of how industrial agriculture is driving indigenous peoples from their lands while the practice simultaneously destroys waterways and the health of surrounding communities. On the same token, genetically modified organisms are posing a threat to the integrity of traditional seeds, and therefore the sanctity of many indigenous cultural practices. A combination of these factors, and many more, has made indigenous peoples significantly more vulnerable to the ills of large-scale industrial agriculture.

III. THE PRECAUTIONARY PRINCIPLE

Behind each of the aforementioned case studies, as well as the GM issue at large, is one influential country: the United States ("U.S."). Monsanto is an immensely influential and well-lobbied American agricultural biotech company. Part of the U.S.' economic strategy, as is the strategy of all nations, involves protecting its

[105] *Id.*
[106] *Id.*

financial interests domestically and abroad.[107] These interests undoubtedly play a large role in American foreign policy, especially in international agreements that the U.S. decides to acquiesce.[108] Despite the best interest of the international community and widespread international consensus against the indiscriminate proliferation of GMOs, the U.S. has been very reluctant to join international agreements and treaties relating to biodiversity protection, presumably for the fear of those agri-biotech interests being threatened.

A. U.S. and the Precautionary Principle

The first time the precautionary principle was introduced to international law was in 1989 with the Montreal Protocol on Substances that Deplete the Ozone Layer.[109] The Protocol's very existence was partly due to the Nobel Prize winning work on atmospheric chemistry from scholars at the University of California in Irvine, the Massachusetts Institute of Technology in Cambridge,

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[107] In 2000, a merger with Pharmacia & Upjohn resulted in Monsanto's net income increasing to $149 million. By 2013, its net income reached $2.5 billion. By 2014, the company's market capitalization was over $66 billion. Drake Bennett, *Inside Monsanto, America's Third-Most-Hated Company*, BLOOMBERG NEWS (July 4, 2014), https://www.bloomberg.com/news/articles/2014-07-03/gmo-factory-monsantos-high-tech-plans-to-feed-the-world; *see also* Eric Lipton, *Food Industry Enlisted Academics in G.M.O. Lobbying War, Emails Show*, N.Y. TIMES, Sept. 5, 2015, at A1 ("Emails and other documents obtained by *The Times* from Washington State . . . show how the opponents of genetically modified foods have used their own creative tactics, although their spending on lobbying and public relations amounts to a tiny fraction of that of biosciences companies."); *see also* Dana Varinsky, *Trump could approve a giant merger that's scaring American farmers*, BUSINESS INSIDER (Feb. 5, 2017), http://www.businessinsider.com/bayer-monsanto-merger-trump-farmers-worried-2017-2 (discussing how with the possibility of a Bayer-Monsanto merger on the horizon, Monsanto's stock prices are likely to skyrocket, as is its political influence).

[108] *See* Lipton, *supra* note 107 ("The efforts to have [academics intervene] have helped produce important payoffs, including the approval by federal regulators of new genetically modified seeds after academic experts intervene with the United States Department of Agriculture on the industry's behalf, the emails show.").

[109] Montreal Protocol on Substances that Deplete the Ozone Layer, Jan. 1, 1989, 1522 U.N.T.S 3, 26 I.L.M. 1550.

and the Max-Planck-Institute for Chemistry in Mainz, Germany.[110] A phrase nestled in the preamble of the 1989 Montreal Protocol reads: "Noting the precautionary measures for controlling emissions of certain chlorofluorocarbons that have already been taken at national and regional levels . . . ."[111] The concept of the precautionary principle, however, has been traced back to Germany, where it was known under the name "Vorsorgenprinzip."[112] This term referred to how man-made activities could severely impact human health.[113] While the Montreal Protocol focused on ozone depletion,[114] the precautionary principle has since then been expanded to apply to many other environmental issues. In 1992, the Rio Declaration on the Environment and Development ("Rio Declaration") stated:

> In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.[115]

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[110] James W. Elkins, *Chlorofluorocarbons (CFCs),* NAT'L OCEANIC & ATMOSPHERIC ADMIN., https://www.esrl.noaa.gov/gmd/hats/publictn/elkins/cfcs.html (last visited June 26, 2017).

[111] Montreal Protocol on Substances that Deplete the Ozone Layer, Jan. 1, 1989, 1522 U.N.T.S 3, 26 I.L.M. 1550.

[112] S.M. Garcia, *The Precautionary Approach to Fisheries and its Implications for Fishery Research, Technology and Management: And Updated Review* § 3.1, U.N. FAO (June 1995), http://www.fao.org/docrep/003/W1238E/W1238E01.htm.

[113] *Id.*

[114] Montreal Protocol on Substances that Deplete the Ozone Layer, Jan. 1, 1989, 1522 U.N.T.S 3, 26 I.L.M. 1550.

[115] U.N. Framework Convention on Climate Change, art. 15, May 9, 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 107.

When applying this to GMOs, it seems that the outcome is simple. With something as unpredictable and uncertain as GMOs, international regulation demands that the countries party to the Convention err on the side of caution. This would mean holding back on GMO promulgation until "threats of serious or irreversible damage"—such as a decrease of global biodiversity—have been dissipated.[116] The U.S. has ratified both treaties,[117] which means the U.S. is bound by their contents. However, the U.S. has painstakingly avoided deeply entangling itself with the precautionary principle when it comes to documents that directly target GMOs. This can be inferred from the U.S.' refusal to ratify the Cartagena Protocol on Biosafety, a supplement to the Convention on Biological Diversity ("CBD"), which has ties to the Rio Declaration.[118]

The U.S. is the only country that has refused to ratify the CBD, most likely in apprehension of the strong, compulsory language.[119] The CBD specifically addresses biotechnology in Article 8, saying:

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[116] U.N. Conf. on Env't & Dev., Rio Declaration on Environment and Development, principle 15, U.N. Doc. A/CONF.151/26/Rev.1 (Vol. I), annex I (Aug. 12, 1992) [hereinafter Rio Declaration].

[117] *Id.*

[118] *Convention on Biological Diversity: CBD List of Parties*, U.N., https://www.cbd.int/information/parties.shtml (last visited Apr. 3, 2017).

[119] *Id.*

> Each Contracting Party shall, as far as possible and as appropriate: . . . (g) Establish or maintain means to regulate, manage or control the risks associated with the use and release of living modified organisms resulting from biotechnology which are likely to have adverse environmental impacts that could affect the conservation and sustainable use of biological diversity, taking also into account the risks to human health.[120]

This article seems to be contrary to the national policy of the U.S., however, seeing as the nation continues to completely deny the risks associated with GMOs while simultaneously exporting this inescapable problem to other nations.

If the CBD did not make the international concern over GMOs clear, the pursuant Protocol did. In its preamble, the Cartagena Protocol on Biosafety to the Convention on Biological Diversity ("Cartagena Protocol") reaffirms the precautionary approach set out in the Rio Declaration.[121] The duration of the Cartagena Protocol continues to build on the Rio Declaration, culminating in text that restricts the transboundary movement of "living modified organisms" without the exporting country first notifying the importing authority of the details of the shipment as listed in Annex I of the Cartagena Protocol.[122] This is called the advance informed agreement procedure.[123] Annex I mandates the exporter include information such as the taxonomic status, the "[d]escription of the nucleic acid or the modification introduced, the technique used, and the resulting characteristics of the living modified organism," as well as the "[r]egulatory status of the

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[120] Convention on Biological Diversity, art. 8(g), June 6, 1992, S. Treaty Doc. No. 103-20, 1760 U.N.T.S. 79.

[121] Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Jan. 29, 2000, 2226 U.N.T.S. 208 [hereinafter Cartagena Protocol].

[122] *Id.* art. 8(1).

[123] *Id.* art. 7.

organism within the state of export."[124] These are bits of information that a nation that has strong intellectual property rights protections, such as the U.S., may be hesitant to divulge.[125] The Cartagena Protocol defines living modified organisms as:

> [A]ny living organism that possesses a novel combination of genetic material obtained through the use of modern biotechnology; . . . (i) "Modern biotechnology" means the application of: a. In vitro nucleic acid techniques, including recombinant deoxyribonucleic acid (DNA) and direct injection of nucleic acid into cells or organelles, or b. Fusion of cells beyond the taxonomic family, that overcome natural physiological reproductive or recombination barriers and that are not techniques used in traditional breeding and selection.[126]

Issues of liability and legal redress are discussed in a subsequent protocol, the Nagoya–Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety ("Nagoya Protocol"), which interestingly asserts that nations may implement the Nagoya Protocol for damages even against non-parties.[127] The Nagoya Protocol was further fortified when it was mentioned in Sustainable Development Goal ("SDG") 15, which reads:

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[124] *Id.* annex 1(g), (h), (m).

[125] *See The International Property Rights Index 2017*, PROPERTY RIGHTS ALLIANCE, http://internationalpropertyrightsindex.org/countries?f=ipri&o=desc, (last visited Sept. 25, 2017) [hereinafter PROPERTY RIGHTS ALLIANCE] (discussing intellectual property rights world rankings).

[126] Cartagena Protocol, *supra* note 121, at art. 3(i)(a)-(b).

[127] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity, art. 3(7), Oct. 29, 2010, UNEP/CBD/COP/DEC/X/1. [hereinafter Nagoya Protocol].

> The global community is committed to conserving biodiversity. Two international agreements aim at sharing the benefits from using genetic resources in a fair and equitable way. As of April 2017, 144 countries ratified the International Treaty on Plant Genetic Resources for Food and Agriculture and 96 countries ratified the Nagoya Protocol.[128]

While the U.S. is one of many countries that has not yet ratified the Cartagena Protocol, a great majority of the international community has.[129] As with the Cartagena Protocol, the U.S. has also refused to sign, much less ratify, the Nagoya Protocol.[130] These abstentions speak volumes of the U.S.' resistance to preserving biodiversity in the face of economic and scientific interests.

B. The U.S. Pushback Against the Precautionary Principle

The terms precautionary principle and precautionary approach are sometimes used interchangeably. However, it is important to distinguish the slight grammatical difference seeing as some parties, including the U.S., consider the two pointedly different, though they address the same issues. First, the term "approach" is perceived as more lenient than "principle," and while the principle may apply to the philosophical aspects, the approach is

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[128] U.N. Secretary-General, *Progress Towards the Sustainable Development Goals*, ¶ 19, U.N. Doc. E/2017/66, (May 11, 2017).

[129] *List of Parties: Cartagena Protocol on Biosafety*, CONVENTION ON BIOLOGICAL DIVERSITY: CARTAGENA PROTOCOL LIST OF PARTIES, https://www.cbd.int/information/parties.shtml#tab=1 (last visited Sept. 27, 2017).

[130] *List of Parties: Nagoya Protocol on Access and Benefit-Sharing,* CONVENTION ON BIOLOGICAL DIVERSITY, https://www.cbd.int/information/parties.shtml#tab=2 (last visited Sept. 27, 2017).

considered to be of more practical use.[131] Another reason as to why the approach may seem more appealing to certain nations is because it "considers explicitly the social and economic implications" of implementation, often balancing the interests of future generations against the payoff for current generations.[132] The U.S. has agreed to recognize the precautionary approach only as a "general principle of international law," but the U.S.' position is that of a small minority. Most major environmental agreements now contain precautionary principle language. Moreover, established international organizations, such as the World Health Organization and the Food and Agricultural Organization, have explicitly released publications stating that the precautionary principle is necessary under conditions of uncertainty.[133]

When comparing the U.S.' domestic policy with its resistance to the international concept of the precautionary principle, however, one cannot help but wonder about the inconsistencies. Domestically, the U.S. has statutes that implement the precautionary approach, though they do not recognize it by that name. For example, the Endangered Species Act ("ESA") is most often implemented to preserve key species within an ecosystem in the hope that doing so will also preserve the complexities of these intricate systems that go far beyond what humans have been able to comprehend.[134] Section (a)(3) of the ESA explains that "these species of fish, wildlife, and plants are of esthetic, ecological, educational, historical, recreational, and scientific value to the

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[131] S.M. Garcia, *supra* note 112, at § 3; *see also* U.N. Educ., Sci. and Cultural Org., *The Precautionary Principle* 23, WORLD COMMISSION ON THE ETHICS OF SCI. KNOWLEDGE AND TECH. (Mar. 2005), http://unesdoc.unesco.org/images/0013/001395/139578e.pdf (hereinafter U.N. Educ., Sci. and Cultural Org.).

[132] S.M. Garcia, *supra* note 112, at § 3.2.

[133] WHO, THE PRECAUTIONARY PRINCIPLE: PROTECTING PUBLIC HEALTH, THE ENVIRONMENT & THE FUTURE OF OUR CHILDREN 2 (Marco Martuzzi and Joel A. Tickner eds., 2004); *see* U.N. Educ., Sci. and Cultural Org., *supra* note 131.

[134] *See* JOAKIM ZANDER, THE APPLICATION OF THE PRECAUTIONARY PRINCIPLE IN PRACTICE: COMPARATIVE DIMENSIONS 269 (Cambridge Univ. Press 2010).

Nation and its people."[135] However, the extent of the ecological or scientific value of various endangered species is often unknown, and perhaps even unknowable. This makes the purpose of the ESA quite analogous to that of the precautionary principle. Other domestic U.S. policies that also share root in the precautionary principle include the Clean Air Act and the Clean Water Act.[136]

These conflicting positions that the U.S. takes with regard to the implementation of the precautionary principle are especially concerning because of the country's wide reach. While domestic policies regarding other environmental concerns may be slightly more protective, when it comes to agricultural biotechnology both abroad and domestically, caution is thrown to the wind. In so doing, the American policy on GMOs is endangering some of the most vulnerable sectors of our population, namely indigenous peoples.

IV. INTERNATIONAL AGREEMENTS INVOLVING RIGHTS OF INDIGENOUS PEOPLES TO THEIR LANDS AND FOOD SECURITY

The adoption of the Declaration on the Rights of Indigenous Peoples ("Declaration") by the General Assembly in 2007 was a milestone for indigenous rights.[137] The text did something novel in that it directly addressed the adversity, discrimination, and injustice that indigenous peoples across the globe are facing, and set down ground rules as to how indigenous populations should be treated.[138] Of these basic rules, there are many that can be used to support claims by indigenous peoples for a right to agricultural self-

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[135] 16 U.S.C. § 1531(a)(3) (2017).

[136] ZANDER, *supra* note 134, at 270.

[137] There was an astronomical amount of pushback for the Declaration on the Rights of Indigenous Peoples. The very existence of the Declaration today is due in large part to the efforts of Chief Justice and Ambassador Hilario David, Jr., who brought the draft Declaration to the General Assembly floor for a vote in 2007. In 2008, Pace University awarded Ambassador David the Elizabeth Haub Award for Environmental Diplomacy for his groundbreaking work in advancing the rights of indigenous peoples. *Elisabeth Haub Award for Environmental Diplomacy*, PACE LAW, http://www.law.pace.edu/elisabeth-haub-award (last visited Sept. 27, 2017).

[138] G.A. Res. 61/295, *supra* note 54.

determination.[139] Articles 24(1) and 31(1) of the Declaration enumerate fundamental rights that indigenous peoples have, which include, "the right to their traditional medicines and to maintain their health practices, including the conservation of their vital medicinal plants, animals and minerals," and:

> [T]he right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions, as well as the manifestations of their sciences, technologies and cultures, including human and genetic resources, seeds, medicines, knowledge of the properties of fauna and flora, oral traditions . . . . They also have the right to maintain, control, protect and develop their intellectual property over such cultural heritage, traditional knowledge, and traditional cultural expressions.[140]

These enumerated rights squarely contradict the practice of imposing GMOs on indigenous peoples, whether it be geographically, economically, or by accidental hybridization and cross-pollination. It is no surprise, therefore, that the U.S. was one of four countries to oppose the Declaration.[141] This opposition put the U.S. in the company of Australia, Canada, and New Zealand—all nations that have severely neglected their indigenous peoples

[139] *Id*. arts. 8(2)(b), 20(1).
[140] *Id.* arts. 24(1), 31(1).
[141] U.N. Human Rts. Off. of the High Comm'r, *Declaration on the Rights of Indigenous Peoples*, http://www.ohchr.org/EN/Issues/IPeoples/Pages/Declaration.aspx (last visited Sept. 27, 2017).

economically, educationally, and health-wise.[142] They also happen to be nations with high stakes in the IPR game.[143] Since then, the U.S. and its fellow dissenters have agreed to support the Declaration, though their initial reluctance indicates a subtle, socio-political position that they are not willing to give weight to the Declaration in making policy on matters involving indigenous peoples and, for our purposes, GMOs.

A. Food Security and Food Sovereignty

The introduction of GM seeds into indigenous lands is not only changing the soil quality and the hydrology of these territories, but also serving to replace traditional heirloom seeds.[144] In doing so, it is also changing indigenous diets, pushing often toward less nutritious, more carbohydrate-filled foods.[145] This leads to a situation in which some indigenous populations are finding themselves semi-food secure, albeit perhaps of imbalanced nutritional value, but not food sovereign. Food security is obtained "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."[146]

To be food sovereign is much more complex, but essentially it means food autonomy, and it is based on sustainable agricultural

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[142] *Id*.; U.N. DEP'T OF INT'L ECON. & SOC. AFFAIRS, STATE OF THE WORLD'S INDIGENOUS PEOPLES, at 22–23, U.N. Doc. ST/ESA/328, U.N. Sales No. 09.VI.13 (2009) (hereinafter STATE OF THE WORLD'S INDIGENOUS PEOPLES); Hans Tammemagi, *Top 5 Cities in the World with the Most Indigenous People*, INDIAN COUNTRY MEDIA NETWORK (Nov. 8, 2014), https://indiancountrymedianetwork.com/travel/destinations/top-5-cities-in-the-world-with-the-most-indigenous-people/.

[143] *See* PROPERTY RIGHTS ALLIANCE, *supra* note 125.

[144] Jessie Cherofsky, *Maintaining the Ways of Our Ancestors: Indigenous Women Address Food Sovereignty*, CULTURAL SURVIVAL QUARTERLY MAGAZINE, Winter 2013; STATE OF THE WORLD'S INDIGENOUS PEOPLES, *supra* note 142, at 19.

[145] Cherofsky, *supra* note 144.

[146] GUSTAVO GORDILLO & OBED MÉNDEZ JERÓNIMO, FOOD SECURITY & SOVEREIGNTY 2 (U.N. Food and Agriculture Organization 2013), http://www.fao.org/3/a-ax736e.pdf.

practices and an ability to shapes one's own means of subsistence.[147] By preventing or in any way interfering with traditional seed saving or cultivation practices, companies are effectively depriving indigenous peoples of their food sovereignty.[148] Such is the case for the indigenous peoples in Perú, for example, where governments and corporations are violating their food sovereignty by non-consensually seizing indigenous lands and planting GM seeds.[149] These types of activities violate the core of the Declaration on the Rights of Indigenous Peoples, especially its Articles 8(2)(b), 20(1), 24(1), and 31(1) mentioned above, as well as many other international agreements.

B. International Agreements Regarding Indigenous Agricultural Rights

Most recently, in September of 2015, the United Nations adopted the 2030 Agenda for Sustainable Development. This agenda set out seventeen Sustainable Development Goals ("SDGs") that are to "end all forms of poverty, fight inequalities and tackle climate change, while ensuring that no one is left behind."[150] Section 2 of the SDG pertains specifically to food security and sustainable agriculture.[151] Subsection 2.3 explicitly mentions increasing income and the agricultural productivity of indigenous peoples.[152] The following subsection, 2.4, lists various priorities, such as ensuring that food production is not only sustainable, but also resilient to climate change and extreme weather patterns, all while contributing positively to soil quality.[153] Subsection 2.5 sets a 2020 goal to maintain:

> [G]enetic diversity of seeds, cultivated plants, farmed and

[147] *See id.* at 3-4.

[148] STATE OF THE WORLD'S INDIGENOUS PEOPLES, *supra* note 142, at 19-20; Cherofsky, *supra* note 144.

[149] Cherofsky, *supra* note 144.

[150] U.N., *The Sustainable Development Agenda* (Jan. 1, 2016), http://www.un.org/sustainabledevelopment/development-agenda/.

[151] G.A. Res. 70/1, at 14-15 (Dec. 2014).

[152] *Id.* at 15.

[153] *Id.*

> domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at national, regional and international levels, and ensure access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge as internationally agreed.[154]

If applied as intended, Section 2 of the SDG can do wonders for the indigenous movement to protect the integrity of traditional seeds.

Two other agreements that can be used to protect indigenous peoples' rights to grow traditional seeds are the International Treaty on Plant Genetic Resources for Food and Agriculture and the Indigenous ("Treaty on Plant Genetic Resources") and the Convention Concerning Indigenous and Tribal Peoples in Independent Countries (otherwise known as "ILO No. 169"). Part III in Article 9 of the Treaty on Plant Genetic Resources mentions the agricultural contributions of indigenous peoples, as well as the need for "protection of traditional knowledge relevant to plant genetic resources for food and agriculture."[155] The troubling language therein, however, states that these rights "rest with national governments," and are "subject to its national legislation."[156] So, in both the cases of the U.S. and Brazil where indigenous' rights to food sovereignty are not protected on the ground, this language does not serve to give indigenous peoples the necessary protections. In Article 9.3, the Treaty goes on to discuss seed saving and exchange practices, but again subjects it to national law.[157]

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[154] *Id.*

[155] International Treaty on Plant Genetic Resources for Food and Agriculture, art. 9.2(a), Nov. 3, 2001, 2400 U.N.T.S. 303 [hereinafter Treaty on Plant Genetic Resources].

[156] *Id.*

[157] *Id*. art. 9.3.

The ILO No. 169 is the second agreement that can be used to protect indigenous' rights to land for subsistence practices. Similar to the Treaty on Plant Genetic Resources, the ILO No. 169 starts off with recognizing the contributions of indigenous peoples to ecological integrity.[158] It then, in Articles 13 through 16, discusses the rights of indigenous peoples to their traditional lands, keeping in mind nomadic peoples and migrant cultivators.[159] Most importantly, the Convention mentions the right of indigenous peoples concerning "lands not exclusively occupied by them, but to which they have traditionally had access for their subsistence and traditional activities."[160] This language goes a long way to cover the subsistence practices of many tribes in the Amazon that require, for hunting and gathering purposes, more than just the lands they occupy daily. It would also serve to help Native Americans in the U.S. gain and retain access to sacred sites.

At first glance, it is surprising that the U.S. ratified the International Treaty on Plant Genetic Resources on December 13, 2016.[161] However, the focus of the treaty overall is the sharing of information on plant genetic resource between nations, and is not averse to biotechnology's involvement in the creation of these genetic resources.[162] The U.S. also ensured to make its concession to the treaty subject to reservation that: "The United States of America understands that Article 12.3(d) shall not be construed in a manner that diminishes the availability or exercise of intellectual

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[158] Indigenous and Tribal Peoples Convention, June 27, 1989, 28 I.L.M 1382 [hereinafter ILO No. 169].

[159] *Id.* art. 14(1).

[160] *Id.*

[161] *International Treaty on Plant Genetic Resources for Food and Agriculture*, FAO, http://www.fao.org/fileadmin/user_upload/legal/docs/033s-e.pdf (last updated April 27, 2017) (hereinafter FAO).

[162] *See* Treaty on Plant Genetic Resources, *supra* note 155, pmbl.

property rights under national laws."[163] As for the ILO No. 169, as of April 3, 2017, only twenty-two nations have ratified the Convention, so the U.S. is not alone in its inaction.[164] Meanwhile, it has been over a decade since the Brazilian government has ratified both treaties, though the enforcement of both is dubious at best.[165] It is likely that Brazil was in a better position to ratify ILO No. 169 than most other nations because the Convention is aligned with its constitution aspirations, even if implementation of those aspirations is lacking.[166] Most nations, like the U.S., do not have such strong protective language for indigenous peoples as part of their national policy, and, therefore, have no preexisting textual basis upon which to ratify the ILO No. 169.

C. Using International Law to Protect Indigenous Peoples Against Infringement upon Their Rights to Land, Health, and Food

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[163] *Id.* at 7; *id.* art. 12.3(d) ("Such access [to plant genetic resources for food and agriculture within the Multilateral System] shall be provided in accordance with the conditions below . . . (d) Recipients shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System.").

[164] Int'l Labour Org. [ILO], *Ratifications of C169 - Indigenous and Tribal Peoples Convention, 1989 (No. 169)*, http://www.ilo.org/dyn/normlex/en/f?p=NORMLEXPUB:11300:0::NO:11300:P11300_INSTRUMENT_ID:312314:NO (last visited Oct. 22, 2017).

[165] *Id.*; FAO, *supra* note 161, at 1.

[166] *Compare* CONSTITUIÇÃO FEDERAL [C.F.] [CONSTITUTION] art. 231 paras. 2–3, 5–6, art. 232 (Braz.) (affording indigenous people further protections, such as the right to the resources of their tradition lands, protections from forced removal and occupation, and standing to sue in their own defense), *and* CONSTITUIÇÃO FEDERAL [C.F.] [CONSTITUTION][TEMPORARY CONSTITUTIONAL PROVISIONS ACT] art. 67 (Braz.) (guaranteeing indigenous people the right to their cultural lands and traditions while putting the onus on the Brazilian government to demarcate their lands), *with* ILO No. 169 art. 14(1), June 27, 1989, 28 I.L.M 1382 ("The rights of ownership and possession of the peoples concerned over the lands which they traditionally occupy shall be recognized."), *and* ILO No. 169 art. 14(2), June 27, 1989, 28 I.L.M 1382 ("Governments shall take steps as necessary to identify the lands which the peoples concerned traditionally occupy, and to guarantee effective protection of their rights of ownership and possession.").

Sovereignty

While there are multiple international agreements that address various indigenous rights issues, the patchwork of ratification and implementation of those agreements leaves much to be desired. Most of the tools we need to address the problem of indigenous food sovereignty as well as indigenous land rights and health already exist in various international agreements. For example, the Declaration of the Rights of Indigenous Peoples on its own gives us a strong foundation for indigenous redress in the face of GMO intrusions. The two most powerful rights enumerated in the Declaration are found in Article 24(1), which discusses the right of indigenous peoples to "the conservation of their vital medicinal plants, animals and minerals," and Article 31(1), which discusses "the right to maintain, control, protect and develop their cultural heritage, traditional knowledge and traditional cultural expressions . . . including human and genetic resources, seeds, medicines."[167] When used in combination with other agreements, such as ILO No. 169, which strongly supports a range of indigenous rights, the Declaration on the Rights of Indigenous Peoples can be used to oppose promulgation of GMOs on indigenous territory. With enough creative thinking, Article 3(7) of the Nagoya Protocol may be used against non-party states (i.e., the U.S.) by party states for damages resulting from irresponsible GMO distribution.[168]

In addition to the international accords, the science behind the unintentional proliferation of GMOs and their homogenizing tendencies can be used as an equally important foundation upon which to argue that GM seeds threaten the tradition seeds, ways of life, and, therefore, the fundamental nature of many indigenous peoples across the world. The ample evidence regarding the effects on bees, the repercussions of excessive fertilizer use, and cross-pollination are all valid arguments for proponents of indigenous rights to attempt to extend protections even beyond indigenous territories. The reason for such expansion would be that having GM plantations in close enough proximity to tribal lands for cross-

[167] G.A. Res. 61/295, *supra* note 54, at arts. 24(1), 31(1).
[168] *See* Nagoya Protocol, *supra* note 127.

pollination to occur also infringes on the right to the integrity of their traditional seeds.

As of 2016, all four nations who had previously voted against adoption of the Declaration on the Rights of Indigenous Peoples, including the U.S., have reversed their votes.[169] While the Declaration itself is not binding, its adoption by the General Assembly lends to the creation of an international norm regarding the treatment of indigenous peoples.[170] Discussion of norms leads us to another possible basis for legal recourse, this one involving a principle of international jurisprudence: customary law.[171] If a customary norm, or a jus cogens, were to develop around the non-proliferation of GMOs—a scenario that seems possible if countries continue to resist the pressure from GM nations and continue to be vocal in their opposition—the U.S. will have to adhere to the norm and, at the very least, suspend exportation. This scenario, however, will be a long-forming process and may come too late to prevent any irreversible damage to the environment and indigenous cultivation practices. The road to this norm will likely be fraught with litigation in international courts and result in much political backlash from GM-proliferating nations upon proponent countries.

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[169] U.N. Div. for Soc. Pol'y and Dev., United Nations Declaration on the Rights of Indigenous Peoples, https://www.un.org/development/desa/indigenouspeoples/declaration-on-the-rights-of-indigenous-peoples.html (last visited Apr. 4, 2017).

[170] U.N. Secretary Gen. for Econ. & Soc. Aff. on FAQs: Declarations on the Rights of Indigenous Peoples 2 (Aug. 2007), http://www.un.org/esa/socdev/unpfii/documents/FAQsindigenousdeclaration.pdf ("UN Declarations are generally not legally binding; however, they represent the dynamic development of international legal norms and reflect the commitment of states to move in certain directions, abiding by certain principles.").

[171] *Statute of the International Court of Justice* art. 38, ¶ 1(b), I.C.J. (Apr. 18, 1946), http://www.icj-cij.org/en/statute. Though the ICJ does not use the term "customary law" per se, this is widely recognized as the article that establishes and recognizes the importance of customary law as second only to international conventions. *See, e.g., International and Foreign Law Research: Customary Law & General Principles*, FLORIDA STATE UNIVERSITY COLLEGE OF LAW RESEARCH CENTER, http://guides.law.fsu.edu/c.php?g=84838&p=547203 (last visited Oct. 31, 2017).

Another jus cogens that seems to already be taking hold is the applicability of the precautionary principle. As discussed in Part III, the precautionary principle dates back to 1989 and has been incorporated in many international documents since. While the U.S. is putting full force into resisting any explicit mention in both its domestic and international entanglements, there seems to be an acceptance building around the principle on the international scale. The emergence of a jus cogens around the precautionary principle as well the fledgling norms forming around the treatment of indigenous peoples, along with all the treaties, declarations, and conventions discussed, gives hope for a comprehensive approach to halting the hazardous spread of GMOs both abroad and in indigenous communities.

CONCLUSION

From the battle of Native Hawaiians against the health risks of pesticides to the food sovereignty and land rights of the indigenous peoples of the Amazon and beyond, there is much yet to be done in relation to indigenous peoples. The land- and chemical-intensive methods we use to grow food are not only hurting other humans, but they are also harming our biosphere. In addition to our unsustainable growing practices, we have unleashed new, hybrid organisms upon the planet in an effort to make agriculture more efficient and resilient. In so doing, we have essentially achieved the opposite, endangering the food chain in the process. It is the international community's duty, as an entity comprised of fellow human beings and as the consumers of the products causing these sovereignty and human rights issues, to reinforce existing doctrine in an even and reliable manner to minimize injustice.

Using the precautionary principle, as well as preexisting international accords such as the Declaration on the Rights of Indigenous Peoples, the Nagoya Protocol, the Treaty on Plant Genetic Resources, and the ILO No. 169, we can challenge the careless promulgation of GMOs not only for the sake of indigenous peoples, but for the sake of all peoples. Davi Kopenawa, shaman of the Yanomami Amazonian tribe, compels us to remember our connection with the earth: "Why is it taking so long to believe that

if we hurt nature, we hurt ourselves? We are not watching the world from without. We are not separate from it."[172] While indigenous peoples may have stronger ties to the land and may live in closer harmony with our planet, in the end we all are dependent on nature to continue to feed and house us. We are also dependent on our governments to work together to ensure we can continue to rely on our food systems.

[172] SURVIVAL INT'L, *supra* note 85.