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## Are GMOs Good or Bad Seeds in the Developing World?: A Discussion of the Growing Role of Developing Countries in the Debate over Climate Change and the Loss of Biodiversity

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**ARE GMOS GOOD OR BAD SEEDS IN THE  
DEVELOPING WORLD?: A DISCUSSION OF THE  
GROWING ROLE OF DEVELOPING COUNTRIES  
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*Alexandra Scuro\**

In our time, man's capability to transform his surroundings, if used wisely, can bring to all peoples the benefits of development and the opportunity to enhance the quality of life. Wrongly or heedlessly applied, the same power can do incalculable harm to human beings and the human environment.

Stockholm Declaration, 1972<sup>1</sup>

We should, as a matter of principle, save every scrap of biodiversity that we can hold on to.

Edward O. Wilson, scientist<sup>2</sup>

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\* J.D. Candidate, 2008, Fordham University School of Law. I would like to thank my family and friends for their unwavering support.

1. U.N Conference on the Human Environment, Stockholm, Swed., June 5-16, 1972, Declaration, §1, ¶ 3, UN. Doc A/Conf.48/14 (June 16, 1972), available at <http://www.unep.org/Documents.multilingual/Default.asp?DocumentID=97&ArticleID=1503> [hereinafter Stockholm Declaration].

2. Edward O. Wilson, *The Future of Life: Second Annual John H. Chafee Memorial Lecture on Science and the Environment*, (Dec. 6, 2001) (transcript available at <http://ncseonline.org/ncseconference/2001conference/Chafee/2001ChafeeReport.pdf>). Wilson is a Pulitzer Prize-winning scientist who was one of the first to use the term "biodiversity" and emphasizes mankind's ethical responsibility to preserve nature. See E. O. WILSON, *THE DIVERSITY OF LIFE* (1993).

## I. INTRODUCTION

Over ten million people live in Zambia, a landlocked country bordered to the south by Zimbabwe and Mozambique in southern Africa.<sup>3</sup> Over fifty percent of Zambia's population lives on less than one dollar per day, and so the country meets the United Nations' requirement for extreme poverty.<sup>4</sup> And yet, when the country, along with its neighbors, was struck by another consecutive dry season and famine in 2002, Zambia declined the offer of American-produced genetically modified ("GM") seeds and seedless corn to alleviate the hunger of its populace.<sup>5</sup> Zimbabwe and Mozambique, despite their lack of enthusiasm for GM products, eventually accepted the aid, but Zambian President Levy Mwanawasa adamantly revoked the offer, saying, "Simply because my people are hungry is not a justification to give them poison."<sup>6</sup>

Five years ago, climate abnormalities, such as the droughts in Africa that led to widespread food shortages, brought genetically modified organisms ("GMOs") and issues of agricultural biodiversity to the forefront of an international environmental discourse that has frequently been rife with disagreement and ambiguity.<sup>7</sup> As contemporary international environmental discussion the GMO debate started in earnest with the 1972 Stockholm Declaration and began again in 1992 with the Convention on Biological Diversity in conjunction with the Rio Earth Summit. Since then a dichotomy of opinion began to appear with some countries willing to take more risk with the environment in favor of economic growth and prosperity while others favored a precautionary approach, which can "be interpreted to require that regulatory measures be adopted to avoid

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3. United Nations Cyberschool Bus, Country at a Glance, Zambia, <http://cyberschoolbus.un.org/infonation/index.asp?id=894> (last visited May 1, 2007).

4. INT'L MONETARY FUND, ZAMBIA POVERTY REDUCTION STRATEGY PAPER 21 (2002), available at <http://www.imf.org/external/np/prsp/2002/zmb/01/033102.pdf>.

5. PETER PRINGLE, FOOD, INC.: MENDEL TO MONSANTO – THE PROMISES AND PERILS OF THE BIOTECH HARVEST 184-89 (2003).

6. *Id.* at 185.

7. See PHILIPPE SANDS, PRINCIPLES OF INTERNATIONAL ENVIRONMENTAL LAW 673 (2d ed. 2003).

environmental harm in the face of scientific uncertainty.”<sup>8</sup> The conflicting American and European ideologies on the Kyoto Protocol are an example of this dichotomy in environmental thinking.<sup>9</sup> The United States, currently the world’s largest producer of greenhouse gases,<sup>10</sup> refuses to ratify the Kyoto Protocol, which is designed to decrease the amount of anthropogenic pollution in the atmosphere by creating a timetable for signatories to reduce emissions.<sup>11</sup> On the other hand, all members of the European Union have ratified the Protocol.<sup>12</sup> The precautionary European stance on carbon emissions contrasts starkly with statements from the White House that have only recently begun to acknowledge mankind’s negative effect on global warming in the face of growing scientific certainty.<sup>13</sup>

Prior to the emergence of GMOs as a topic of environmental controversy five years ago, a writer for *The New York Times* remarked, “In most of Africa, where ordinary people living on the land still face immediate problems right out of the Bible – war, drought, famine, and plague – the issue of global warming is not on everyone’s

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8. Alhaji B.M. Marong, *From Rio to Johannesburg: Reflections on the Role of International Legal Norms in Sustainable Development*, 16 GEO. INT’L ENVTL. L. REV. 21, 65 (2003).

9. See SANDS, *supra* note 7, at 370-71.

10. CNN.com In-Depth Specials - Global Warming: U.S. Turns Its Back on Kyoto, <http://www.cnn.com/SPECIALS/2001/globalwarming/> (last visited May 1, 2007).

11. See SANDS, *supra* note 7, at 370-71.

12. *Id.* at 371.

13. In a 2001 address, President Bush remarked that:

[A]lthough some of the increase in global temperature may be due to human activity, the report [of the National Academy of Sciences] tells us that we do not know how much effect natural fluctuations in climate may have had on warming. We do not know how much our climate could, or will change in the future. We do not know how fast change will occur, or even how some of our actions could impact it . . . . And, finally, no one can say with any certainty what constitutes a dangerous level of warming, and therefore what level must be avoided.

Pres Release, White House, Office of the Press Sec’y, President Bush Discusses Global Climate Change, (June 11, 2001), *available at* <http://www.whitehouse.gov/news/releases/2001/06/20010611-2.html>. In contrast, the United States approved the February 2, 2007 Intergovernmental Panel on Climate Change’s Report. Press Release, Office of Sci. and Tech. Policy, Intergovernmental Panel Finalizes Report (Feb. 2, 2007), *available at* <http://www.whitehouse.gov/news/releases/2007/02/20070202.html>.

lips.”<sup>14</sup> A decade after this statement was published, as fear of future armed conflicts occurring in the developing world over water and food access has become a popular rallying cry for precautionary environmental activists in the West, climate change has aggressively entered the socio-political dialogue in many countries in Africa and throughout the world.<sup>15</sup> The fact that Zambia would rely so stubbornly on the precautionary principle and turn down any type of food when its people needed it most becomes invariably more complicated when viewed in light of the revitalized global dialogue regarding global warming.<sup>16</sup> The February 2, 2007 report of the Intergovernmental Panel on Climate Change (“IPCC”) agreed with “*very high confidence* that the globally averaged net effect of human activities since 1750 has been one of warming.”<sup>17</sup> With Congress and the House of Representatives under Democratic control,<sup>18</sup> the rumor of a global warming bill winding up on President George W. Bush’s desk before he completes his second term,<sup>19</sup> and the popularity of climate change as a topic for politicking by Democratic presidential hopefuls,<sup>20</sup> one might hope that an American ratification of a precautionary environmental document might not be far behind.

Already, *The Nation*, a notable liberal weekly publication that has interpreted the Panel’s report as a death knoll for the fight to prevent climate change, declares, “Now the race to survive it has begun. Because we waited so long to act, the best humanity can do now is slow global warming down to where we can hope to endure it with relatively manageable damages.”<sup>21</sup> If, however, any drastic change in environmental mentality took place in the American government or there was ratification of any international precautionary document coping with global warming, concerns regarding the currently avail-

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14. James C. McKinley, *Global Warming: Around the Globe, Big Worries and Small Signs of Progress; Weary Africa Braces for More Extremes*, N.Y. TIMES, Dec. 1, 1997, at F9.

15. See, e.g., TIM FLANNERY, *THE WEATHER MAKERS: THE HISTORY & FUTURE IMPACT OF CLIMATE CHANGE* (2006).

16. PRINGLE, *supra* note 5, at 185.

17. Intergovernmental Panel on Climate Change Report, *Climate Change 2007: The Physical Science Basis, Summary for Policymakers 5* (Feb. 2, 2007) (emphasis in original), available at <http://www.ipcc.ch/SPM2feb07.pdf> [hereinafter IPCC Report].

18. Mark Hertsgaard, *Killer Weather Ahead*, THE NATION, Feb. 26, 2007 at 5.

19. *Id.*

20. See *id.*

21. *Id.*

able methods for managing climate change would rapidly begin to emerge. Without an internationally agreed-upon regulatory scheme in place to guide countries in enduring the effects of global warming, damages resulting from misguided efforts by countries, multinational corporations, non-governmental organizations, and even individuals to deal with climate change could result in far worse than “relatively manageable” effects.<sup>22</sup>

Although, as will be discussed in Part I, the potential exists for GMO use to diminish global biodiversity,<sup>23</sup> GM products seem like an otherwise logical solution to changing climate conditions and fluctuating arability of land.<sup>24</sup> It is, therefore, increasingly vital that we remember that, while we may still be able to reverse some of the effects of climate change, biodiversity once lost is lost forever and has unknowable effects on the interrelation of global ecological health.<sup>25</sup> Additionally, the dichotomy that has developed in the last thirty years between precautionary and risk-taking countries and which, as will be examined in Part III, has been manifesting itself anew in the developing world, is dangerous in the context of the growing debate over global warming and the relatively marginalized concern over biodiversity loss if the ideology of the risk-taking countries should prevail.<sup>26</sup> Although a growing precautionary attitude in the developing world towards GMOs may start to impact the practices of risk-taking multinational corporations, this may result in a devastating effect on poverty eradication and accelerate a future reliance on GMOs.<sup>27</sup>

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22. *Id.*

23. Elisabeth Rosenthal, *Biotech Food Tears Rifts in Europe*, N.Y. TIMES, June 6, 2006, at C1.

24. See generally RICHARD MANNING, *AGAINST THE GRAIN: HOW AGRICULTURE HAS HIJACKED CIVILIZATION* (2005) (discussing the complexity of the modern system of agriculture).

25. For instance, scientists now think that thousands of years of cheetahs being taken as pets for royalty has contributed to the development of a rare genetic abnormality – a lack of genetic diversity – in the global cheetah population. As the head of the research team Dr. Stephen O’Brien says, “It is not a trivial thing to lose your genetic variation. Genetic variation exists so ecological pressures can be adapted to.” *Loss of Gene Diversity is Threat to Cheetahs*, N.Y. TIMES, Sept. 17, 1985, at C1.

26. Compare PRINGLE, *supra* note 5, with Somini Sengupta, *On India’s Despairing Farms, a Plague of Suicide*, N.Y. TIMES, Sept. 19, 2006, at A1.

27. In the context of global warming, the precautionary principle dictates that measures should be taken “to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects” regardless of whether or not there is scien-

As this Note will discuss, GMOs may not be good in the developing world,<sup>28</sup> but drastic changes in the environment from deforestation of the Amazon to create cropland in Brazil to the desertification of Africa as a result of climate change may make them necessary to stave off human suffering.<sup>29</sup> This Note seeks to provide insight into the implications of both Zambia's rejection of GM agricultural products and other countries' acceptance of GM foods by renewing the discussion of the debate concerning biodiversity and GMOs as it pertains to the needs of the developing world in the context of a changing global climate.<sup>30</sup> Part II explores the double-edged nature of global warming that simultaneously reduces biodiversity and encourages the use of technologies that also potentially harm biodiversity. Part III analyzes the inferior role of biodiversity in the legal and policy debate over how to deal with global warming. Part IV demonstrates the potential effects of both GMOs and climate change on the growing ideological dichotomy in the developing world. Finally, this Note concludes that, as the world continues to marginalize biodiversity concerns in favor of the more popular topic of global warming, the door opens for methods, such as GMOs, that are destructive to biodiversity in the name of coping with climate change to be employed and become commonplace.<sup>31</sup> Hopefully an increase in productive discussion of methods for combating global climate change will occur in the wake of the IPCC's recent report. Precautionary thinkers must prevail in order to ensure the future of biodiversity and discourage the use of harmful technology that might cause irreparable damage that could rival that which climate change has the potential to cause.

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tific certainty regarding a specific threat or damages. United Nations Framework Convention on Climate Change, art. 3, para. 3, May 9 1992, S. Treaty Doc. No. 102-38, 1771 U.N.T.S. 165 [hereinafter Climate Change Convention].

28. Sengupta, *supra* note 26.

29. See generally AL GORE, *AN INCONVENIENT TRUTH: THE PLANETARY EMERGENCY OF GLOBAL WARMING AND WHAT WE CAN DO ABOUT IT* (2006).

30. Climate change, as defined by the Framework Convention on Climate Change, "means a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods." Climate Change Convention, *supra* note 27, at art. 1, para. 3.

31. See generally Randall S. Abate, *Kyoto or Not, Here We Come: The Promise and Perils of the Piecemeal Approach to Climate Change Regulation in the United States* 15 CORNELL J.L. & PUB. POL'Y 369 (2006) (discussing the dichotomy of the approaches to climate change that exists between the United States, a proponent of GMOs, and the European Union, a fierce regulator of GM products).

## II. CLIMATE CHANGE: A DOUBLE-EDGED SWORD

The issue of global warming has historically attracted significantly more attention than biodiversity, and the recent resurgence in interest over climate change is no exception. In the United States, celebrities, magazines, and government programs have popularized the cult of energy efficiency, recycling, and alternative energy as an effort to counteract the social culture of excess.<sup>32</sup> In the last year alone, many radio and television news programs have created forums for discussion of changing climate.<sup>33</sup> Magazines and other print media have also weighed in on the climate change issue. *Elle* featured a "Green Issue,"<sup>34</sup> *Self* included a special article that included "enlightening facts about global warming" and "tips to shrink your carbon footprint,"<sup>35</sup> and *Wired* includes many earth-conscious ads such as one from Honda's "Environmentology" campaign that advertises the fuel efficiency and low emissions of its vehicles. Al Gore's film *An Inconvenient Truth* recently won the Academy Award for Best Documentary Feature,<sup>36</sup> and Gore received a Nobel Peace Prize nomination for his work in popularizing climate change issues.<sup>37</sup>

Ironically, excessive consumption that is propelled by large population numbers and ad campaigns that cleverly convince people they need more products than they actually do is a key driving force in

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32. Jill Serjeant, *Some Celebrities Who Made Green Issues Cool*, REUTERS, Feb. 26, 2007. "When Al Gore gets nominated for two Oscars and a Nobel Prize for alerting the world to global warming, you know the cultural climate has changed. Going 'green' used to be anti-establishment. Now it's a national priority." Frances Anderton, *When is Green Design 'Greenwashing'?* (KCRW radio broadcast Feb. 20, 2007), available at [http://www.kcrw.com/etc/programs/de/de070220when\\_is\\_green\\_design](http://www.kcrw.com/etc/programs/de/de070220when_is_green_design), Feb. 20, 2007.

33. For example, the Weather Channel introduced a weekly program entitled "The Climate Code." One can listen to the program online at <http://climate.weather.com/>. KCRW also launched a program by the name of "Good Food Goes Green" which was aired on March 3, 2007 and is available at [http://www.kcrw.com/etc/programs/gf/gf070303good\\_food\\_goes\\_green](http://www.kcrw.com/etc/programs/gf/gf070303good_food_goes_green).

34. ELLE, May 2006.

35. Francesca Castagnoli, *Laurie David wants you to save the planet: Being green is so easy, you'll wonder why you didn't start sooner*, SELF, Dec. 2006.

36. *Scorsese Finally Wins at Academy Awards*, N.Y. TIMES, Feb. 26, 2007, at A1.

37. *Gore earns Nobel nomination for global warming work*, CNN, Feb. 1, 2007, available at <http://www.cnn.com/2007/POLITICS/02/01/gore.nobel.ap/index.html>; Anderton, *supra* note 32.

the global warming calamity in the United States. Unfortunately, this culture of excess is catching on more and more in countries with rapidly expanding population and industry such as China and India.<sup>38</sup>

Climate change occurs when greenhouse gases become thicker than normal in the atmosphere.<sup>39</sup> Although the atmosphere is composed mostly of nitrogen and oxygen, one percent of the atmosphere consists of the so-called greenhouse gases: carbon dioxide, ozone, water vapor, nitrous oxide, and methane.<sup>40</sup> Normally, atmospheric gases create a natural “blanket effect,” which regulates the temperature of the earth by allowing warming sun rays in and out of the atmosphere.<sup>41</sup> However, the thickened layer of greenhouse gases allows the short-wave radiation to enter the atmosphere and heat the earth’s surface but traps most of the reflected long-wave rays that attempt to bounce off of the earth’s surface and return to space; these trapped rays in turn warm the environment.<sup>42</sup> The gases that build up can appear in the atmosphere naturally, but the IPCC’s recent report points to the substantial role of human activity by saying, “The primary source of the increased atmospheric concentration of carbon dioxide since the pre-industrial period results from fossil fuel use, with land use change providing another significant but smaller contribution.”<sup>43</sup>

Scientists have hypothesized that there may be several potential consequences of global warming.<sup>44</sup> Sea levels may rise as a result of melting glaciers and ice shelves.<sup>45</sup> The Gulf Stream, which is driven by salt-and-temperature-regulated thermohaline circulation, has behaved inconsistently in the past with its most recent malfunction

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38. Although “developing countries blamed many environmental problems on the consumerism of the industrialized West,” fast-growing countries in the developing world such as China and India are on track to surpass western rates of consumption and emission. Marong, *supra* note 8, at 35; Keith Bradsher, *Use of Air-Conditioning Refrigerant Is Widening the Hole in the Ozone Layer*, N.Y. TIMES, Feb. 23, 2007, at C1.

39. MARK MASLIN, *GLOBAL WARMING: A VERY SHORT INTRODUCTION* 4 (2004).

40. *Id.* at 4-6.

41. *Id.* at 6.

42. *Id.* at 4.

43. *Id.*; IPCC Report, *supra* note 17, at 2.

44. See generally *The Heat Is On: A Special Report on Climate Change*, THE ECONOMIST, Sept. 9, 2006 [hereinafter *The Heat Is On*].

45. *A Survey of Climate Change: Those in Peril by the Sea*, THE ECONOMIST, Sept. 9, 2006.

8,200 years ago when a large amount of freshwater diluted and weakened it.<sup>46</sup> Scientists are concerned that the same influx of melted water that causes ocean levels to rise at alarming rates may cause the Gulf Stream to shut down.<sup>47</sup> As global warming increases the temperature of the oceans, storms such as hurricanes, which are strengthened when they pass over warm water, may intensify to catastrophic levels.<sup>48</sup> And most immediately problematic for those concerned about maintaining current levels of biodiversity is that many plants and animals are finding it difficult to flourish in their natural habitats because of climate change and are being forced to move to a different ecological zone.<sup>49</sup> As species move within and between zones in an unnatural manner or shift their reproduction in response to climate change, they disrupt the ecological balance in both the niche moved to and the niche left behind.<sup>50</sup>

Climate change is a trendy topic of popular discourse that has pressing, long-term implications.<sup>51</sup> On the other hand, the potential for biodiversity loss as a result of global warming – and the likely catastrophic repercussions of that biodiversity loss – should be emphasized alongside the discussion of climate change, and efforts to save biodiversity should be principal in the solutions for climate change.<sup>52</sup> Unfortunately, biodiversity has been marginalized by the international debate over whether global climate change is occurring, whether the causes are natural or anthropogenic, whether its effects are reversible, and what might be done to combat rising temperatures, rising sea levels, increasing intensity and frequency of natural disasters, and – most relevant to this Note – increasing inadequacy of traditional agricultural methods as a result of droughts, floods, and decreasing arability of land.<sup>53</sup> Biodiversity loss, such as the bleaching and decay of a coral reef ecosystem or the extinction of rare species,<sup>54</sup> often takes place away from human notice while effects of climate change – the drying up of a once-large lake, steadily increas-

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46. *Id.*

47. *Id.*

48. *A Survey of Climate Change: Reaping the Whirlwind*, THE ECONOMIST, Sept. 9, 2006.

49. *A Survey of Climate Change: Where the Wild Things Aare*, THE ECONOMIST, Sept. 9, 2006 [hereinafter *Where the Wild Things Are*].

50. *Id.*

51. *The Heat is On*, *supra* note 44.

52. *Where the Wild Things Are*, *supra* note 49.

53. MASLIN, *supra* note 39, at 99-101.

54. *See generally* RICHARD ELLIS, THE EMPTY OCEAN (2003).

ing temperatures, and arguably events like Hurricane Katrina in 2006, the catastrophic southeast Asian tsunami in 2005, and the devastating annual flooding in Europe – are anything by imperceptible.<sup>55</sup>

Indeed, climate change is like a double-edged sword that that simultaneously reduces biodiversity and potentially encourages the use of technologies that also can harm biodiversity. As the climate changes, so too will the need for technology to adapt to the changes. As this Note explains, GMOs – even when produced, distributed, and used in an ethical manner – are a problematic tool for adaptation, because they have great potential for permanently decreasing natural biodiversity.

#### A. *Biodiversity in Relation to Climate Change*

Climate change is, indeed, a trendy topic.<sup>56</sup> However, biodiversity – as the element most immediately in danger of extinction as a result of climate change – deserves our attention more now than ever before.<sup>57</sup> The 1992 Convention on Biological Diversity defines biodiversity as “the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes biodiversity within species, between species and of ecosystems.”<sup>58</sup> Taken further, biodiversity can be divided into three hierarchical categories – genetic diversity, species diversity, and ecosystem diversity.<sup>59</sup> Biodiversity exists in varying levels of concentration throughout the world with some areas particularly rich in genetic material such as the Amazon rainforest and some areas less

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55. Joseph B. Treaster & N.R. Kleinfield, *Hurricane Katrina: The Overview; New Orleans is Inundated as 2 Levees Fail; Much of Gulf Coast is Crippled; Toll Rises*, N.Y. TIMES, Aug. 31, 2005, at A1; Eric Lichtblau, *Asia's Deadly Waves: Rescue and Relief; Indonesia Dispatches Troops to Aid Towns Left in Rubble*, N.Y. TIMES, Jan. 1, 2005, at A1; Mark Landler, *Weather Turns Dangerous and Deadly Across Europe*, N.Y. TIMES, Jan. 4, 2003, at A5.

56. See Serjeant, *supra* note 32.

57. MASLIN, *supra* note 39, at 97-99.

58. Convention on Biological Diversity, art. 2, June 5, 1992, S. Treaty Doc. No. 103-20, 1760 U.N.T.S. 143, available at <http://www.biodiv.org/convention/articles.asp> (emphasis in original) [hereinafter Biodiversity Convention].

59. SANDS, *supra* note 7, at 499.

diverse.<sup>60</sup> Some human intervention has actually contributed to biodiversity. For instance, centuries of slash-and-burn tactics in some parts of the Amazon have removed one less-diverse layer of forest, thus exposing and allowing a more diverse secondary layer to flourish.<sup>61</sup> Additionally, the creation of an extensive levee system has created saltwater wetlands that make the Mississippi delta region one of the most biologically diverse ecosystems on the planet.<sup>62</sup> However, human intervention in the form of land modification for agriculture, hunting and fishing, habitat destruction by industry, and climate change has exponentially increased with the rapid population growth of the last century and has more often led to a devastating loss in biodiversity and change in climate.<sup>63</sup>

Ecologists denote three main reasons to deal with loss of biodiversity.<sup>64</sup> First, biodiversity provides a variety of agricultural products for human consumption.<sup>65</sup> Second, biodiversity contributes to the biosphere's support of human life and the global environment in general.<sup>66</sup> Third, biodiversity provides the world with non-scientific

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60. Many countries are rich in resources when compared with developed, industrial countries that have largely depleted their resources. Marong, *supra* note 8, at 39.

61. ELLI LOUKA, BIODIVERSITY & HUMAN RIGHTS: THE INTERNATIONAL RULES FOR THE PROTECTIONS OF BIODIVERSITY 37 (2002).

62. In a lecture sponsored by the Friends of New Orleans, King Milling, president of Whitney National Bank and chairman of the Governor's Advisory Commission on Coastal Restoration and Conservation followed a presentation by author John Barry on the benefits of the Louisiana levee system to the Mississippi delta community by further illustrating the complicated relationship between man and nature in the region. Milling explained that the levee system has created over 7,000 square miles of wetlands, which is the seventh largest delta on earth and an area of exponentially increased biodiversity. Milling remarked that "the existence of that ecosystem is and always has been critical to our survival" and mapped out various ways to prevent unintended consequences of the levees such as soil and nutrient deprivation to areas that need it most. Milling iterated a sense of urgency by saying, "If we don't start the process, we will lose it all." Without an eye on the man-made levees, communities, people, and biodiversity will be lost. King Milling, Chairman, Governor's Advisory Commission on Coastal Restoration and Conservation, Remarks at the Friends of New Orleans Lecture at Loyola University New Orleans School of Law (Jan. 4, 2007).

63. SANDS, *supra* note 7, at 49; *see generally* GORE, *supra* note 29.

64. SANDS, *supra* note 7, at 499-500.

65. Agricultural products can range from food to pharmaceuticals to trees that are used for building construction as well as paper products. *Id.* at 500.

66. The "greater environment" includes the inner mechanisms of all food chains upon which mankind depends. *Id.*

aesthetic and intrinsic value.<sup>67</sup> Most pertinent to a discussion about GMOs is the broad concept assumed by ecologists in this analysis – that changes to the level of biodiversity in one area will unavoidably affect other ecosystems and thus have transnational effects.<sup>68</sup> Opponents of GMO use fear that a drastic alteration to the natural biological makeup of one area may have irreversible effects on the world environment in general and specifically on human living conditions and the global economic marketplace.<sup>69</sup>

Because biodiversity is a global issue, a variety of scientific and political opinions regarding the issue are to be expected. Scientists generally agree that biodiversity is inherently valuable.<sup>70</sup> However, preferred methods of preserving biodiversity vary. Some scientists believe that preservation is key while others advocate incorrupt national and/or international management of genetic resources.<sup>71</sup> The first official publication from an international organization regarding biotechnology was published by the Organization for Economic Cooperation and Development (“OECD”) in 1986 and is entitled *Recombinant DNA Safety Consideration*.<sup>72</sup> This publication, which emphasizes an individualized region-by-region analysis for biotechnology risk management, served as a manual for countries to develop some of the first national safety protocols.<sup>73</sup> The first publication of the United Nations (“UN”) was a “Voluntary Code of Conduct for the Release of Organisms into the Environment” by the UN Industrial Development Organization (“UNIDO”) in 1991,<sup>74</sup> but the UN’s most important contribution to the discussion regarding the global environment and GMOs would come the following year with

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67. *Id.*

68. See Sean Murphy, *Biotechnology and International Law*, 42 HARV. INT’L L.J. 47, 49 (2001) (mentioning the “potentially severe and adverse transnational effects” of biotechnology).

69. *Id.*

70. See WILSON, *supra* note 2.

71. See, e.g., LOUKA, *supra* note 61, at 18.

72. François Pythoud & Urs P. Thomas, *The Cartagena Protocol on Biosafety, in GOVERNING GLOBAL BIODIVERSITY: THE EVOLUTION AND IMPLEMENTATION OF THE CONVENTION ON BIOLOGICAL DIVERSITY* 40 (Philippe G. Le Prestre ed., 2002).

73. *Id.*

74. *Id.*

the UN's 1992 Biodiversity Convention and Biodiversity Protocols.<sup>75</sup>

Motivated by emerging scientific evidence that species were disappearing at an exponential rate,<sup>76</sup> the 1992 Biodiversity Convention and Protocols, discussed in Part II, attempt to stem the loss of biodiversity on national and international levels but do not satisfy the concerns of all scientists. The Biodiversity Convention, which emphasizes *in situ* conservation methods – such as the establishment of national parks and protected areas within natural habitats – and relegates supplemental *ex situ* methods – such as genetic banks and protected areas like wildlife conservatories that are located away from natural habitats – to the discretion and management of the country of origin, may not be an effective or cost-efficient solution to biodiversity loss.<sup>77</sup> The Biodiversity Protocol reaffirms the precautionary approach, first introduced in the 1992 Rio Declaration on Environment and Development.<sup>78</sup> The Protocol attempts to balance growing public concern over transboundary use of GM products with the touted benefits of biotechnology.<sup>79</sup> Hopefully the international community will become more receptive to the Protocol as years pass.

Management on an international level may be better in the long run, but the immediacy of political and economic interests too often foul attempts at international cooperation.<sup>80</sup> The likelihood that an international gene bank or similar *ex situ* conservatory method will be effectively employed in the near future is, sadly, not great.<sup>81</sup> For individuals concerned about the mass introduction of GMOs into the global environment, the future of biodiversity looks bleak indeed.

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75. Biodiversity Convention, *supra* note 58; Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Jan. 29, 2000, 39 I.L.M. 1027 [hereinafter Biosafety Protocol].

76. See MASLIN, *supra* note 39, at 97-98.

77. LOUKA, *supra* note 61, at 120 (commenting on the impracticability of Article 9 of the Biodiversity Convention); SANDS, *supra* note 7 at 518.

78. Biosafety Protocol, *supra* note 75, at pmb1.

79. DOCUMENTS IN INTERNATIONAL ENVIRONMENTAL LAW 725 (Philippe Sands & Paolo Galizzi eds. 2004).

80. See SANDS, *supra* note 7, at 518 (discussing the complexities of *ex situ* and *in situ* conservation).

81. *Id.*

*B. GMOs and Climate Change*

The genetic modification of organisms began in the 1970s by using recombinant DNA technology, which allows scientists to isolate desirable genetic traits from one organism and splice them into another, thus creating a GMO that would not otherwise exist in nature.<sup>82</sup> Genetic modification of food (into so-called “transgenic” plants)<sup>83</sup> began with alteration of the genetic makeup of tomatoes so that they could ripen on the vine, stay firm during transportation to the consumer, and refrain longer from rotting in the store and at home.<sup>84</sup> The focus of the biotech industry soon turned to the protection of staple crops from pests and inclement environmental conditions, but public opinion turned more critical as biotechnology improved and its use became more pervasive.<sup>85</sup> While faith in the discretion of the Food and Drug Administration assuaged many Americans’ early concerns about the safety of GMOs, many other countries and some environmentalists approached the new biotechnology sector with more caution and skepticism.<sup>86</sup> Fears – some rational, some less than rational – began to develop that the GM plants would lead to an increase of allergies in humans, contamination of non-GM crops, and the natural development of “superweeds” and mutation of pests.<sup>87</sup>

Monsanto, a multinational company that is incorporated in the United States, is the world’s largest proponent, developer, and distributor of GMO products.<sup>88</sup> Most of the world’s GM crops used to grow in North America, however, the use of GMOs in the developing world is steadily increasing.<sup>89</sup> In contrast with the United States and some developing countries, Europe complies fully with the pre-

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82. See Abby Munson, *Genetically Manipulated Organisms: International Policy-Making and Implications*, 69 INT’L AFFAIRS 497 (1993).

83. Pythoud & Thomas, *supra* note 72, at 39.

84. Genetic modification of the ripening agent in tomatoes created a tomato that was much tastier than the alternative – relatively taste-free tomatoes that were picked unripe from the vine, transported, and then rapid-ripened with ethylene gas. PRINGLE, *supra* note 5, at 1-2.

85. *Id.* at 3.

86. *Id.*

87. *Id.*

88. Monsanto was founded in St. Louis, Missouri. Monsanto Company, Company Information, [http://www.monsanto.com/monsanto/layout/about\\_us/default.asp](http://www.monsanto.com/monsanto/layout/about_us/default.asp) (last visited Mar. 3, 2007).

89. See generally *id.*

cautionary principle and is “the only large swath of the world that does not already grow or buy the crops.”<sup>90</sup> Theodore Koliopanos, former deputy environmental minister of Greece illustrates Europe’s stalwart anti-GMO ideology when he says, “All political parties [in Greece] are opposed, which is odd because we disagree on everything else.”<sup>91</sup>

GMO production now provides potential to benefit (in addition to investors, the seed and chemical companies, the farmer, and the food processor) a large consumer group – the impoverished regions in the developing world.<sup>92</sup> However, environmentalists fear that GMOs may be seen as an easy solution that may do more harm than good in the long run.<sup>93</sup> Many critics fear that GMOs might one day be found to have “obvious ill effects.”<sup>94</sup> Significant to this Note, however, is are the fears that GM plants will cross-pollinate with non-GM plants and create an undesirable new product; GMOs will mutate into a similarly unforeseen end product; or that GMOs will accidentally and irrevocably become mixed with naturally occurring biological matter and biodiversity will be forever altered with unknown – and potentially dire – consequences.<sup>95</sup> Because much of the developing world, on guard against new attempts at colonization by the developed world and therefore protective of its rich stores of biodiversity and genetic material, shares this concern, potential for GM products to alleviate poverty in the developing world adds a new dimension to the debate over biodiversity loss.<sup>96</sup>

*C. At the Intersection of Climate Change and Biodiversity: The Developing World and GMOs*

Putting aside the ethics of GMO use, scientists and scholars alike generally agree that GMOs could be effective in alleviating hunger and reducing poverty in the developing world “if governments, industry, and overzealous sentries don’t stand in the way.”<sup>97</sup> However, factors unique to the developing world and the context of a changing global environment must color any discussion of GMO use

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90. Rosenthal, *supra* note 23.

91. *Id.*

92. PRINGLE, *supra* note 5, at 2.

93. Rosenthal, *supra* note 23.

94. *Id.*

95. See PRINGLE, *supra* note 5, at 193.

96. See Marong, *supra* note 8.

97. PRINGLE, *supra* note 5, at 1.

in impoverished nations. As a result of their pasts as colonies, many developing countries lack financial solvency, political strength, and control over indigenous resources.<sup>98</sup> Additionally, the relationship between the developed and developing worlds is largely one of a North-South dependency.<sup>99</sup> In other words, the region richest in biodiversity and genetic materials, the developing South, must rely on technology and innovation from the developed North.<sup>100</sup> This dynamic, which also incidentally plays out in pharmaceutical development and distribution, is neo-colonial in nature – a relationship in which the developed world does not always see immediate motivation to provide aid to developing countries and in which the developing world inevitably suffers.<sup>101</sup> In sub-Saharan Africa, for instance, over 100 million farmers lose some or all of their crops to parasitic witchweed, which attaches to roots and deprives plants of water and nutrients.<sup>102</sup> However, the African governments have neither the resources nor the technological advancement to develop the GM solution to witchweed.<sup>103</sup> If the African community is to utilize a technology-based solution to witchweed, then they must rely on research and production performed and financed by governments and multinational corporations with roots in the developed world.<sup>104</sup> Unfortunately, the developed world requires incentive – usually financial – to share its technological expertise.<sup>105</sup> For example, an airborne fungus called black Sigatoka easily devastates banana crops in Central and South America; a Belgian company developed a fungus resistant banana plant but delayed its release without explanation as to why for almost ten years.<sup>106</sup> While the developed world continues to “sum up experience and go on discovering, inventing, creating, and advancing,”<sup>107</sup> it is usually at the expense and to the detriment of the developing world.

Not only does the developing world depend upon a few corporations in the developed world for the supply of helpful GM products,

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98. Marong, *supra* note 8, at 39 (discussing corruption in oil-rich Nigeria).

99. *Id.* at 31.

100. *Id.* at 35.

101. See Raj Bhala, *Marxist Origins of the “Anti-Third World” Claim*, 24 *FORDHAM INT’L L.J.* 132, 150 (2000).

102. PRINGLE, *supra* note 5, at 4.

103. *Id.*

104. *Id.*

105. *Id.*

106. *Id.*

107. Stockholm Declaration, *supra* note 1.

but they are also completely at the mercy of the intellectual property laws controlling the use of the GMOs.<sup>108</sup> In countless instances, companies from the technology-rich North create a GM product with resources found in the biologically diverse South and then patent the genetic structure of the creation.<sup>109</sup> The patent process then hampers both the use and further development of the GMO.<sup>110</sup> The control of the multinational corporations over the genetic makeup of food that is integral to the sustenance of the developing world is the most neo-colonial element of the GM revolution.<sup>111</sup>

A final relevant fear felt by the developing world in regards to GMOs is perhaps best stated by author Peter Pringle in his recent book *Food, Inc.*: If a company is able to manipulate “a transgenic caffeine-loaded soybean to produce coffee in Minnesota,” then what will become of the independent coffee farmers and agriculturally-based, already-dependent developing countries?<sup>112</sup> Interestingly, this fear concerns small farmers in America as well.<sup>113</sup> At the annual benefit concert Farm Aid, held in 2006 in Camden, New Jersey, anti-biotechnology organizations and farmers alike spoke of taking the farms back from the biotechnology sector and liberating farmers from GMOs.<sup>114</sup> If this is the sentiment growing amongst small, independent farming operations in the United States, then perhaps the labored push into the world’s developing markets can be seen as a desperate attempt by the biotechnology companies to keep GMOs alive elsewhere. Unfortunately, as populations grow and agricultural conditions continue to change in the developing world as a result of global warming, GM products may rapidly become an easy solution to famine and poverty.<sup>115</sup> Although GMOs and biodiversity may be marginalized by discussion of climate change,<sup>116</sup> the time for a strong, international regulatory scheme for GMOs and other methods

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108. PRINGLE, *supra* note 5, at 6.

109. *Id.*

110. *Id.*

111. *See id.*

112. *Id.* at 13.

113. Farm Aid: Good Food, Family Farmers, Better America, <http://www.farmaid.org> (last visited Mar. 3, 2007).

114. *Id.*

115. *See generally* World Population Prospects, The 2004 Revision, U.N. Doc. ESA/P/WP.193 (Feb. 2, 2005) (analyzing population growth) [hereinafter World Population].

116. The February 2, 2007 IPCC Report does not mention biodiversity. IPCC Report, *supra* note 17.

for coping with global warming has arrived. Unfortunately, policy makers do not seem to be paying attention to GMOs or biodiversity as they focus instead on the more socially relevant issue of climate change,<sup>117</sup> and – as will be discussed in Part III – international legal instruments generally create more ambiguity than concrete regulations.<sup>118</sup>

### III. THE ROLE OF BIODIVERSITY IN THE GLOBAL WARMING DEBATE

Several international legal instruments address the need to stem loss of biodiversity and regulate use of GMOs.<sup>119</sup> The need for GMOs has increased in recent years as industrial societies have flourished in the North and begun to develop in the South.<sup>120</sup> As the human population has grown, the need for efficiently produced food has also increased.<sup>121</sup> Because biodiversity loss and GMO use have historically gone hand in hand with human development, the legal instruments first address the need for developed and developing countries to work together in achieving sustainable growth and maintenance.<sup>122</sup> In 1992, the UN Conference on Environment and Development (also known as the Rio Earth Summit) convened to bring the concept of sustainability into the development dialogue and produced the Rio Declaration on Environment and Development (“Rio Declaration”).<sup>123</sup> Principle 27 of the Rio Declaration expands upon the doctrine of shared responsibility developed in the 1972 Stockholm Declaration and asserts that “[s]tates and people shall cooperate in good faith and in a spirit of partnership . . . in the fur-

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117. *Id.*

118. For instance, Principle 16 of the Rio Declaration denotes the “polluter pays principle” but does not define “polluter” or “pollution” for the purposes of the Declaration. United Nations Conference on Environment and Development, June 3-14, 1992, Rio Declaration on Environment and Development, princ. 16, (June 16, 1992), 31 I.L.M. 874 (1992) [hereinafter Rio Declaration].

119. *Id.*; Biosafety Protocol, *supra* note 75.

120. See generally PRINGLE, *supra* note 5.

121. See World Population, *supra* note 115.

122. James C.N. Paul, *The United Nations and the Creation of an International Law of Development*, 36 HARV. INT’L L.J. 307, 311 (discussing the importance of “collective efforts” in the international law of development).

123. Désirée M. McGraw, *The Story of the Biodiversity Convention: From Negotiation to Implementation*, in GOVERNING GLOBAL BIODIVERSITY: THE EVOLUTION AND IMPLEMENTATION OF THE CONVENTION ON BIOLOGICAL DIVERSITY 7 (Philippe G. Le Prestre ed., 2002).

ther development of international law in the field of sustainable development.”<sup>124</sup> Although the Stockholm Declaration was not initially legally binding, many of the ideas introduced have become customary international law and have been incorporated into later agreements such as the Rio Declaration.<sup>125</sup> One of the main ideas behind the Rio Declaration is, in fact, Principle 4 of the Stockholm Declaration, which declared that nature conservation is a “special responsibility” of man in his existence and development and must therefore receive importance in planning for economic development.<sup>126</sup>

Adopted twenty years later almost simultaneously with the Rio Declaration, the 1992 Convention on Biological Diversity (“Biodiversity Convention”) similarly illustrates a shared responsibility between developed and developing countries in promoting and utilizing sustainability,<sup>127</sup> but the Convention imposes obligations upon individual states and clarifies the rights of states in specific regard to conservation of native biological resources.<sup>128</sup>

The 2000 Cartagena Protocol on Biosafety to the Convention on Biological Diversity (“Biosafety Protocol”) builds upon ideas established by the Biodiversity Convention and deals specifically with the debate over transboundary use of GMOs (which the Protocol refers to as living modified organisms).<sup>129</sup>

#### A. *The 1992 Biodiversity Convention*

The Biodiversity Convention emphasizes long-term sustainable development and, most remarkably, represents several concessions made by the developed world to the developing world.<sup>130</sup> Eighty-

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124. Rio Declaration, *supra* note 118, at art. 27.

125. For instance, Principle 21 of the Stockholm Declaration becomes Principle 2 of the Rio Declaration. *Id.* at princ. 2; Stockholm Declaration, *supra* note 1, at princ. 21.

126. Stockholm Declaration, *supra* note 1.

127. Biodiversity Convention, *supra* note 58, at art. 5 (emphasizing the importance of cooperation between nations).

128. *Id.* at art. 6 (emphasizing the importance of national – and omitting international - conservation techniques).

129. The Biosafety Protocol defines an LMO as “any biological entity capable of transferring or replicating genetic material, including sterile organisms, viruses and viroids.” Biosafety Protocol, *supra* note 75, at art. 3. The Protocol refers to GMOs as living modified organisms. For the sake of continuity, this Note discusses GMOs rather than utilizing the synonymous term LMO.

130. McGraw, *supra* note 123, at 7.

seven parties originally signed the Convention, an instrument designed to combat poverty and promote sustainable growth.<sup>131</sup> Unlike many international agreements, the Biodiversity Convention developed largely outside of public attention; negotiations took place at the relatively remote location of Nairobi, Kenya while the international media and NGOs were largely preoccupied by the concurrent UN Framework Convention on Climate Change negotiations and UNCED.<sup>132</sup> Despite its development outside of the public notice, the public generally accepts the Convention's goal of regulating the use of natural resources.<sup>133</sup> As environmental consultant Désirée McGraw remarks, earlier "species-specific and site-specific treaties . . . made it easier for the public to embrace 'charismatic animals,' such as pandas and seals pups, and to explore 'exotic sites' such as the rainforests of Borneo and Brazil."<sup>134</sup>

Within a year and a half, 165 countries had signed the Biodiversity Convention, 30 countries ratified it, and it entered into force.<sup>135</sup> Articles 8 and 9 of the Convention impose obligations on countries to conserve natural resources through both *in situ* and *ex situ* methods.<sup>136</sup> Article 8 encourages countries to use *in situ* methods such as regulating conservatory mechanisms and creating protected areas to preserve naturally occurring biological resources.<sup>137</sup> The significantly shorter Article 9 places responsibility for *ex situ* conservation methods on the country of origin of the specific resource to be preserved.<sup>138</sup> An example of one of these methods is the Centro Internacional de la Papa, the Peruvian center devoted to preserving hundreds of varieties of the potato and Andean root and tuber crops.<sup>139</sup> In the interest of not infringing upon sovereign rights of states to indigenous resources, Article 15 also relegates the responsibility of conservation to the state in which the resources are found.<sup>140</sup> However, as mentioned earlier, this dependence on individual countries

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131. DOCUMENTS IN INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 79, at 726-27.

132. McGraw, *supra* note 123, at 16.

133. *Id.* at 26.

134. *Id.*

135. *Id.* at 17.

136. Biodiversity Convention, *supra* note 58, at arts. 8 and 9.

137. *Id.* at art. 8.

138. *Id.* at art. 9.

139. International Potato Center - Centro Internacional de la Papa, <http://www.cipotato.org/cip/mission.asp> (last visited Mar. 3, 2007).

140. Biodiversity Convention, *supra* note 58, at art. 15.

to fund and organize environmental conservation measures means that some efforts will not be effective as a result of money shortage, state corruption, and lack of infrastructure.<sup>141</sup> Article 16 provides for the transfer of technology from the developed world to developing countries but maintains as a caveat patent and other legal rights of the more advanced countries.<sup>142</sup>

A striking element in the negotiations surrounding the Biodiversity Convention is the fact that the developing world – the biodiversity-rich South – possessed “a preponderance of the assets under negotiation.”<sup>143</sup> Economic desires of the developing world reflected in the Biodiversity Convention thus thwarted the attempts of some of the more environmentally concerned developed countries that wished to pursue a conservationist course of action in the developing world.<sup>144</sup> Instead, the Convention encourages the careful use of available resources and provides financial assistance via Articles 21 and 39 in the form of a multilateral fund.<sup>145</sup>

#### B. *The 2000 Biosafety Protocol*

The Biosafety Protocol, administered by the Biodiversity Convention,<sup>146</sup> builds on ideas present in the Convention, but analysis of the preamble to the Biosafety Protocol provides explanation as to why only 51 parties originally signed the Protocol.<sup>147</sup> Attendees at the meeting broke into approximately five groups that frequently disagreed, making the negotiation process long and difficult.<sup>148</sup> The groups included: (1) the major agricultural exporters (the United States, Australia, Canada, and Argentina), (2) the European Union, (3) the so-called Like-Minded Group (most developing countries), (4) the compromising countries (including Japan, Norway, Switzerland, New Zealand, and Mexico), and (5) the countries in Central and Eastern Europe.<sup>149</sup> The Protocol, adopted in Montreal after al-

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141. Marong, *supra* note 8, at 39 (discussing corruption in oil-rich Nigeria).

142. Biodiversity Convention, *supra* note 58, at art. 16.

143. McGraw, *supra* note 123, at 7.

144. *Id.*

145. *Id.*

146. Pythoud & Thomas, *supra* note 72, at 39.

147. DOCUMENTS IN INTERNATIONAL ENVIRONMENTAL LAW, *supra* note 79, at 726-27.

148. *Id.* at 46.

149. *Id.*

most five years of negotiation,<sup>150</sup> developed in order to deal with the most debated characteristic of the Biodiversity Convention – its lack of “science-based prioritizing.”<sup>151</sup> In other words, the Protocol displays for the first time the willingness of some countries to work against the political might of the risk-taking countries and cites to a lack of scientific evidence in order to propagate a more precautionary approach to natural resources and biogenetics.<sup>152</sup>

The Protocol clearly acknowledges the need to create standards for biosafety to control the potential effects of biotechnology on the global environment.<sup>153</sup> The preamble recognizes both sides of the philosophical debate concerning biotechnology and recognizes the importance of free international trade but also emphasizes that the “Protocol shall not be interpreted as implying a change in the rights and obligations of a Party under any existing international agreements.”<sup>154</sup> First it acknowledges the general opinion shared by the European Union and some other precaution-minded nations: “the rapid expansion of modern biotechnology and the growing public concern over its potential adverse effects on biological diversity, taking also into account risks to human health.”<sup>155</sup> Then it identifies the more scientifically minded, risk-taking view adopted by the United States and other countries “that modern biotechnology has great potential for human well-being if developed and used with adequate safety measures for the environment and human health.”<sup>156</sup>

In light of the debate over GMOs, the Biosafety Protocol does not work towards elimination of GMOs from the global discourse.<sup>157</sup> Instead, the Protocol attempts to require “the safe [transboundary] transfer, handling, and use of living modified organisms” as a reasonable attempt to incorporate both precautionary and pro-GMO views.<sup>158</sup> At the core of this aim is a view especially supported by the European Union: that individuals have the “right” to be fully informed about the products available in their country.<sup>159</sup> In relation to impoverished consumers in the developing world, these rights, the

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150. *Id.* at 39.

151. McGraw, *supra* note 123, at 21.

152. *See id.*

153. Pythoud & Thomas, *supra* note 72, at 41.

154. Biosafety Protocol, *supra* note 75, at pmbl, para. 10.

155. *Id.* at para. 5.

156. *Id.* at para. 6.

157. Biosafety Protocol, *supra* note 75, at art. 1.

158. *Id.*

159. Pythoud & Thomas, *supra* note 72, at 51.

“right to know” and the “right to choose,” may seem unimportant or irrelevant;<sup>160</sup> however, this observation illustrates yet another neo-colonial aspect of GMO use.<sup>161</sup> Article 7 introduces the advance informed agreement (“AIA”) procedure regarding GMO products that are intended “for intentional introduction into the environment of the Party of import.”<sup>162</sup> The key difference between the objectives of GMO-producing and developing countries going into Protocol negotiations is that GMO producers and exporters opposed labeling all GM products as such, while developing countries supported the AIA procedure for all GMOs, regardless of their purpose.<sup>163</sup> To the dismay of most developing countries, however, the AIA procedure does not cover imported food, feed, or processing products and also does not apply to GMOs “not likely to have adverse effects on the conservation and sustainable use of biological diversity, taking also into account risks to human health.”<sup>164</sup> As leaders in Zambia, Zimbabwe, and Mozambique expressed during the recent famine, the developing world worries that imported products intended as food might, especially in times of crisis, be incorporated into the countries’ agriculture by needy farmers and thus impact the integrity of regional biodiversity.<sup>165</sup>

To protect the interests of the precautionary countries and “avoid adverse effects on the conservation and sustainable use of biological diversity,” the Protocol regulates the export of GMOs from countries with strong biotech industries.<sup>166</sup> Article 18 requires that GMOs must be clearly labeled and the transit must be monitored.<sup>167</sup> Although the Biosafety Protocol emphasizes the precautionary principle, it does not create as a standard for regulation the ideals of the most risk-averse nations – and yet extremely science-friendly countries such as the United States, unsurprisingly, have not signed the Protocol.<sup>168</sup> Article 11 allows any country to ban GMOs under a

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160. See Bhala, *supra* note 101.

161. *Id.*

162. Biosafety Protocol, *supra* note 75, at art. 7.

163. Rafe Pomerance, *Biosafety Protocol: Cartagena and Beyond*, 8 N.Y.U. ENV. L.J. 614, 615 (2000).

164. Biosafety Protocol, *supra* note 75, art. 7, para. 4.

165. Pythoud & Thomas, *supra* note 72, at 45.

166. Biosafety Protocol, *supra* note 75, art. 18, para. 1.

167. *Id.* at para. 2.

168. Convention on Biological Diversity, Cartagena Protocol on Biosafety, Status of Ratification and Entry into Force (Dec. 6, 2006), available at <http://www.biodiv.org/biosafety/signinglist.aspx?sts=rtf&ord=dt#td>.

“framework that is consistent with the objective of th[e] Protocol” and allows developing and economically transitioning countries to perform a “risk assessment” in determining whether or not to allow import of GM material.<sup>169</sup> In short, although Paragraph 8 of Article 11 allows countries to prioritize precaution, a reasonable reader of the Protocol might, especially in considering the Protocol alongside broad humanitarian documents such as the UN Declaration of Human Rights,<sup>170</sup> read the balanced treatment of the debate as insinuating that in a true humanitarian emergency (such as famine and starvation in which benefits to human health outweigh unproven risks), benefit to the populace would outweigh scientifically unproven concerns.<sup>171</sup>

### C. *Inadequate Policy Solutions*

Perhaps, instead of regulating the preexisting economic relationship between the developed and developing worlds, a new partnership should be created.<sup>172</sup> While the Biodiversity Convention and Biosafety Protocols attempt to streamline and make safe the export-import flow of goods from North to South, a better long-term solution for the developing countries that accept the risks of GMOs would be to ensure that the technology and intellectual property rights are accessible to countries that may use them to the greatest benefit.<sup>173</sup> Indeed, as Peter Pringle says:

If a new transgenic rice plant can help to cure blindness in those who live on little more than a bowl of rice a day, some new partnership between rich and poor has to be forged so that the intellectual property rights to such a marvelous invention will be shared.<sup>174</sup>

The BBC recently reported that Monsanto attempted this goal by promising to share royalty-free access to a vitamin A-infused variety

169. Biosafety Protocol, *supra* note 75, art. 11.

170. Universal Declaration of Human Rights, G.A. Res. 217(III)A, U.N. Doc. A/810 (Dec. 10, 1948), available at <http://www.un.org/Overview/rights.html>.

171. See generally PRINGLE, *supra* note 5, at 184-89 (discussing the Zambian crisis of 2002).

172. Marong, *supra* note 8 (discussing the developmental divide between countries in the northern and southern hemispheres).

173. *Id.*

174. PRINGLE, *supra* note 5, at 13.

of rice.<sup>175</sup> However, this act of benevolence was seen by many as a creative advertisement ploy – and reportedly a successful one – to increase acceptance of GM products in the developing world.<sup>176</sup>

One need only glance through the 1992 UN Framework Convention on Climate Change and the 1997 Kyoto Protocol to the UN Framework Convention on Climate Change to make two intriguing observations. First, the Kyoto Protocol institutionalizes the marginalization of biodiversity in the face of the global warming issue by failing to mention the term “biodiversity.”<sup>177</sup> Second, the Protocol omits developing nations from the guidelines established for emission regulation.<sup>178</sup> It is easy to argue that nations have a common but differentiated responsibility when it comes to halting the progress and reversing the effects of global warming.<sup>179</sup> Indeed, it would be unfair for developed countries to formally dictate the actions of developing countries after centuries of stifling the power of the developing populace while leeching off of their resources to strengthen industrialized economies.<sup>180</sup> However, allowing developing nations to progress without regulations that are comparable in their purpose to emission standards – which fundamentally encourage industries and individuals to make developmental decisions with consideration for global ecological health – may prove to be dangerous to worldwide biodiversity in the long-term if developing nations begin to rely on potentially non-sustainable methods of development – such as GMOs – in the face of global warming.

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175. Alex Kirby, *GM Rice Patents Given Away*, Aug. 4, 2000, <http://news.bbc.co.uk/2/hi/science/nature/865946.stm>. See <http://www.rice-research.org/>, a website set up in June 2006 by Monsanto to facilitate the international sharing of rice genome sequencing.

176. *Id.*

177. Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 11, 1997, 37 I.L.M. 22.

178. *Id.*; ELIZABETH KOLBERT, *FIELD NOTES FROM A CATASTROPHE: MAN, NATURE, AND CLIMATE CHANGE* 156 (2006).

179. Climate Change Convention, *supra* note 27, at art. 4 (denoting “common but differentiated responsibility and . . . specific national and regional developmental priorities, objectives and circumstances”).

180. See generally KOLBERT, *supra* note 178, at 155.

## IV. GMOs, GLOBAL WARMING, AND A DEVELOPING DICHOTOMY

It is vitally important to analyze the potential effects of methods – such as GMOs – that may be used to deal with the issues presented by climate change and biodiversity loss. The debate over GMOs has unfolded in a similar manner to the debate over beef hormones and other modes of interference in natural agricultural methods.<sup>181</sup> Global opinion has been largely dominated by the two opposite perspectives of the United States, reluctant to accept ideas not substantiated by “hard science,” and the European Union, much more in favor of precaution.<sup>182</sup> Of course, it is possible that much of the European distaste for GM products stems from the fact that GMOs were introduced at the same time that the continent was dealing with fallout from the mad cow crisis.<sup>183</sup> With one side of the debate arguably influenced by fear and the other side of the debate encouraged by immediate economic benefit rather than ethical or long-term considerations,<sup>184</sup> the developing world must carefully weigh the advantages and disadvantages of accepting GM products into their environments and national industries.

Farmers in countries like Brazil fear that the introduction of trendy GM foods will severely harm their conventional food market by flooding the market with stockpiled GM seeds and putting small-scale farmers out of business by encouraging the growth of large-scale agricultural practice.<sup>185</sup> As mentioned in the introduction, even during country-wide famine, Zambia, Zimbabwe, and Mozambique remained unconvinced of the safety of biotechnology.<sup>186</sup> Zimbabwe and Mozambique eventually relented to the pressure of international aid organizations to accept GM corn that had been milled and was free of seeds.<sup>187</sup> Zambia, on the other hand, believed that by waiting, an offer would be made of unmodified corn being held in non-American granaries.<sup>188</sup> Aside from belief that other aid was available, Zambia had several reasons for turning down the GM corn.<sup>189</sup>

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181. PRINGLE, *supra* note 5, at 16.

182. SANDS, *supra* note 7, at 7.

183. PRINGLE, *supra* note 5, at 16.

184. *Id.*

185. *Brazil Activists Target Monsanto*, BBC, June 3, 2006, <http://news.bbc.co.uk/2/hi/americas/2961284.stm>.

186. PRINGLE, *supra* note 5, at 184-89.

187. *Id.*

188. *Id.* at 185.

189. *Id.*

First, Zambia's scientists, perhaps heavily influenced by European opinion, convinced the Zambian government that the precautionary perspective was the only way to view GMOs.<sup>190</sup> GMOs were to be considered dangerous until proven safe.<sup>191</sup> Second, the Zambian government feared that accepting the corn might change the feeling of the Zambian public and create domestic demand for more GM products.<sup>192</sup> This might, in the long run, affect Zambia's ability to export to Europe and other anti-GM regions.<sup>193</sup>

The debate over GMOs highlights some of the most important issues facing the developing world. GM planting is still illegal in many countries that want to preserve their national agricultures as GM-free.<sup>194</sup> Developing countries must weigh potential for poverty reduction against possible loss of biodiversity over time, famine and malnutrition against reliance on Western-bred " Frankenfoods," and economic independence against reliance on Western companies like Monsanto to provide seeds and agricultural know-how.<sup>195</sup>

#### A. *GMOs in India: Moneylenders Are the New Bollworms*

The five-year-old theoretical debate over GMOs pales in importance against the actual effects of GMOs on the parties in the developing world who choose to accept them.<sup>196</sup> In India, for instance, the government only offers subsidies to producers of some food grains.<sup>197</sup> Farmers, lured by the potential to reduce expenditures on pesticides by twenty-five percent and to increase overall crop yield, purchase GM seeds like the ones sold by multinational corporations such as Monsanto at almost twice the price of conventional seeds, but they must turn to non-governmental lending organizations in order to financially support the purchase.<sup>198</sup> A variety of genetically modified cottonseeds sold by Monsanto called Bt cotton resists bollworm infestation but remains vulnerable to other forms of crop destruction such as drought and flooding.<sup>199</sup> This reliance on expen-

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190. *Id.* at 186.

191. *Id.*

192. *Id.*

193. *Id.*

194. *Id.* at 193.

195. *Id.*

196. Sengupta, *supra* note 26.

197. *Id.*

198. *Id.*

199. The sale of Monsanto's Bt cottonseeds has doubled in the last year. *Id.*

sive seed that is still so dependent on climate and weather conditions leads to a new dimension of subjugation of the Indian farmers.<sup>200</sup> Moneylenders who charge high interest rates or an extra premium frequently force the farmers to sell the bulk of their crops to them at a price below the market level.<sup>201</sup> Farmers thus lose a large portion of their crops not to the bollworms but to the financiers.<sup>202</sup>

India's allowance of GMOs in its agricultural economy seems to be rooted in the hope – reflected by the actions of the farmers – that GMOs will be an easy, effective alternative to government subsidies of agricultural goods. In India, this is clearly not the case.<sup>203</sup> GM seeds are not miracle seeds; they still need appropriate growing conditions and care.<sup>204</sup> Although a reduction in pesticide use reduces danger to the environment and the health of the farmer, the impact of inconsistency in growing conditions greatly increases the financial harm to an impoverished farmer who has depended on high-interest non-governmental financial support for purchasing GM seeds.<sup>205</sup> If GMOs provided a guaranteed mode of reducing pesticide use and increasing total product yield, then India's hands-off policy still would not be justified. Then, India would be allowing multinational companies – with profits rather than the best interests of India in mind – to change the character of Indian agriculture, usurping the place of bollworms and moneylenders to feed on the vulnerability of the farmers.<sup>206</sup>

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200. Sengupta tells the story of Anil Kondba Shende, a 31-year-old farmer and father of two young sons, who borrowed nine dollars from a neighbor to pay for the one-liter bottle of pesticide he swallowed to kill himself at the end of the planting season. Shende lost three batches of Monsanto-produced genetically modified cotton seeds – two because the monsoon season was late and one because it brought too much rain and flooded his field – and owed at least four debts. *Id.*

201. “Business has boomed with the arrival of high-cost seeds and pesticides. ‘Many moneylenders have made a whole lot of money . . . . Farmers, many of them, are ruined.’” *Id.*

202. *See id.*

203. *Id.*

204. *See id.*

205. *See id.*

206. *See id.* (mentioning the case being brought by the Indian state of Andhra Pradesh against Monsanto in an effort to reduce the royalty from Bt cotton seeds as a possible problem-solving mechanism against GMO patents being owned by multinational corporations).

## V. CONCLUSION

Thanks in part to the many international meetings that have occurred over the last few decades – and especially in light of the IPCC’s recently published report – Western popular culture has begun to embrace the idea that the global climate is changing.<sup>207</sup> However, as the world continues to marginalize biodiversity concerns in favor of the more popular topic of global warming, the door opens for methods, such as GMOs, to be employed that are destructive to biodiversity in the name of coping with global warming. In 1962, Rachel Carson’s *Silent Spring* revolutionized the way that the world regarded the use of chemicals in agricultural production.<sup>208</sup> Chemicals such as DDT, once viewed as easy and efficient (and even, at one time, safe) ways to decrease the effect of pests on crops soon gave way to safer chemicals.<sup>209</sup> Now multinational corporations, such as Monsanto, that are integral players in the global agricultural economy are eschewing these chemicals for GMOs.<sup>210</sup> While this Note suggests ways to prevent GMOs and the companies that peddle them from destroying the fragile economic structure and populace of the developing world, it does not deny the precautionary opinion that GMOs may be no better for the developing world in the long run than poisonous pesticide.<sup>211</sup>

While consumers in the developed world have plenty of “no GMO,” locally farmed, and green options in the grocery store, consumers in the developing world do not have the same freedom of choice.<sup>212</sup> Too often they are at the mercy of their governments, and too often they suffer.<sup>213</sup> The suicide rate of Indian farmers has been sharply increasing since India has been allowing companies like Monsanto to sell GM seed to its farmers.<sup>214</sup> Hundreds of thousands of Zambians could have starved to death as a result of President Mwanawasa’s unequivocal stand against GM aid.<sup>215</sup> Clearly, neither the developing countries using GMOs nor the ones refusing them have found the balance or the solutions necessary to suit their na-

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207. Serjeant, *supra* note 32.

208. See generally RACHEL CARSON, *SILENT SPRING* (1962).

209. *Id.*

210. See PRINGLE, *supra* note 5.

211. *Id.*

212. *Id.* at 184-89; Sengupta, *supra* note 26.

213. *Id.*

214. Sengupta, *supra* note 26.

215. PRINGLE, *supra* note 5, at 184-89.

tional agricultural systems.<sup>216</sup> Unfortunately, with the global climate changing at the rate forecasted over the next fifty years,<sup>217</sup> the agricultural systems will be forced to change along with fluctuating temperatures, weather patterns, and land arability.

This Note asserts that the preservation of global diversity is, in the long run, an important goal for developing countries to keep in mind as they purchase seeds and accept aid from multinational corporations and developed countries. Reliance on a South-to-South transfer instead of a North-to-South transfer – of seeds, of technology, and of knowledge – might have the same long-term effect of preserving biodiversity with the added bonus of liberating the developing world from neo-colonialism and staving off future imperialism.<sup>218</sup> The developing world is right to fear “the new level of control over food production that the technology has put into the hands of a few international conglomerates.”<sup>219</sup> However, attempts to manipulate the developed world, such as President Mwanawasa’s demands for non-GMO seeds during Zambia’s recent famine, come across as being foolhardy ways to treat the impoverished populace and ineffective methods of combating global climate change while preserving indigenous biodiversity.<sup>220</sup>

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216. *Id.*; Sengupta, *supra* note 26.

217. MASLIN, *supra* note 39, at 83-101.

218. South-to-South transfers of capital is a growing portion of successful FDI, because South-to-South transfers tend to carry with them greater understanding of development-specific needs. If this trend continues, then it would be a good thing for the developing world if a South-to-South transfer of capital *and* knowledge continues to increase.

219. PRINGLE, *supra* note 5, at 5.

220. *Id.*