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Tara Kowalski

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TARA KOWALSKI*

I. INTRODUCTION

Florence Wambugu, a native African, spent years trying to improve production of sweet potatoes in Africa through traditional plant breeding. Sweet potatoes are a staple crop in Kenya, but viruses and pests plague this valuable food source.[1] After years of research, Wambugu realized she would be unable to develop virus-resistant potatoes using traditional plant breeding. Meanwhile, scientists in St. Louis, Missouri had already created virus-resistant crops through biotechnology.[2] These scientists shared their knowledge with Wambugu and supported her efforts to develop virus-resistant sweet potatoes. In 2001, Wambugu initiated field tests of genetically modified (GM) potatoes in Kenya. As her research progresses, Wambugu anticipates that Kenyan farmers will soon be able to grow virus-resistant sweet potatoes. Such a development could increase sweet potato yields by enough to feed an additional ten million people.[3] Although Wambugu's story demonstrates the important role that

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* J.D., University of California at Davis; B.A., University of California at San Diego. Special thanks to Professor Holly Doremus for her insightful comments and to the Loyola of Los Angeles International and Comparative Law Review staff for their helpful editing and suggestions.

1. Florence Wambugu, *Taking the Food Out of Our Mouths*, WASH. POST, Aug. 26, 2001, at B7.

2. *Id.*

3. *Id.*

biotechnology can play in developing countries, these countries may not have sufficient access to this life-saving technology.

This Article introduces some of the economic, political, and legal issues surrounding the use of biotechnology in developing countries. Part II describes how biotechnology can aid developing countries in eradicating hunger, poverty, and disease. Part III examines developing countries' current access to biotechnology. Part IV explores the primary barriers that impede developing countries' access to biotechnology: lack of infrastructure, capital, and trained scientists; lack of purchasing power; varying levels of protection for intellectual property (IP) rights; and general opposition to biotechnology. Part V discusses the current state of the law, specifically the Paris Convention for the Protection of Industrial Property, the General Agreement on Tariffs and Trade, the Agreement on Trade-Related Aspects of Intellectual Property Rights, the Convention on Biological Diversity, and U.S. House of Representatives Resolution 2912. Part VI argues that solutions to developing countries' limited access to biotechnology should be sought through government action rather than through corporate social responsibility.

II. ERADICATING HUNGER, POVERTY, AND DISEASE IN DEVELOPING COUNTRIES THROUGH BIOTECHNOLOGY

In developing countries, 840 million people currently suffer from malnutrition and 1.3 billion are afflicted with poverty.[4] Approximately 30 to 40% of the people in these countries cannot afford a diet consisting of the minimum amount of calories necessary to ensure a healthy and active life.[5] In addition, 250 million children are at risk of vitamin A deficiency, which can result in learning disabilities and irreversible blindness.[6] Population growth threatens to intensify hunger and poverty in developing countries. Global population is expected to double by

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4. CLIVE JAMES, GLOBAL STATUS OF COMMERCIALIZED TRANSGENIC CROPS: 2000 § 1 (Int'l Serv. for the Acquisition of Agri-biotech Application, Brief No. 21, 2000) *available at* http://www.isaaa.org.

5. J.E.W. BROERSE & T. VAN DE SANDE, TECHNOLOGY TRANSFER OR ALTERNATIVE TECHNOLOGY, *in* 55 ISSUES IN AGRICULTURAL BIOETHICS, EASTER SCHOOL SERIES IN AGRICULTURAL SCIENCES 361, 363 (B. Mepham, G. Tucker, and J. Wiseman, eds., 1995).

6. Gordon Rausser et al., *Public-private Alliances in Biotechnology: Can They Narrow the Knowledge Gaps Between Rich and Poor?* 25 FOOD POL'Y 500 (2000).

2050, with 90% of the growth occurring in developing counties.[7] Life-threatening diseases, such as malaria, hookworm, sleeping sickness, and schistosomiasis, also burden populations in developing countries.[8] Biotechnology offers hopes of solving these problems, primarily through GM crops and life-saving drugs.

GM crops can alleviate hunger and malnutrition in developing countries by increasing developing countries' crop yields. GM crops can increase crop yields because they can be genetically engineered to resist the destructive conditions prevalent in developing countries, such as insects, herbicides, viruses, drought, and soil acidity.[9] To date, scientists have created more than twenty plant species that are resistant to over thirty different viral diseases.[10] In addition, they have engineered herbicide-resistant canola, corn, cotton, maize, and soybean, [11] as well as insect-resistant cotton, maize, potatoes, rice, sugarcane, tobacco, tomatoes, and walnuts.[12] Although most of these crops are not staples for developing countries, the same technology can be applied to developing countries' crops.[13]

GM crops are more promising than traditional plant breeding at increasing crop yields because traditional plant breeding may be nearing its peak. Traditional plant breeding requires ample fresh water and arable land in order to increase crop yields. Unfortunately, both resources are decreasing rapidly. In fact, during the last twenty-five years, misuse and overuse have degraded more than one fourth of the world's agricultural lands, pastures, forests, and woodlands.[14] In addition, experts have warned that even with improved irrigation, the world needs 17% more fresh water than is currently available, in order to meet its food needs.[15] These figures suggest that traditional plant breeding alone cannot sufficiently increase crop yields. In contrast, GM

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7. Per Pinstrup-Anderson & Marc J. Cohen, *Modern Biotechnology for Food and Agriculture: Risks and Opportunities for the Poor*, 1999 AGRIC. BIOTECHNOLOGY AND THE POOR: PROCEEDINGS OF THE INT'L CONF., WASH. D.C. 159, 160.

8. Jeffrey Sachs, *Helping the World's Poorest*, ECONOMIST, Aug. 14, 1999.

9. *Id.*

10. Luis Herrera-Estrella, *Genetically Modified Crops and Developing Countries*, 124 PLANT PHYSIOLOGY 923 (2000).

11. *See* JAMES, *supra* note 4, at 9–11.

12. Herrera-Estrella, *supra* note 10.

13. *Id.*

14. *Id.*

15. *Id.*

crops can be genetically engineered to survive drought and infertile soil. Therefore, they may be more effective than traditional plant breeding at improving developing countries' crop yields.

GM crops can also reduce hunger in developing countries by preventing crops from spoiling before human consumption. Many developing countries lose substantial amounts of tropical fruit because they lack the necessary storage conditions and transportation systems to deliver the fruit before spoilage.[16] Biotechnology can alleviate this problem by producing crops that are genetically modified to delay ripening. In fact, scientists have already created a delayed-ripening tomato, and may be able to create delayed-ripening tropical fruits.[17] Through the use of such GM crops, developing countries would be able to increase and preserve crop yields.

Scientists can also use biotechnology to treat vitamin deficiencies and life-threatening diseases in developing countries. For example, scientists are currently able to enhance crops with vital nutrients, such as vitamin A and iron.[18] In addition, recent biotechnological advances, such as mapping the malaria genome, suggest that scientists may be able to create vaccines for malaria and other diseases.[19]

Finally, developing countries can use biotechnology to boost their economic growth and alleviate poverty. GM crops offer an opportunity to improve agricultural programs in developing countries, which can lead to increased employment opportunities, greater self-sufficiency, and heightened economic stability.[20] These possibilities are particularly important, considering that most developing countries have a sizable agriculture sector and some have agriculture-based economies. In Ethiopia, for example, agriculture "accounts for half of the Gross Domestic Product (GDP), 90% of exports, and 80% of total employment."[21] In India, agriculture accounts for 25% of the GDP and 60% of total

16. *Id.* at 923.

17. *Id.*

18. Miguel A. Altieri, *No: Poor Farmers Won't Reap the Benefits*, 119 FOREIGN POL'Y 123, 123 (2000).

19. Sachs, *supra* note 8, at 17–18.

20. *See* Mark Strauss, *When Malthus Meets Mendel*, 119 FOREIGN POL'Y 105, 108 (2000).

21. CENTRAL INTELLIGENCE AGENCY, THE WORLD FACTBOOK (2002), *available at* http://www.odci.gov/cia/publications/factbook/geos/et.html (last visited Apr. 29, 2003).

employment.[22] Since these countries continue to lose arable land and suffer from periods of drought,[23] GM crops that are immune to these conditions could help stabilize and improve these countries' economies. With poverty being the leading cause of malnutrition, improved economies in developing countries could also help solve their hunger problems.

Biotechnology promises to increase the quantity and quality of food and drugs, which could alleviate hunger, vitamin deficiencies, and disease in developing countries. In addition, biotechnology may promote economic growth in developing countries. But will developing countries have access to the technology?

III. STATISTICS ON DEVELOPING COUNTRIES' ACCESS TO BIOTECHNOLOGY

Developing countries currently lack sufficient access to biotechnology in two respects. First, they do not have an adequate quantity of biotechnology to address their needs. Second, developed countries, which conduct most biotechnology research and development (R&D), create products for developed markets. Therefore, most current biotechnology does not address problems that are unique to developing countries.

The United States is currently the world leader in both the production and consumption of biotechnology.[24] U.S. international patent filings demonstrate its dominance in the area of biotechnology R&D.[25] In the first half of the 1990s, the United States held priority of 63% of international biotechnology patents and 59% of the most highly cited biotechnology inventions.[26] Federal grants and private industry are the two primary sources of funding for biotechnology R&D in the United States. The United States provides more funding for biotechnology R&D than any other government in the world. Additionally, the private sector spends $18 billion a year on biotechnology R&D.[27]

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22. *Id.*
23. *See id.*
24. John M. Golden, *Biotechnology, Technology Policy, and Patentability: Natural Products and Invention in the American System*, 50 EMORY L.J. 101, 107 (2001).
25. *Id.*
26. *Id.* at 107 n.27.
27. *Id.* at 107.

The disparity in access to biotechnology is illustrated by the global distribution of GM crops. Between 1996 and 2000, developed countries grew 85% of GM crops.[28] Although developed countries possess most of the global GM crops, developing countries' share of GM crops has been steadily increasing. For example, from 1997 to 2000, developing countries' share of GM crops increased from 14 to 24%.[29]

Despite increasing ownership, developing countries still lack access to a majority of GM crops. In 2000, thirteen countries grew GM crops—eight developed countries and five developing countries.[30] The United States, Canada, Argentina and China grew 99% of the global GM crop area.[31] Of these countries, the United States grew 68% of the global GM crop area.[32] Argentina, Canada, and China grew 23%,[33] 7%, and 1%, respectively.[34] These statistics demonstrate that most developing countries continue to lack access to GM crops.

Since developed countries dominate biotechnology R&D, most biotechnology advances do not address the needs of developing countries. For example, most GM crops are not staple foods, like rice and cassava, in developing countries.[35] Rather, GM crops, like corn and cotton, are better suited for the U.S. and European markets.[36] In fact, the four major GM crops grown globally are soybean, corn, canola, and cotton.[37] Soybean, the leading GM crop, constituted 58% of the global area of GM crops in 2000.[38] In addition, most GM crops are genetically modified to increase crop yields in temperate zones, such as Europe and the United States.[39] Developing countries, however, need biotechnology advances that are adapted to their native environments. The technology should be geared to increase crop

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28. JAMES, *supra* note 4, at 3.
29. *Id.*
30. *Id.* at 6.
31. *Id.*
32. *Id.*
33. *Id.*
34. *Id.*
35. Strauss, *supra* note 20, at 110.
36. *Id.*
37. JAMES, *supra* note 4, at 12.
38. *Id.* at 7.
39. *Cf.* Herrera-Estrella, *supra* note 10, at 924; Sachs, *supra* note 8, at 17–20 (stating that the world's richest countries, i.e., developed countries, lie in temperate zones and GM crops are genetically modified to increase crop yields in developed countries).

yields in tropical and desert zones and engineered to be drought-resistant, tolerable of saline soils and resistant to native diseases and pests.[40]

The disparity between R&D aimed at developed and developing countries needs is best illustrated by comparing the budgets allocated to the two areas of research. Monsanto, a U.S. biotechnology company that develops GM crops, allocates the overwhelming majority of its budget toward improving temperate-zone agriculture.[41] Monsanto is only one of the many biotechnology companies that focus on temperate-zone agriculture. Yet, Monsanto's R&D budget alone is twice the size of the R&D budget for the entire worldwide network of public-sector tropical research institutes.[42] This disparity demonstrates that R&D inadequately addresses developing countries' unique agricultural needs.

Additionally, most medical-related biotechnology R&D fails to address developing countries' needs because it targets the ailments of developed countries, such as cancer and cardiovascular disease.[43] Substantially less R&D is directed at ailments common to developing countries, such as malaria, hookworm, sleeping sickness, and schistosomiasis.[44] For example, the National Cancer Institute (NCI) allocated $3.76 billion to its budget for cancer research in 2001.[45] By contrast, NCI spends only $80 million per year on malaria research. Additionally, biotechnological advances point to the potential of a malaria vaccine.[46] Yet, of the worldwide expenditures for biotechnology R&D, only a small fraction is spent on vaccine research.[47]

Developing countries could benefit greatly from biotechnology's promise of increased quantity and quality of food and drugs. However, the above statistics show that developing countries currently lack sufficient access to biotechnology,

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40. *See* Herrera-Estrella, *supra* note 10, at 923; Sachs, *supra* note 8, at 17, 20.
41. Sachs, *supra* note 8, at 17, 19.
42. *Id.*
43. Sachs, *supra* note 8, at 17, 18.
44. *Id.*
45. National Cancer Institute, *Message from the Director to NCI Grant Recipients Regarding the FY 2001 Grant Funding Policy*, *at* http://www.cancer.gov/scienceresources/announcements/2001_funding_policy.htm (Mar. 1, 2001).
46. Sachs, *supra* note 8, at 17–19.
47. *Id.* at 17, 19.

particularly in areas that would address these countries' unique needs.

IV. BARRIERS TO BIOTECHNOLOGY IN DEVELOPING COUNTRIES

Developing countries have limited access to biotechnology for four main reasons. First, varying levels of IP protection affect these countries' access to biotechnology. Strong IP protection renders products too expensive for developing countries and prevents researchers from gaining access to basic knowledge.[48] Conversely, weak IP protection discourages technology transfer, foreign investment, and local creation.[49] Second, developing countries lack the infrastructure,[50] capital,[51] and pool of trained scientists necessary to develop their own biotechnology products.[52] Third, the private industry, which conducts the most biotechnology R&D, is motivated by profit and sees no market in developing countries.[53] Finally, anti-biotechnology groups object to increasing developing countries' access to biotechnology.[54]

A. The Role of Intellectual Property Protection

IP rights present a unique challenge to developing countries because patents can both hinder and further developing countries' access to biotechnology. Patents give patent-holders a monopoly on their technology for the term of the patent, which is typically twenty years.[55] However, patent holders must publicly disclose information about the technology, including how to construct and utilize it.[56] This disclosure requirement allows the public to implement the technology as soon as the patent expires. The primary justification for patent rights is promotion of scientific[57] and technological progress.[58]

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48. *See* ROHINI ACHARYA, THE EMERGENCE AND GROWTH OF BIOTECHNOLOGY: EXPERIENCES IN INDUSTRIALIZED AND DEVELOPING COUNTRIES 56 (1999).
49. Amy E. Carroll, *Not Always the Best Medicine: Biotechnology and the Global Impact of U.S. Patent Law*, 44 AM. U. L. REV. 2433, 2464 (1995).
50. ACHARYA, *supra* note 48, at 57.
51. *Id.*
52. *Id.*
53. Carroll, *supra* note 49, at 2463.
54. *Id.*
55. *Id.* at 2443 n.60.
56. *See id.* at 2447.
57. *Id.* at 2444 n.63.
58. *See generally id.* at 2439.

Weak IP protection hinders developing countries' access to biotechnology in two principal ways. First, weak IP protection increases piracy, thereby discouraging developed countries from exporting their biotechnology products to developing countries.[59] For example, a 1986 International Trade Commission (ITC) study estimated that worldwide losses due to inadequate IP protection were approximately $61 billion.[60] The ITC study further showed that these losses caused U.S. industry to cut back employment and R&D in developing countries.[61] Second, weak IP protection obstructs domestic development in developing countries. For example, weak IP protection discourages foreign investment and technology transfer.[62] Additionally, it chills domestic creation by decreasing incentives to invent.[63] Thus, in many ways, weak IP protection perpetuates developing countries' lack of biotechnology.

Although strong IP protection may increase exports, foreign investment, technology transfer, domestic creation, and proprietary rights, it also limits developing countries' access to biotechnology in two important ways. First, it increases the cost of biotechnology because patent holders have no competitors during the term of the patent.[64] Second, it restricts domestic and foreign researchers' access to the basic science necessary to conduct R&D that will benefit developing countries.[65] Thus, strong IP protection can actually impede development in developing countries.

B. Lack of Infrastructure, Capital, and Trained Scientists

Biotechnology has been characterized as "one of the most capital and research intensive industries in the history of civilian manufacturing."[66] The cost of introducing a new GM crop to market can range from $30 to $50 million.[67] Similarly, bringing biotechnology-based pharmaceuticals to market costs

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59. *Id.* at 2470.
60. Deborah Mall, *The Inclusion of a Trade Related Intellectual Property Code Under General Agreement on Tariffs and Trade (GATT)*, 30 SANTA CLARA L. REV. 265, 267 (1990).
61. Mall, *supra* note 60, at 267–68.
62. Carroll, *supra* note 49, at 2469.
63. *Id.*
64. *See generally id.* at 2443 n.59.
65. *See id.* at 2471.
66. Strauss, *supra* note 20, at 108.
67. *Id.*

approximately a quarter of a billion dollars and takes four to seven years.[68] Developing countries lack the government funding and capital markets necessary to fund expensive biotechnology R&D. For example, in 1988, India's total R&D budget was $2.5 million.[69] This is less than 5% of the capital needed to bring a new GM crop to market, and less than 1% of the capital needed to bring a new pharmaceutical to market.

Even if developing countries had adequate R&D funding, they lack the infrastructure necessary to support biotechnology development, including regulations, facilities, equipment, transportation, telecommunications, training, distribution channels, and links between researchers and the industry.[70] Developing countries also lack trained scientists. For example, in 1988, India had only 3.12 researchers per 10,000 people.[71] Developing countries lack trained scientists for three reasons. First, their national curricula, until very recently, did not include biotechnology courses.[72] Second, they lack strength in basic science and technology.[73] Finally, they have limited resources to invest in training.[74] Some countries have attempted to solve these problems by sending students abroad for training or by collaborating with foreign universities and training institutions. However, many countries cannot afford to do this. Plus, students who train abroad often do not return to their native countries because the foreign countries offer better resources.[75]

Because developing countries lack capital, infrastructure, and trained scientists, they are dependent on developed countries for their biotechnology needs.[76] However, profit motives often hinder developed countries from addressing those needs.

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68. Carroll, *supra* note 49, at 2476.
69. ACHARYA, *supra* note 48, at 61.
70. *Id.* at 54–58.
71. *Id.* at 61.
72. *Id.* at 63.
73. *Id.* at 64.
74. *Id.*
75. *See id.* at 63–65.
76. *See generally* Ismael Serageldin, *Biotechnology and Food Security in the 21st Century*, 285 SCI. 387 (1999).

C. Privatization of Biotechnology R&D and the Biotechnology Industry's Profit Motive

Three main players dominate biotechnology R&D: private companies, governments, and universities.[77] Although each player conducts its own research, governments and private companies often supplement their research through funding to universities.[78] Generally, each player has different motives. A government's primary motive is to advance the national interest in scientific and technological progress.[79] A university's primary motive is to conduct front-line science, which will increase its prestige and ability to secure grants.[80] Conversely, private companies seek mainly to generate profits.[81]

Today, private companies conduct most of the world's biotechnology R&D,[82] accounting for 80% of all international biotechnology research.[83] Since this industry's primary motivation is profit, R&D investment is unlikely unless a viable market exists for the resulting product. The enormous expense and time-commitment associated with biotechnology R&D exacerbates the private industry's bias towards profit maximization.[84] Due to the extreme poverty of developing countries, the biotechnology industry does not perceive these countries as commercial prospects.[85] Accordingly, the private industry creates few biotechnology products aimed at developing countries' needs.[86]

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77. Golden, *supra* note 24, at 132.
78. *Id.*
79. *Id.*
80. *Id.* at 134. In the early 1980s, Congress attempted to promote interaction between the private companies, governments, and universities by passing legislation that encouraged a "cooperative model" of R&D. For example, the Stevenson-Wydler Act required federal laboratories to facilitate technology transfer to the industry. In addition, the Bayh-Dole Act allowed government grantees and contractors to patent and sell licenses to their inventions. Similarly, the Trademark Clarification Act of 1984 and the Federal Technology Transfer Act of 1986 permitted government owned and operated laboratories to enter Cooperative Research and Development Agreements with nonfederal entities and required federal employees to receive a portion of patent royalties. These government initiatives resulted in a trend towards public-private alliances. *Id.* at 119–22.
81. *Id.* at 133.
82. Strauss, *supra* note 20, at 110.
83. *Id.*
84. *See id.*
85. *See* Herrera-Estrella, *supra* note 10, at 924.
86. *See id.*

This is particularly problematic for developing countries because the private industry conducts most biotechnology R&D.[87]

Some biotechnology companies do assist developing countries in gaining access to biotechnology. For example, Monsanto has entered into agreements to develop virus-resistant crops with government agricultural research institutes in Kenya and Mexico.[88] In South Africa, Monsanto has also established a farmer's academy, which teaches students the technical and business aspects of farming.[89] In addition, several nonprofit organizations help developing countries utilize biotechnology. For example, over the past fifteen years, the Rockefeller Foundation has funded approximately $100 million of plant biotechnology research and scientist training in developing countries.[90] These philanthropic companies and nonprofit organizations are removing barriers to biotechnology in developing countries. Such companies and organizations are rare, however, and their budgets pale in comparison to the R&D budgets allocated for products in developed countries.[91]

D. Biotechnology Opponents

Some biotechnology advocates blame biotechnology opponents for developing countries' limited access to biotechnology. For example, Dr. John Moyo, a Tanzanian professor who works with the United Nation's Food and Agriculture Organization stated, "[a]mong the many stumbling blocks confronting scientists and policy makers in developing countries is the unprecedented opposition to genetically modified organisms by some elements of society, particularly those who have never had to sleep on an empty stomach."[92] Wambugu expressed similar beliefs, stating, "anti-biotechnology

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87. Strauss, *supra* note 20, at 110; Herrera-Estrella, *supra* note 10, at 924; Sachs, *supra* note 8, at 18.

88. Pinstrup-Anderson & Cohen, *supra* note 7, at 163.

89. MONSANTO FUND, GLOBAL CONTRIBUTIONS REPORT 4 (2000).

90. Rockefeller Foundation, *Crop Biotechnology: Benefits, Risks and Ownership*, *at* http://www.rockfound.org/display.asp?context=1&Collection=4&DocID=141&Preview (Sept. 16, 2002).

91. *See* Pinstrup-Anderson & Cohen, *supra* note 7, at 164 (comparing the Rockefeller Foundation's $7.4 million agricultural program in developing countries in 1998 to Monsanto's $1.3 billion budget for agricultural research that same year).

92. *Agriculture: Member States Should be More Open to GMOS, Says Fischler*, EUR. REP. 470, Sept. 19, 2002, *available at* 2001 WL 26061565.

protesters . . . would deny developing countries like my home, Kenya, the resources to develop a technology that can help alleviate hunger, malnutrition and poverty."[93]

Biotechnology opponents fear that GM crops will increase the risk of famine by threatening biological diversity.[94] Reduced biological diversity in developing countries is particularly problematic because most of the world's biological diversity is found in developing countries. Opponents also fear that GM crops are unsafe, and that farmers in developing countries will become dangerously dependent on them.[95]

Opponents have launched anti-biotechnology campaigns in order to conduct public protests and communicate their concerns. For example, in April 2001, protesters set fire to Monsanto's facilities in Italy.[96] In July 2001, thirty demonstrators from Thailand's provinces protested the use of GM crops by dumping garbage bins full of GM papayas, tomatoes, and corn on the steps of the U.N. building.[97] Further, in August 2001, hundreds of protesters in the Philippines destroyed GM corn grown by Monsanto.[98]

It is unclear whether opposition to biotechnology actually impedes developing countries' access to biotechnology. However, such opposition should be considered in assessing the barriers to biotechnology in developing countries, along with three other factors: lack of infrastructure, capital, and trained scientists; privatization of biotechnology R&D and the industry's profit motives; and IP rights. International treaties and national legislation address some aspects of these barriers.

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93. Florence Wambugu, *Protesters Don't Help: Africa Needs Biotech to Combat Hunger*, TULSA WORLD, Nov. 18, 2001, at G3.

94. Altieri, *supra* note 18, at 123–24.

95. *Id.* at 123.

96. *See Fire at Monsanto Plant in Italy, Company Blames Arsonists*, AGENCE FRANCE-PRESSE, April 3, 2001, *available at* 2001 WL 2376491.

97. *British Deputy PM Defends Genetically Modified Crops*, AGENCE FRANCE-PRESSE, *available at* http://www.monsanto.co.uk/new/ ukshowlib.phtml?uid=5383 (July 10, 2001).

98. Kitta MacPherson, *A Rain of Hope for the Starving: Opponents Fear the Consequences of Genetically Engineered Hybrid*, STAR-LEDGER, Jan. 6, 2000, *available at* 2002 WL 3159013.

V. CURRENT STATE OF THE LAW

There is no international law that requires developed countries to share their biotechnology with developing countries. However, some international treaties and certain U.S. legislation address issues relevant to biotechnology and technology transfer in developing countries. For example, the Paris International Convention (Paris Convention), the General Agreement on Tariffs and Trade (GATT), and the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS) address international IP issues in the context of trade. Similarly, the Convention on Biological Diversity addresses international IP issues in the context of conserving biological diversity.[99] Furthermore, the U.S. Congress is currently considering House of Representatives Resolution 2912, a bill that would create incentives for U.S. institutions to transfer technology to developing countries.[100]

A. Paris, GATT, and TRIPS

The first global discussion of patent law occurred in 1883 at the Paris International Convention for the Protection of Industrial Property.[101] The Paris Convention established two basic principles: national treatment and international priority.[102] The principle of national treatment requires member countries to provide nationals of other member countries with patent rights at least as good as they give their own nationals.[103] The principle of international priority allows patent applicants, who file in a Paris Convention country, to use the filing date as a priority date in every other member country, provided the second filing occurs within twelve months of the first filing.[104] Although the Paris Convention established national treatment and international priority, it contains few provisions concerning minimum rights. For example, it does not specify the duration or subject matter of patents. In fact, it does not even require countries to protect

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99. Convention on Biological Diversity, June 4, 1993, art. 1, S. TREATY Doc. No. 103–20.

100. H.R. 2912, 107th Cong. §2 (2001).

101. *See* Mall, *supra* note 60, at 266 n.8.

102. *See* Paris Convention for the Protection of Industrial Property, July 14, 1967, arts. 2, 4, 53 Stat. 1748, 828 U.N.T.S. 305 [hereinafter Paris Convention].

103. Paris Convention, *supra* note 102, art. 2, 53 Stat. at 1748, 828 U.N.T.S. at 305.

104. *Id.* art. 4, 53 Stat. at 1748, 828 U.N.T.S. at 305.

patents. Moreover, the Paris Convention lacks enforcement mechanisms and dispute resolution methods.[105]

In 1967, the World Intellectual Property Organization (WIPO) was established to enforce international IP agreements, including the Paris Convention.[106] Developed countries, however, were dissatisfied with WIPO's enforcement.[107] Thus, they sought to include trade related IP rights in GATT. Their efforts resulted in the incorporation of the Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS Agreement) into GATT, thus subjecting TRIPS to GATT's dispute resolution and enforcement mechanisms.[108]

The TRIPS Agreement establishes a minimum level of IP protection which member countries must implement. For example, members must make patents "available for any inventions, whether products or processes, in all fields of technology, provided they are new, involve an inventive step, and are capable of industrial application."[109] Additionally, members must recognize patent holders' exclusive rights to make, use, offer for sale, sell, and import their products or processes.[110] These provisions, however, create problems for developing countries, which lack the resources necessary to implement the required minimum levels of IP protection. In addition, some developing countries depend on inexpensive, generic versions of patented drugs to treat health problems, such as AIDS.[111]

TRIPS recognizes these problems and addresses them through three provisions in a declaration at the World Trade Organization (November WTO declaration) in November 2001. First, the TRIPS Agreement gives the world's least developed countries until 2005 to implement its minimum levels of IP protection.[112] In November 2001, this deadline was extended to

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105. *See id.*

106. Carroll, *supra* note 49, at 2457.

107. *Id.* at 2458.

108. Mall, *supra* note 60, at 279.

109. Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, art. 27, *reprinted in* INTERNATIONAL TREATIES ON INTELLECTUAL PROPERTY 599 (Marshall A. Leaffer ed., BNA Books 2d ed. 1997) [hereinafter TRIPS Agreement].

110. TRIPS Agreement, *supra* note 109, art. 28.

111. Tina Rosenberg, *Look at Brazil*, N.Y. TIMES MAG., Jan. 28, 2001, at 28.

112. TRIPS Agreement, *supra* note 109, art. 66.

2016.[113] Second, TRIPS states that "[d]eveloped country Members shall provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to least-developed country Members in order to enable them to create a sound and viable technological base."[114] The November WTO declaration reaffirmed this requirement.[115] Finally, TRIPS allows countries to grant compulsory licenses for patented products and processes "in the case of a national emergency or other circumstances of extreme urgency."[116] Compulsory licenses allow parties to make certain uses out of patented products and processes without the patent holder's permission, provided that the parties pay the patent holder "adequate remuneration."[117] TRIPS, however, does not define "adequate remuneration."[118]

Signatories to TRIPS are reluctant to grant compulsory licenses due to fear of trade sanctions.[119] The November WTO declaration, however, makes clear that TRIPS permits compulsory licenses.[120] Specifically, the declaration states that a "[m]ember has the right to grant compulsory licenses" as well as "the right to determine what constitutes a national emergency or other circumstances of extreme urgency" such as "public health crises."[121]

Most developing countries are signatories to GATT and TRIPS.[122] Developed countries, which are responsible for most of the biotechnology R&D, such as the United States, Canada, and the European Union are also signatories to GATT and TRIPS. Therefore, GATT and TRIPS are particularly relevant to developing countries' access to biotechnology.

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113. Declaration on the TRIPS Agreement and Public Health, WT/MIN(01)/DEC/2, *at* http://www.wto.org/english/thewto_e/minist_e/min01_e/ min01_e.htm., (Nov. 20, 2001) [hereinafter TRIPS Declaration].

114. TRIPS Agreement, *supra* note 109, art. 66.

115. TRIPS Declaration, *supra* note 113.

116. TRIPS Agreement, *supra* note 109, art. 31(b).

117. TRIPS Agreement, *supra* note 109, art. 31(h).

118. *See* Rosenberg, *supra* note 111, at 31.

119. *Id.* at 31, 52.

120. TRIPS Declaration, *supra* note 113.

121. *Id.*

122. INTERNATIONAL TREATIES ON INTELLECTUAL PROPERTY 587 (Marshall A. Leaffer ed., BNA Books 2d ed. 1997).

B. Convention on Biological Diversity

While TRIPS, GATT, and the Paris Convention address international IP issues in the context of trade, the Convention on Biological Diversity (Biodiversity Convention) addresses international IP issues in the context of preserving biological diversity.[123] The Biodiversity Convention established strategies, plans and programs to conserve biological diversity and its sustainable use. It also addresses IP issues affecting developing countries.[124] In Article 15, the Biodiversity Convention recognizes countries' proprietary rights to their natural resources:

> Recognizing the sovereign rights of States over their natural resources, the authority to determine access to genetic resources rests with the national governments and is subject to national legislation.... Access, where granted shall be on mutually agreed terms and subject to the provisions of this Article. Access to genetic resources shall be subject to prior informed consent of the Contracting Party providing such resources, unless otherwise determined by that Party.... Each Contracting Party shall take legislative, administrative or policy measures, as appropriate ... with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources. Such sharing shall be upon mutually agreed terms.[125]

This provision is significant because many of the natural resources used in biotechnology products are found in developing countries.

Article 16 requires developed countries to transfer technology to developing countries:

> Each Contracting Party, recognizing that technology includes biotechnology, and that both access to and transfer of technology among Contracting Parties are essential elements for the attainment of the objectives of this Convention, undertakes subject to the provisions of this Article to provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic

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123. Convention on Biological Diversity, June 4, 1993, art. 1, S. TREATY DOC. NO. 103-20.

124. *Id.* art. 6.

125. *Id.* art. 15.

> resources and do not cause significant damage to the environment.... In the case of technology subject to patents and other intellectual property rights, such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights.... Each Contracting Party shall take legislative, administrative or policy measures, as appropriate, with the aim that Contracting Parties, in particular those that are developing countries, which provide genetic resources are provided access to and transfer of technology which makes use of those resources, on mutually agreed terms, including technology protected by patents and other intellectual property rights, where necessary....[126]

Articles 15 and 16 of the Biodiversity Convention are enforceable through Article 27, which provides for optional recourse to the International Court of Justice and/or arbitration, and mandatory recourse, at the request of one party to a dispute, to nonbinding conciliation.[127]

On its face, the Biodiversity Convention is extremely promising for developing countries. However, in practice it has done little to increase developing countries' access to biotechnology for two major reasons. First, the United States, which dominates biotechnology R&D, signed the convention on June 4, 1993, but has yet to ratify it. Second, the convention's provisions are ambiguous. For example, signatories must take legislative, administrative, and policy measures "as appropriate" and must share the results of R&D "in a fair and equitable way."[128] These vague phrases makes enforcement of the convention difficult.[129]

C. U.S. House of Representatives Resolution 2912

The United States has attempted to increase developing countries' access to biotechnology through legislation, such as U.S. House of Representatives Resolution 2912 (H.R. 2912). H.R. 2912 authorizes the National Science Foundation (NSF) to establish a grant program for partnerships between U.S. research

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126. *Id.* art. 16.
127. *Id.*
128. *Id.* art. 15, sec. 7.
129. Chris Wold, *The Futility, Utility, and Future of the Biodiversity Convention*, 9 COLO. J. INT'L ENVTL. L. & POL'Y 1, 7 (1998).

organizations and research organizations in developing countries for research on plant biotechnology.[130] Specifically, H.R. 2912 authorizes the appropriation of $6 million to the NSF for fiscal year 2002, $9 million for fiscal year 2003, and $9 million for fiscal year 2004.[131]

H.R. 2912 further specifies that the NSF shall award grants to institutions of higher education or nonprofit organizations to establish research partnerships with developing countries.[132] The resolution further specifies that these research partnerships shall focus on developing plant biotechnology that targets developing countries' needs.[133] H.R. 2912 also explicitly condones the use of the grant money for the following: conducting basic genomic research on crops in developing countries; developing plant biotechnology that will advance and expedite the development of improved cultivars, including those that are pest-resistant, produce increased yield, or increase stress-tolerance; developing technologies to produce pharmaceutical compounds, such as vaccines and medications, in plants that can be grown in developing countries; and researching plant biotechnology's impact on the social, political, and economic conditions in developing countries.[134]

H.R. 2912 would improve developing countries' access to biotechnology. However, it is unclear whether Congress will pass it. The resolution was introduced on September 20, 2001[135] when it was immediately assigned to the House Committee on Science. To date, no further action has been taken.[136]

VI. SHIFTING THE DISCUSSION AWAY FROM CORPORATE SOCIAL RESPONSIBILITY AND TOWARD GOVERNMENT ACTION

Some commentators focus on the social responsibility of private companies to transfer biotechnology to developing countries;[137] however, this may not be an appropriate role for corporations. Corporations have a legal duty to maximize wealth

130. H.R. 2912, 107th Cong. (2001).
131. *Id.* § 3.
132. *Id.* § 2(a).
133. *See id.* § 2(c).
134. *Id.* § 2(c).
135. H.R. 2912, 107th Cong. (2001).
136. *Id.*
137. *See* Strauss, *supra* note 20, at 105; *see also* Rosenberg, *supra* note 111, at 26; Sachs, *supra* note 8.

for their shareholders.[138] In some cases, this duty may conflict with the notion that corporations should transfer technology to developing countries. For example, Monsanto's philanthropic projects in developing countries provide some economic benefits to Monsanto's shareholders, such as company goodwill, advertising, and new markets.[139] If the economic costs of Monsanto's philanthropic projects outweigh these economic benefits, however, then Monsanto's board of directors may have breached their duty to their shareholders. Of course, the shareholders are unlikely to prevail in a suit against the directors because the costs and benefits are difficult to quantify and the directors are protected by the business judgment rule. However, this example demonstrates that corporations' duties are to their shareholders, not the general welfare of society. Accordingly, we should not look to the biotechnology industry to increase developing countries' access to biotechnology. Instead, we should look to government.

The U.S. government can increase developing countries' access to biotechnology in two important ways. First, it can ratify the Biodiversity Convention and satisfy its obligations under the Convention. These obligations include respecting developing countries' proprietary rights to their genetic resources, sharing R&D with developing countries, and transferring technology to developing countries.[140] Because the United States conducts most of the world's biotechnology R&D, developing countries would benefit substantially if the United States adopted and fulfilled its obligations under the Biodiversity Convention.

Second, the United States can provide organizations and corporations financial incentives to build infrastructure, transfer technology, train scientists, and invest in developing countries. For example, Congress should pass H.R. 2912. Additionally, public agencies should offer similar grants to institutions that assist developing countries in building infrastructure, training scientists, and conducting R&D. The U.S. Congress should also offer tax breaks to corporations, like Monsanto, that establish programs to further developing countries' access to biotechnology.

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138. CHARLES R.T. O'KELLEY & ROBERT B. THOMPSON, CORPORATIONS AND OTHER BUSINESS ASSOCIATIONS CASES AND MATERIALS, 261 (1999).

139. *See* MONSANTO FUND, GLOBAL CONTRIBUTIONS REPORT (2000).

140. *Id.*

To ensure the efficacy of these assistance programs, the U.S. Congress should prioritize building infrastructure and training scientists. Then, they should concentrate on assisting developing countries with implementing simple biotechnology techniques that focus on the crops and drugs most important to each individual country. Financial incentives and tax breaks are preferable to direct foreign aid because they offer permanent changes. Developing countries with biotechnology infrastructure and trained scientists will no longer be dependent on developed countries for their biotechnology needs.

Taxpayers may oppose using public funds to assist developing countries. However, TRIPS states that the United States shall provide its industries with incentives to promote technology transfer to developing countries. Therefore, if the United States does not use public funds to incentivize technology transfer to developing countries, it may be in violation of TRIPS.

VII. CONCLUSION

Biotechnology offers hopes of eliminating hunger, poverty, and disease in developing countries. These countries, however, lack sufficient access to biotechnology because they lack the resources to produce it and the money to buy it. The biotechnology industry, which controls most of the biotechnology R&D, will not address developing countries' needs because corporations' role in society is to maximize their shareholders' wealth, and developing countries are not a profitable market. Therefore, it is futile to look to the biotechnology industry to increase developing countries' access to biotechnology. Instead, we must look to our government which can further the interests of developing countries by ratifying treaties, like the Biodiversity Convention, and passing legislation, like H.R. 2912.