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# Trade Liberalization, Food Security, and the Environment: The Neoliberal Threat to Sustainable Rural Development

Carmen G Gonzalez, *Seattle University*



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# Trade Liberalization, Food Security, and the Environment: The Neoliberal Threat to Sustainable Rural Development

Carmen G. Gonzalez\*

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## Introduction

According to the UN Food and Agriculture Organization (FAO), there are 852 million undernourished people in the world, of whom approximately 815 million reside in developing countries.<sup>1</sup> Progress in hunger reduction has slowed in recent years, and the number of undernourished people is growing in most of the developing world.<sup>2</sup> Rampant hunger and malnutrition impair the economic performance of individuals, households, and entire nations,<sup>3</sup>

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<sup>1</sup> U.N. FOOD & AGRIC. ORG., THE STATE OF FOOD INSECURITY IN THE WORLD 2004 6 (July 2004), available at <http://www.fao.org> (last visited Dec. 29, 2004) [hereinafter FAO, STATE OF FOOD INSECURITY 2004].

<sup>2</sup> U.N. FOOD & AGRIC. ORG., THE STATE OF FOOD INSECURITY IN THE WORLD 2003 4 (July 2003), available at [http://www.fao.org/documents/show\\_cdr.asp?url\\_file=/DOCREP/006/j0083e00.htm](http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/006/j0083e00.htm) (last visited Sept. 29, 2004) [hereinafter FAO, STATE OF FOOD INSECURITY 2003].

<sup>3</sup> See U.N. FOOD & AGRIC. ORG., THE STATE OF FOOD INSECURITY IN THE WORLD 2002, *Undernourishment Around the World* 8 (July 2002), available at <http://www.fao.org/DOCREP/005/y7352e/y7352e00.htm> (last visited Sept. 29, 2004) [hereinafter FAO, STATE OF FOOD INSECURITY 2002]. For example, anemia, stunted growth, iodine deficiency, and iron deficiency have reduced GDP by several percentage points in countries as diverse as Bolivia, Nicaragua, India, Pakistan, and South Africa. *Id.* at 8-9.

and can lead to political instability and civil strife.<sup>4</sup> Environmental degradation has depressed agricultural productivity,<sup>5</sup> and is increasingly recognized as a major factor contributing to both food insecurity and conflict.<sup>6</sup> Natural resource degradation through unsustainable farming methods can exacerbate poverty, produce large-scale migrations, sharpen social cleavages, weaken institutions, and result in outbreaks of violent conflict.<sup>7</sup> For example, one of the underlying causes of the conflict in the Darfur region of Sudan was the drought and desertification that prompted Arab herders to encroach upon African tribal lands.<sup>8</sup> It is important to recognize that food security and ecological sustainability are closely intertwined and that both are critical to sustainable rural development.

This article examines the impact of the neoliberal policy prescriptions of the World Trade Organization (WTO), the World Bank, and the International Monetary Fund (IMF) on hunger and natural resource degradation in the developing world. The neoliberal economic model generally consists of trade liberalization, slashing of social spending, privatization of industry and public services, deregulation, and unrestricted movement of capital.<sup>9</sup> While mindful of the various elements that comprise the neoliberal model, this article focuses specifically on the food security and environmental consequences of trade liberalization in the agricultural sector.

The article's conclusions are two-fold. First, "free trade" is a misnomer. The neoliberal trade regime institutionalizes a double standard that permits protectionism in developed countries while requiring developing countries to open their markets to highly subsidized foreign competition. This double standard reinforces pre-existing patterns of trade and production that

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<sup>4</sup> See *id.*, *Toward the Summit Commitments*, at 4. Food insecurity and conflict often coincide. According to some analysts, poverty and underdevelopment, which are closely linked to food insecurity, make countries more prone to conflict. Indeed, food insecurity and conflict often share a common set of risk factors, including degradation and unequal access to natural resources, repressive political systems, and socially and culturally polarized societies. *Id.* at 4-6.

<sup>5</sup> See Per Pinstrup-Anderson & Rajul Pandya-Lorch, *Food Security and Sustainable Use of Natural Resources: A 2020 Vision*, 26 *ECOLOGICAL ECON.* 1, 5-6 (1998).

<sup>6</sup> See *id.* at 6; see also THOMAS F. HOMER-DIXON, *ENVIRONMENT, SCARCITY AND VIOLENCE* 73-106 (1999) (describing the relationship between environmental scarcity and violent conflict); LEIF OHLSSON, SWEDISH INTERNATIONAL DEVELOPMENT AGENCY, *LIVELIHOOD CONFLICTS: LINKING POVERTY AND ENVIRONMENT AS CAUSES OF CONFLICT* (2002), available at <http://www.gm-nccd.org/FIELD/Bilaterals/Sweden/sweden7.pdf> (last visited Sept. 29, 2004) (describing how environmental degradation fuels conflict by undermining the livelihoods of the poor).

<sup>7</sup> See FAO, *STATE OF FOOD INSECURITY 2002*, *supra* note 3, *Toward the Summit Commitments*, at 6.

<sup>8</sup> Emily Wax, *Darfurians Could Lose the Land They Fled*, *WASH. POST*, Dec. 3, 2004, at A16.

<sup>9</sup> The adoption of the neoliberal economic model in much of the developing world has resulted in a significant slowdown in economic growth, greater poverty and inequality, and growing social and political unrest. See William Finnegan, *The Economics of Empire: Notes on the Washington Consensus*, *HARPER'S*, May 1, 2003, at 42, 45-50 (describing the elements of the neoliberal model).

undermine the livelihoods of rural smallholders, degrade the natural resource base necessary for food production, and impede the economic diversification necessary for food security at the national level. Second, even if the neoliberal model were applied in an even-handed manner to both developed and developing countries, it would nevertheless have a negative impact on food security and ecological sustainability.

In order to assess the impact of trade liberalization in the agricultural sector, it is important to grasp four fundamental points developed in Parts I and II of the article.

First, hunger is a function of poverty rather than food scarcity. Food production has kept far ahead of population growth for nearly half a century. People go hungry because they lack the resources with which to purchase or grow food. Consequently, measures that increase poverty will have a negative impact on food security.

Second, nearly eighty percent of the world's undernourished people reside in rural areas in the developing world. Most of these malnourished people are small farmers whose livelihoods depend on selling their agricultural output. Policies that depress agricultural prices (such as food aid or production-enhancing programs like the Green Revolution) exacerbate hunger by rendering small farmers destitute, thereby depriving them of the income with which to purchase agricultural inputs, pay taxes, and purchase consumer goods and food not produced on the farm.

Third, economic diversification is necessary to achieve food security at the national level. A food secure country is one that can grow or import the food necessary to feed its population. The most food insecure countries are those that rely on one or two agricultural commodities to finance the importation of food products.<sup>10</sup> These countries are vulnerable to world market price fluctuations and to the declining terms of trade for agricultural commodities relative to manufactured goods. Economic policies that directly require or indirectly reinforce specialization in a handful of primary agricultural commodities exacerbate food insecurity by hindering economic diversification.

Fourth, biological diversity is necessary for ecosystem health and for the integrity of the food supply. Consequently, monocultural production techniques that maximize the production of a few crops degrade the natural resource base necessary for food production by eroding biological diversity, promoting pest and disease infestation, depleting soil fertility, and requiring massive application of harmful agrochemicals.

Taken together, these insights highlight the misguided nature of international efforts to solve the problem of hunger by providing free or subsidized food, by promoting monocultural production based on the theory of comparative advantage, and by maximizing the supply of food without regard

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<sup>10</sup> See, e.g., U.N. ECON. COMM'N ON LATIN AM. AND THE CARIBBEAN (ECLAC), *THE SOCIAL PANORAMA OF LATIN AMERICA* 12-13 (2003) [hereinafter ECLAC].

to the impact on poverty and inequality. The significance of these observations is often obscured by the fact that the relevant research has been undertaken in different disciplines. For example, the ecological literature on sustainable agriculture and the economic literature on food security make analogous critiques of the theory of comparative advantage as applied to the agricultural sector. Contrary to the theory of comparative advantage, economic specialization in the cultivation of monocultures is inimical to the biological diversity essential to ecosystem health. This economic specialization is also an obstacle to the economic diversification necessary to promote food security. One of the contributions of this article is to bring together insights from a variety of disciplines in order to explain the links among hunger, rural poverty, and environmental degradation and to explore the roots of these problems in historical and contemporary international trade and agricultural policy.

It is important to emphasize that trade liberalization did not create the patterns of trade and production that produce food insecurity and environmental degradation in the developing world. Rather, these patterns have their genesis in colonialism, in the post-colonial integration of many developing countries into the global trading system, and in the unintended consequences of post-World War II development assistance programs (such as the Green Revolution). Trade liberalization under structural adjustment and under the WTO trade regime aggravates hunger and natural resource degradation precisely because it reinforces these underlying trade and production patterns.

As explained in Part II, the underlying inequities in the global trading system have their origin in the colonial division of labor that relegated the colonized “periphery” to the production of primary agricultural products for the benefit of the colonizing “core.” As a consequence of this economic specialization, many developing countries currently rely on export-oriented crop production as a means of generating the foreign exchange earnings with which to purchase manufactured goods and food products. Specialization in the cultivation of cash crops contributes to food insecurity in two distinct ways. First, it diverts prime agricultural lands from food production to cash crop production. Second, it subjects developing country export revenues to fluctuating world market prices for agricultural commodities and to the declining terms of trade for agricultural products. Developing countries thereby produce less food and lack the steady and reliable export earnings necessary to finance the importation of food products. This economic specialization also degrades the environment by replacing biodiverse agroecosystems with monocultures that require application of large amounts of chemical fertilizers and synthetic pesticides.

After World War II, international development assistance programs inadvertently exacerbated food insecurity and environmental degradation by aggravating rural poverty and promoting monocultural production techniques. For example, both the Green Revolution and the provision of

surplus U.S. grain as aid undermined the livelihoods of poor farmers in the developing world by depressing agricultural prices. The Green Revolution also extended to food crops the monocultural production techniques used for cash crops. As a consequence of the Green Revolution, the world's food supply came to rely on a smaller number of crops and on an increasingly narrow genetic base. Farmers throughout the developing world abandoned traditional biodiverse cultivation techniques in favor of uniform seeds, chemical fertilizers, and synthetic pesticides manufactured by transnational corporations headquartered in the industrialized world. The rapidly expanding commercial cultivation of genetically modified crops threatens to reinforce monocultural production techniques and to increase the dependence of farmers in the developing world on inputs and innovations produced in the industrialized world.

As detailed in Part III, the structural adjustment programs mandated by the IMF and World Bank exacerbated the problem of economic specialization and ecologically harmful monocultures by requiring developing countries to increase agricultural exports in order to boost the foreign exchange earnings available to service the foreign debt. In addition, developing countries were required to eliminate agricultural subsidies and to lower tariffs and eliminate non-tariff barriers. Because these policy prescriptions did not apply to industrialized countries, structural adjustment promoted a double standard that plagues the agricultural sector to this day: protectionism in wealthy countries; liberalized trade in poor countries. While developing countries opened their markets to foreign competition, the United States and the European Union (EU) increased agricultural subsidies and utilized both tariff and non-tariff barriers to keep out developing country exports.

Structural adjustment had a devastating impact on food security and the environment in the developing world. The reduction or elimination of (tariff and non-tariff) import barriers resulted in an influx of cheap, subsidized food from the United States and the European Union. Small farmers were rendered destitute, and hunger increased at the household level. By depressing food prices, the cheap imports also discouraged domestic food production. At the same time, the protectionist import barriers and trade-distorting subsidies maintained by the United States and the European Union reduced developing country export revenues. Food security declined at the national level as developing countries produced less food and had less foreign exchange with which to purchase imports. Finally, the export-oriented policies favored by the World Bank and the IMF degraded the environment by promoting the expansion of chemical-intensive, monocultural production techniques (industrial agriculture). The widespread adoption of industrial agriculture has contributed to a wide range of ecological problems, including soil degradation, loss of agricultural productivity, depletion of

freshwater resources, contamination of water supplies by pesticides and fertilizers, loss of biological diversity, and loss of ecosystem resilience.<sup>11</sup>

The 1947 General Agreement on Tariffs and Trade (1947 GATT) failed to curb agricultural subsidies and import barriers due to weaknesses in the agreement that facilitated these protectionist practices. However, the WTO Agreement on Agriculture was explicitly intended to correct market distortions in the agricultural sector. Regrettably, the Agreement on Agriculture was riddled with ambiguities and exceptions that enabled the United States and the EU to maintain protectionist import barriers and trade-distorting subsidies. Indeed, subsidy levels in industrialized countries increased after the Agreement on Agriculture came into effect—from \$308 billion in 1986-1988 to \$318 billion in 2002. By contrast, developing countries were required by World Bank- and IMF-mandated structural adjustment programs to maintain relatively open markets. In effect, the WTO Agreement on Agriculture institutionalized the double standard in the agricultural sector: protectionism in wealthy countries; liberalized trade in poor countries.

Many proponents of trade liberalization would agree with the above analysis and would argue that the solution is simple: level the playing field by requiring the United States and the EU to eliminate agricultural subsidies and reduce tariffs. As explained in Part V, dismantling the protectionist barriers of the United States and the EU would certainly reduce the inequities in the global trading system, but trade liberalization is not sufficient to promote food security and ecological sustainability in the long term.

First, trade liberalization in the industrialized world is not sufficient to address the distortions and inequities caused by the monopolization of agricultural markets by a handful of transnational corporations. For example, five agrochemical companies currently control over sixty-five percent of the global pesticide market. Many of these companies have merged with companies that produce seeds and fertilizers. These companies can extract monopolistic prices for key agricultural inputs. A similar concentration of market power exists among the transnational corporations that process and market agricultural output. These companies utilize their market power to dictate agricultural commodity prices. Farmers are increasingly squeezed between the handful of transnational corporations that supply inputs and the handful of transnational corporations that purchase their agricultural output. The monopolization of agricultural trade by

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<sup>11</sup> See Brian Halweil, *Farming in the Public Interest*, in THE WORLDWATCH INST., STATE OF THE WORLD 2002, 51, 53-56 (2002); Jules N. Pretty et al., *Policy Challenges and Priorities for Internalizing the Externalities of Modern Agriculture*, 44(2) J. ENVTL. PLAN. & MGMT. 263, 264 (2001) [hereinafter Pretty, *Policy Challenges and Priorities*]; LORI ANN THRUPP, WORLD RES. INST., LINKING BIODIVERSITY AND AGRICULTURE: CHALLENGES AND OPPORTUNITIES FOR SUSTAINABLE FOOD SECURITY 4-10 (1997) [hereinafter THRUPP, LINKING BIODIVERSITY AND AGRICULTURE]; see also David E. Adelman & John H. Barton, *Environmental Regulation for Agriculture: Towards a Framework to Promote Sustainable Intensive Agriculture*, 21 STAN. ENVTL. L.J. 3, 4 (2002).



transnational agribusiness places developing country farmers at an enormous competitive disadvantage and threatens to perpetuate poverty and hunger.

Second, trade liberalization impedes the economic diversification necessary to promote food security at the national level. Contrary to the free market prescriptions of the IMF, the World Bank, and the WTO, virtually all industrialized countries (including the United States, France, Germany, Japan, and the United Kingdom) relied on tariffs, subsidies, and other interventionist measures to industrialize. Most recently, the newly industrializing countries of South Korea, Taiwan, and Singapore successfully industrialized their economies using a combination of tariffs, subsidies, and regulation of foreign investment. Trade liberalization deprives developing countries of the very tools used by industrialized countries to diversify and industrialize their economies.

Finally, trade liberalization poses a threat to the biological diversity necessary to maintain healthy agroecosystems. The elimination of U.S. and EU subsidies and import barriers is anticipated to increase crop specialization in the developing world in accordance with the dictates of global markets. This development would continue the erosion of crop diversity and the displacement of sustainable agricultural production techniques by chemical-intensive monocultures.

There is only one country in the western hemisphere that has emphatically rejected the neoliberal economic model and has promoted a nation-wide experiment in ecologically sustainable alternatives to export-oriented industrial agriculture. That country is Cuba.<sup>12</sup> From the colonial period until the early 1990s, Cuba, like many developing countries, was highly food insecure as a consequence of its dependence on one agricultural commodity (sugar) to generate the bulk of foreign exchange earnings and its reliance on imports to satisfy domestic food needs.<sup>13</sup> During the first three decades of the revolution (1959-1989), the Cuban government embarked on an investment strategy designed to produce large-scale, chemical-dependent, capital-intensive farms specializing in sugar cane and livestock.<sup>14</sup> Cuba's adoption of industrial agriculture resulted in serious ecological harm and little improvement in food security.<sup>15</sup> When the collapse of the socialist trading bloc in 1990 plunged the Cuban economy into a state of crisis known

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<sup>12</sup> See generally SUSTAINABLE AGRICULTURE AND RESISTANCE (Fernando Funes et al. eds., 2002) (describing the transformation of Cuban agriculture after the demise of the socialist trading bloc).

<sup>13</sup> See Carmen G. Gonzalez, *Seasons of Resistance: Sustainable Agriculture and Food Security in Cuba*, 16 TUL. ENVTL. L.J. 685, 689-95, 703-07 (2003); see also Laura J. Enriquez, *Cuba's New Agricultural Revolution: The Transformation of Food Crop Production in Contemporary Cuba*, 14 FOOD FIRST DEV. REP. (May 2000), available at <http://www.foodfirst.org/pubs/devreps/dr14.html> (last visited Nov. 9, 2004) (explaining that export-oriented agricultural production and dependence on food imports are common in the Caribbean and much of the developing world).

<sup>14</sup> Gonzalez, *supra* note 13, at 707-08.

<sup>15</sup> *Id.* at 706-08.

as the Special Period in Peacetime, Cuba experienced severe shortages of food, fuel, and agricultural inputs.<sup>16</sup> The Cuban government responded to the crisis by implementing a series of reforms (including diversification of the agricultural sector, production for the domestic market, and active promotion of organic and semi-organic techniques) that enhanced food security and promoted ecological sustainability.<sup>17</sup> These reforms have been hailed by some commentators as “unprecedented, with potentially enormous implications for other countries suffering from the declining sustainability of conventional agricultural production.”<sup>18</sup>

Cuba’s post-1990 economic experiment raises many questions of interest to developing countries caught in the vise of neoliberal economic policies. The transformation of Cuban agriculture was made possible by Cuba’s relative economic isolation, including its exclusion from major international trade and financial institutions as a consequence of the U.S. economic embargo.<sup>19</sup> When the U.S. embargo is lifted, Cuba will be faced with the difficult task of maintaining an autonomous development path in the face of intense pressure to adopt neoliberal reforms and to revert to the export-oriented industrial agricultural model. Cuba is therefore a superb vehicle for examining the ways in which global trade and financial institutions constrain the development options of small, trade-dependent developing countries and threaten food security and the environment.

An analysis of the historic roots and current status of export-oriented industrial agriculture in the developing world through the lens of food security and ecological sustainability necessarily requires a definition of key terms. Part I introduces the concept of food security and explains the key elements of ecological sustainability. Part II traces the evolution of industrial agriculture in developing countries from the colonial period through the Green Revolution and discusses some of the risks and benefits of biotechnology. Part III examines the ways in which the neoliberal economic model imposed through trade agreements and structural adjustment programs reinforces export-oriented industrial agriculture and compromises food security and ecological sustainability. Part IV shifts the focus to Cuba, describing the evolution of industrial agriculture in Cuba and highlighting

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<sup>16</sup> *Id.* at 686.

<sup>17</sup> *Id.* at 712-28. These reforms included decentralization and diversification of agricultural production, renewed emphasis on production for the domestic market, promotion of organic and semi-organic farming techniques, and opening farmers’ markets (at prices determined by supply and demand) in order to boost food production and improve food distribution. Cuba shifted from a large-scale, export-oriented, chemical-intensive agricultural development strategy to one that favored smaller-scale production, ecologically sustainable farming techniques, and production for the domestic market. *Id.*

<sup>18</sup> See THE GREENING OF THE REVOLUTION: CUBA’S EXPERIMENT WITH ORGANIC AGRICULTURE 8 (Peter Rosset & Medea Benjamin eds., 1994) [hereinafter THE GREENING OF THE REVOLUTION].

<sup>19</sup> See MINOR SINCLAIR & MARTHA THOMPSON, OXFAM, CUBA: GOING AGAINST THE GRAIN: AGRICULTURAL CRISIS AND TRANSFORMATION 43 (2001), available at [http://www.oxfamamerica/newsandpublications/publications/research\\_reports/art1164.html](http://www.oxfamamerica/newsandpublications/publications/research_reports/art1164.html) (last visited Sept. 29, 2004).

the innovative policies and practices adopted by the Cuban government in the aftermath of the collapse of the socialist trading bloc. Part IV concludes with an assessment of the potential impact of neoliberalism on the Cuban reforms. Finally, Part V argues that the neoliberal economic model is inherently incompatible with food security and ecological sustainability.

#### I. FOOD SECURITY AND ECOLOGICAL SUSTAINABILITY: CRITICAL ISSUES FOR DEVELOPING COUNTRIES

This Part supplies the theoretical framework for the remainder of the article by defining food security and ecological sustainability.

##### *A. Food Security: An Entitlements Approach*

Food security is “physical and economic access by all people at all times to sufficient, safe and nutritious food to maintain a healthy and active life.”<sup>20</sup> Contrary to popular misconception, food insecurity is not caused by food scarcity.<sup>21</sup> Indeed, global food production since 1950 has kept far ahead of population growth, and many of the countries experiencing rampant hunger routinely export more agricultural products than they import.<sup>22</sup> Food insecurity is therefore not due to lack of food or even lack of productive capacity.<sup>23</sup> Rather, people go hungry because of economic inequalities that prevent them from obtaining food.<sup>24</sup>

The notion of food insecurity as a consequence of food distribution, rather than food scarcity, is a product of the pioneering work of Amartya Sen, winner of the 1998 Nobel Prize in economics.<sup>25</sup> In Sen’s view, food security is

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<sup>20</sup> This definition is based on the food security definition adopted at the 1996 World Food Summit and on the definition utilized by the World Bank in its influential 1986 report on world hunger. Like the World Food Summit and the World Bank report, this article recognizes that eradication of poverty and inequality is critical to promoting food security. See U.N. FOOD & AGRIC. ORG. (FAO), ROME DECLARATION ON WORLD FOOD SECURITY, WORLD FOOD SUMMIT 13-17 (Nov. 1996), available at <http://www.fao.org/DOCREP/003/w3613e/w36163E00.htm> (last visited Sept. 29, 2004) (vowing to “implement policies aimed at eradicating poverty and inequality and improving physical and economic access by all, at all times, to sufficient, nutritionally adequate and safe food and its effective utilization”); WORLD BANK, POVERTY AND HUNGER: ISSUES AND OPTIONS FOR FOOD SECURITY IN DEVELOPING COUNTRIES 1 (1986) (defining food security as “access by all people at all times to enough food for an active, healthy life,” and recognizing that food insecurity is caused mainly by a lack of purchasing power) [hereinafter WORLD BANK, POVERTY AND HUNGER].

<sup>21</sup> See E.M. YOUNG, WORLD HUNGER 3 (1997); STEPHEN DEVEREUX, THEORIES OF FAMINE 57-82 (1993); WORLD BANK, POVERTY AND HUNGER, *supra* note 20, at 1.

<sup>22</sup> See FRANCES MOORE LAPPE ET AL., WORLD HUNGER: TWELVE MYTHS 8-14 (1998).

<sup>23</sup> See *id.*; JOHN MADELEY, FOOD FOR ALL: THE NEED FOR A NEW AGRICULTURE 34 (2002) [hereinafter MADELEY, FOOD FOR ALL].

<sup>24</sup> See MADELEY, FOOD FOR ALL, *supra* note 23, at 32-34; WORLD BANK, POVERTY AND HUNGER, *supra* note 20, at 1.

<sup>25</sup> See JENNY EDKINS, WHOSE HUNGER? CONCEPTS OF FAMINE, PRACTICES OF AID 43-49 (2000) (describing Sen’s challenge to the assumption that famine is caused by food shortages).

a matter of entitlements, which he defines as the ability to command food using the legal means available in society.<sup>26</sup> Sen's analysis of the role of entitlements transformed the debate on food security from a scarcity-based approach to one that emphasizes the political, economic, and legal institutions that determine how available food is distributed.<sup>27</sup>

Sen identifies food security at the household level as a function of the household's package of entitlements.<sup>28</sup> This package may consist of all or some of the following: (i) production-based entitlements (the right to consume the food produced);<sup>29</sup> (ii) labor-based entitlements (the right to the income obtained through the sale of labor);<sup>30</sup> (iii) trade-based entitlements (the right to purchase food in the market);<sup>31</sup> and (iv) transfer-based entitlements (the right to food donated by others, such as family, friends, and government aid programs).<sup>32</sup> Utilizing this framework, food security in rural households in

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<sup>26</sup> AMARTYA SEN, *POVERTY AND FAMINES: AN ESSAY ON ENTITLEMENT AND DEPRIVATION* 1-2 (1981) [hereinafter SEN, *POVERTY AND FAMINES*].

<sup>27</sup> EDKINS, *supra* note 25, at 45; YOUNG, *supra* note 21, at 4. As a consequence of Sen's work, it is now widely accepted that promotion of food security requires a reduction of poverty and inequality. See, e.g., JOHAN POTTIER, *ANTHROPOLOGY OF FOOD: THE SOCIAL DYNAMICS OF FOOD SECURITY* 142-43 (1999); GORDON CONWAY, *THE DOUBLY GREEN REVOLUTION: FOOD FOR ALL IN THE 21ST CENTURY* 4-5, 286-87 (1997); YOUNG, *supra* note 21, at 2-7; DEVEREUX, *supra* note 21, at 57-82; FRANK ELLIS, *AGRICULTURAL POLICIES IN DEVELOPING COUNTRIES* 302-11, 316 (1992); WORLD BANK, *POVERTY AND HUNGER*, *supra* note 20, at 1; U.N. FOOD & AGRIC. ORG., *STATE OF FOOD INSECURITY 2000, at What Have We Learned? and The Socio-Economic Impact of Agricultural Modernization* (2000) (concluding that hunger is not the result of insufficient food supplies, but lack of access to food supplies, and stating that world food security is a matter of insufficient purchasing power of the poor) [hereinafter FAO *STATE OF FOOD INSECURITY 2000*]. While Sen's approach has generally been well received, Sen's work has been criticized for being overly technocratic and insufficiently attentive to economic and political context. See generally EDKINS, *supra* note 25, at 49-66 (discussing this and other criticisms of Sen's work).

<sup>28</sup> SEN, *POVERTY AND FAMINES*, *supra* note 26, at 1-2; YOUNG, *supra* note 21, at 6.

<sup>29</sup> SEN, *POVERTY AND FAMINES*, *supra* note 26, at 1-2. The key determinant of production-based entitlements is access to land and livestock on the basis of ownership or other rights, such as tenancy, sharecropping, or usufruct rights. See CHRISTOPHER STEVENS ET AL., *THE WTO AGREEMENT ON AGRICULTURE AND FOOD SECURITY* 5 (2000). Governments can boost production-based entitlements by offering farmers credit, input subsidies (such as free or subsidized seeds and fertilizer), research and extension services, and irrigation projects or by distributing land pursuant to land reform legislation. *Id.* at 19-22.

<sup>30</sup> SEN, *POVERTY AND FAMINES*, *supra* note 26, at 2. Labor-based entitlements will be determined by the availability of employment in both urban and rural areas. Governments can promote labor-based entitlements by creating incentives for the generation of employment in agricultural production, manufacturing, or other industries. See STEVENS ET AL., *supra* note 29, at 7, 34-35.

<sup>31</sup> SEN, *POVERTY AND FAMINES*, *supra* note 26, at 2. The price of food relative to household income is the key factor affecting trade-based entitlements. Food prices will turn on local or regional food production, the degree of market integration, transportation costs, food subsidies, and, if food is imported, world market agricultural prices. See STEVENS ET AL., *supra* note 29, at 6.

<sup>32</sup> SEN, *POVERTY AND FAMINES*, *supra* note 26, at 2. Governments can promote transfer-based entitlements by providing non-targeted assistance programs (such as food subsidies available to all regardless of income), targeted assistance programs (such as food stamps or food-for-work programs available only to the most vulnerable group), or social safety nets designed to assist

developing countries will turn on access to land, the availability of employment, income earned from employment or from the sale of agricultural output, food available for purchase in the market, and assistance from family members or the state.<sup>33</sup> For urban dwellers, food security will depend on employment earnings, the consumption and sale of crops grown in backyards or common lands, food available for purchase on the market, publicly-subsidized food programs, and assistance from family members.<sup>34</sup>

Food security at the national level parallels food security at the household level.<sup>35</sup> Like household food security, the food security of a state is a function of (i) production-based entitlements (domestic food production capacity),<sup>36</sup> (ii) trade-based entitlements (ability to earn foreign exchange in order to import food),<sup>37</sup> and (iii) transfer-based entitlements (ability to obtain food as aid).<sup>38</sup> Thus, a food-secure state is one that can produce, purchase, or obtain as aid the food necessary to satisfy the needs of its population.

Contrary to the specialization promoted by the theory of comparative advantage,<sup>39</sup> diversifying exports is the key to maintaining food security.<sup>40</sup> The least food-secure states are those that combine inadequate domestic food production with heavy reliance upon one or two agricultural export commodities for a significant portion of foreign exchange earnings.<sup>41</sup> Poor harvests or sudden declines in world market prices for exports can deprive these countries of the foreign exchange earnings necessary to purchase

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those experiencing deterioration in any of their entitlements. See STEVENS ET AL., *supra* note 29, at 8.

<sup>33</sup> YOUNG, *supra* note 21, at 6.

<sup>34</sup> *Id.*

<sup>35</sup> See STEVENS ET AL., *supra* note 29, at 18.

<sup>36</sup> See *id.* at 18.

<sup>37</sup> See *id.*

<sup>38</sup> See *id.*

<sup>39</sup> Modern trade theory is based in large part on David Ricardo's theory of comparative advantage. According to this theory, human happiness will be increased if each country produces those commodities best suited to it by virtue of natural or historical circumstances. Overall production will increase, and countries can simply trade with one another for the commodities they do not produce. See PAUL SAMUELSON, *ECONOMICS* 630 (11th ed. 1980) (describing comparative advantage as the "unshakeable basis for international trade").

<sup>40</sup> See JEAN DRÈZE & AMARTYA SEN, *HUNGER AND PUBLIC ACTION*, reprinted in THE AMARTYA SEN AND JEAN DRÈZE OMNIBUS 76-77, 168-70 (1999).

<sup>41</sup> See STEVENS ET AL., *supra* note 29, at 14; ECLAC, *supra* note 10, at 12-13 (2003). For example, of the forty-seven countries in sub-Saharan Africa, thirty-nine are dependent on two primary commodities for over fifty percent of export earnings. Declines in the prices of these commodities can have severe economic consequences. See U.N. FOOD & AGRIC. ORG, *TRADE REFORMS AND FOOD SECURITY: CONCEPTUALIZING THE LINKAGES*, ch. 4.1 (2003), available at <http://www.fao.org/DOCREP/005/Y4671E/y4671E00.htm> (last visited Sept. 29, 2004) [hereinafter *FAO, TRADE REFORMS AND FOOD SECURITY*].

essential foodstuffs.<sup>42</sup> Likewise, increases in the world market price of imports can make it difficult to obtain the food necessary to satisfy domestic nutritional needs.<sup>43</sup> Beginning in the 1880s, developing countries that specialize in agricultural exports have been battered by the declining terms of trade for agricultural products relative to manufactured goods.<sup>44</sup> These countries have found themselves on an economic treadmill whereby they must significantly expand export production in order to keep pace with increasingly expensive manufactured imports.<sup>45</sup> Consequently, diversification of exports is necessary to promote food security and to secure the steady and reliable revenue stream necessary for economic development.<sup>46</sup>

*B. Ecological Sustainability: Protecting the Natural Resource Base Necessary for Production*

Ecological sustainability is the productive use of nature's goods and services without damaging the environment.<sup>47</sup> Sustainability is a goal rather than a predetermined set of practices. The actual practices adopted on any given farm will be specific to the farm's unique biophysical and socioeconomic characteristics.<sup>48</sup>

Drawing upon the work of biologist Jules Pretty, it is possible to identify certain characteristics of sustainable agricultural production. First, sustainable agriculture strives to integrate a wide range of natural pest, nutrient, soil, and water management technologies into the production process, while minimizing the use of non-renewable inputs, such as synthetic fertilizers and pesticides, which may harm human health or the

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<sup>42</sup> YOUNG, *supra* note 21, at 41.

<sup>43</sup> *Id.*

<sup>44</sup> JAMES M. CYPHER & JAMES L. DIETZ, *THE PROCESS OF ECONOMIC DEVELOPMENT* 86 (1997).

<sup>45</sup> *Id.*

<sup>46</sup> See U.N. FOOD & AGRIC. ORG. (FAO), *MULTILATERAL TRADE NEGOTIATIONS ON AGRICULTURE: A RESOURCE MANUAL*, Vol. I, at 36-37 (2000), available at [http://www.fao.org/documents/show\\_cdr.asp?url\\_file=/DOCREP/003/x7351E00.htm](http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/003/x7351E00.htm) (last visited Nov. 9, 2004) [hereinafter *FAO RESOURCE MANUAL*, Vol. I].

<sup>47</sup> See JULES N. PRETTY, *AGRI-CULTURE: RECONNECTING PEOPLE, LAND AND NATURE* 56 (2002) [hereinafter *PRETTY, AGRI-CULTURE*]. The definition of sustainability used in this article is derived in part from the concept of sustainable development. Sustainable development is generally defined as meeting "the needs of the present without compromising the ability of future generations to meet their own needs." WORLD COMM'N ON ENV'T & DEV., *OUR COMMON FUTURE* 43 (1987). In the agricultural context, this would entail preserving the productive capacity of the ecosystem and minimizing the use of non-renewable resources. See PETER EINARSSON, *FORUM SYD, AGRICULTURAL TRADE POLICY AS IF FOOD SECURITY AND ECOLOGICAL SUSTAINABILITY MATTERED* 4 (2000), available at <http://www.agobservatory.org/library.cfm?refID=29994> (last visited Nov. 9, 2004).

<sup>48</sup> See generally JULES N. PRETTY, *REGENERATING AGRICULTURE: POLICIES AND PRACTICES FOR SUSTAINABILITY AND SELF-RELIANCE* 8-13 (1995) [hereinafter *PRETTY, REGENERATING AGRICULTURE*].

environment.<sup>49</sup> Second, sustainable agriculture utilizes the knowledge and skills of farmers as well as the latest scientific innovations in order to promote self-reliance and reduce dependence on costly external inputs.<sup>50</sup> Third, sustainable agriculture recognizes the important contribution of biodiversity to agricultural production and ecosystem health, and adopts practices that enhance and conserve biodiversity in agroecosystems, including plant genetic resources, livestock, insects, and soil organisms.<sup>51</sup> Biological diversity is essential to ecosystem health because it enhances the ability to resist and recover from disturbances that disrupt important ecosystem processes.<sup>52</sup> Biodiverse farming systems are more resistant to pests and disease, conserve soil fertility, reduce dependency on harmful agrochemicals, reduce risks of catastrophic crop failure, and improve human nutrition by offering a wide variety of plants and animals for human consumption.<sup>53</sup> Finally, sustainable agriculture is multifunctional. In addition to producing food, it provides important public goods, such as clean water, wildlife conservation, carbon sequestration in soils, flood protection, and aesthetically pleasing landscapes.<sup>54</sup>

The importance of biological diversity for the maintenance of ecosystem health may create a conflict between sustainable agriculture and the increasing economic specialization promoted by neoclassical trade theory.<sup>55</sup> From a trade theory perspective, countries with abundant natural resources and little capital should capitalize on their comparative advantage by specializing in the production of one or two primary commodities and purchasing capital-intensive goods from industrialized countries.<sup>56</sup> This theoretical approach underpins the policy prescription of the World Bank, the IMF, and the WTO.<sup>57</sup>

Regrettably, trade theory neglects to recognize that extension of the principle of specialization from an industrial context to an agricultural context erodes biodiversity and jeopardizes the ecosystem services necessary

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<sup>49</sup> See PRETTY, *AGRI-CULTURE*, *supra* note 47, at 56.

<sup>50</sup> Jules N. Pretty, *Reducing Food Poverty by Increasing Sustainability in Developing Countries*, 95 AGRIC., ECOSYSTEMS & ENV'T 217, 218-19 (2003) [hereinafter Pretty, *Reducing Food Poverty*]; PRETTY, *REGENERATING AGRICULTURE*, *supra* note 48, at 12. For example, a farm might incorporate a diversity of inter-linked enterprises, such that byproducts or wastes from one enterprise (for example, manure from livestock operations) become inputs to another. *Id.* at 10.

<sup>51</sup> See THRUPP, *LINKING BIODIVERSITY AND AGRICULTURE*, *supra* note 11, at 1-4, 10-12.

<sup>52</sup> Fred P. Gale, *Economics Specialization Versus Ecological Diversification: The Trade Policy Implications of Taking the Ecosystem Approach Seriously*, 34 ECOLOGICAL ECON. 285, 287 (2000).

<sup>53</sup> THRUPP, *LINKING BIODIVERSITY AND AGRICULTURE*, *supra* note 11, at 3.

<sup>54</sup> See Pretty, *Reducing Food Poverty*, *supra* note 50, at 219.

<sup>55</sup> See Gale, *supra* note 52, at 288-89.

<sup>56</sup> *Id.* at 289-290; see also FAO, *TRADE REFORMS AND FOOD SECURITY*, *supra* note 41, at ch. 1.3.

<sup>57</sup> See FAO, *TRADE REFORMS AND FOOD SECURITY*, *supra* note 41, at ch. 1.3.

to sustain agricultural production over the long-term.<sup>58</sup> Likewise, as explained in the preceding section, reliance on a handful of primary commodities for the bulk of export earnings compromises food security.<sup>59</sup> Thus, economic specialization on the basis of the theory of comparative advantage is inconsistent with the economic diversification required to promote food security and with the biological diversity necessary to promote ecological sustainability.

These preliminary insights can be illustrated by an account of the historical evolution of industrial agriculture in the developing world from colonialism through the Green Revolution and the food security and ecological consequences of these developments.

## II. ORIGINS OF INDUSTRIAL AGRICULTURE IN THE DEVELOPING WORLD

Three factors contributed to the adoption by developing countries of monocultural, chemical-intensive, export-oriented model of agricultural production: the colonial and post-colonial economic division of labor, the post-World War II agrochemical production boom, and the Green Revolution. This section argues that the economic specialization in agro-export production introduced by colonialism (and favored by the theory of comparative advantage) and the chemical-intensive monocultural farming practices promoted by the Green Revolution established the patterns of trade and production that create food insecurity and environmental degradation in the developing world. Part A discusses the economic and political factors that caused many developing countries to specialize in agro-export production and to rely on food imports to satisfy domestic needs. Parts B and C examine the technological innovations that transformed biodiverse self-sufficient traditional farms into ecologically harmful monocultures. Part D draws upon the lessons of the preceding sections to evaluate the potential risks and benefits of the rapidly expanding commercial cultivation of genetically modified crops.

### *A. Export Monocultures: the Colonial and Post-Colonial Legacy*

The central role of export-oriented agricultural production in the economies of many developing countries has its genesis in colonialism.<sup>60</sup> European colonization of Asia, Africa, and Latin America was accompanied by the imposition of export-oriented crop production as a means of

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<sup>58</sup> Gale, *supra* note 52, at 289-90; THRUPP, *supra* note 11, at 4-10 (discussing the causes and consequences of loss of agrobiodiversity). See *infra* notes 135-69 and accompanying text for an analysis of the ways in which agricultural specialization degrades the environment and undermines food security.

<sup>59</sup> See *supra* notes 40-46 and accompanying text.

<sup>60</sup> See YOUNG, *supra* note 21, at 41-42.



transferring wealth from the colonized “periphery” to the colonizing “core.”<sup>61</sup> By the latter part of the nineteenth century, places as diverse as Malaysia (rubber producer), India (cotton producer), Egypt (cotton producer), Argentina (beef and wheat producer), Ghana (cocoa producer), and Cuba (sugar producer) had become specialized in the production of one or more export crops for European (and later U.S.) markets.<sup>62</sup> As they gained independence, the former colonies were reintegrated into the world economy as suppliers of raw materials and as consumers of imported manufactured goods.<sup>63</sup>

As a consequence of this history of economic specialization, many developing countries currently maintain a dangerous reliance on the production of a handful of primary commodities (such as sugar, coffee, cocoa, or tea) for the bulk of export revenues.<sup>64</sup> Contrary to the theory of comparative advantage, specialization has not brought prosperity. On the contrary, developing countries that specialize in one or two agricultural commodities to generate export earnings with which to purchase manufactured goods are highly vulnerable to the vicissitudes of world market prices for agricultural commodities and to increases in prices for imported

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<sup>61</sup> See *id.* at 40-41; ERIC R. WOLF, EUROPE AND THE PEOPLE WITHOUT HISTORY 140-41, 310-15 (1997); MADELEY, FOOD FOR ALL, *supra* note 23, at 13; TERENCE HOPKINS ET AL., THE AGE OF TRANSITION 4 (1998); CARY FOWLER & PAT MOONEY, SHATTERING: FOOD, POLITICS AND THE LOSS OF GENETIC DIVERSITY 40-41, 179 (1996); Vandana Shiva, *Monocultures of the Mind*, in MONOCULTURES OF THE MIND: PERSPECTIVES ON BIODIVERSITY AND BIOTECHNOLOGY 78-79 (1993) [hereinafter Shiva, *Monocultures of the Mind*]; see also BELINDA COOTE, THE TRADE TRAP 41-42 (1992) (describing the imposition of cotton cultivation in Chad by the French in the 1920s). As John Stuart Mill openly acknowledged, “Our West India colonies, for example, cannot be regarded as countries . . . . The West Indies . . . are the place where England finds it convenient to carry on the production of sugar, coffee, and a few other tropical commodities.” JOHN STUART MILL, *Principles of Political Economy, with Some of their Applications to Social Philosophy*, in 2 COLLECTED WORKS OF JOHN STUART MILL 693 (J.M. Robson ed., 1965).

<sup>62</sup> See YOUNG, *supra* note 21, at 41; WOLF, *supra* note 61, at 310-41 (providing a detailed description of the worldwide specialization in export crops); Gonzalez, *supra* note 13, at 689-92 (discussing the factors that produced Cuba’s specialization in sugar).

<sup>63</sup> YOUNG, *supra* note 21, at 41. In Latin America, for example, agro-export production introduced by the Spanish and Portuguese colonizers expanded after political independence. Between 1820 and 1930, as the power of the mercantile colonial powers (Spain and Portugal) waned and Great Britain assumed the role of dominant industrial and commercial power, the newly independent states of Latin America re-entered the global economy as suppliers of agricultural commodities to Europe and the United States and as purchasers of manufactured goods. ALAIN DE JANVRY, THE AGRARIAN QUESTION AND REFORMISM IN LATIN AMERICA 62-65 (1981).

<sup>64</sup> YOUNG, *supra* note 21, at 41; COOTE, *supra* note 61, at 3-11; Yon Fernandez de Larrinoa Arcal & Materne Maetz, *Trends in World Agriculture and Trade*, in FAO RESOURCE MANUAL VOL. I, *supra* note 46, at 12, available at [http://www.fao.org/documents/show\\_cdr.asp?url\\_file=docrep/003/x7352E01.htm](http://www.fao.org/documents/show_cdr.asp?url_file=docrep/003/x7352E01.htm) (last visited Nov. 9, 2004). According to the U.N. Food and Agriculture Organization, as many as forty-three developing countries currently depend on a single agricultural commodity to generate over twenty percent of total export revenues and derive over half of total export revenues from agricultural exports. Most of these countries are located in sub-Saharan Africa, Latin America, and the Caribbean. FAO, STATE OF FOOD INSECURITY 2003, *supra* note 2, at 17.

goods.<sup>65</sup> For example, between 1980 and 1998, the terms of trade between agricultural commodities and manufactured goods fell by more than forty percent, thereby causing agricultural export revenues to drop while the price of imports increased.<sup>66</sup> Furthermore, agricultural commodity prices fluctuated significantly during this period, thus depriving developing countries of the stable and steady revenue stream needed for productive investment and for the purchase of goods not produced locally.<sup>67</sup> In the terminology of entitlements, the trade-based entitlements of many developing countries are quite precarious. Slight fluctuations in global commodity prices can interfere with their ability to purchase food and other essential items in international markets.<sup>68</sup>

Economic specialization also eroded the production-based entitlements of developing countries by diverting prime crop land to export production and encouraging dependence on food imports to satisfy domestic nutritional

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<sup>65</sup> See YOUNG, *supra* note 21, at 41, 66; COOTE, *supra* note 61, at 8; FAO, STATE OF FOOD INSECURITY 2003, *supra* note 2, at 17. In addition, because export agriculture relies on marketing institutions controlled by transnational agribusiness, only a fraction of the revenues derived from the sale of agricultural commodities accrues to the producing country. DE JANVRY, *supra* note 63, at 161.

<sup>66</sup> See Fernandez de Larrinoa Arcal & Maetz, *supra* note 64, at 13; see also YOUNG, *supra* note 21, at 41-42; COOTE, *supra* note 61, at 8-10.

<sup>67</sup> See Fernandez de Larrinoa Arcal & Maetz, *supra* note 64, at 12.

<sup>68</sup> See YOUNG, *supra* note 21, at 42. One solution to this predicament is economic diversification—the development of a manufacturing base in order to ensure robust trade-based entitlements at the national level. See DRÈZE & SEN, *supra* note 40, at 76-77, 168-70; COOTE, *supra* note 61, at 10. Taiwan, South Korea, and Singapore, for example, diversified their trade-based entitlements by embarking on an ambitious state-led industrialization drive. These countries identified industries with strong export potential and used a combination of tariffs and subsidies to protect and promote the selected industries. See Ha-Joon Chang, *The East Asian Development Experience*, in RETHINKING DEVELOPMENT ECONOMICS 107, 111-17 (Ha-Joon Chang ed., 2003). However, many developing countries, especially those designated as Least Developed Countries by the United Nations, derive no more than ten percent of gross domestic product from manufacturing. These countries lack the capital to industrialize. Indeed, many of these countries resorted to external borrowing when declining export earnings and unfavorable terms of trade created serious balance of payments difficulties. The resulting debt service obligations depleted the export earnings that would otherwise be available for investment. Moreover, the countries that did develop a manufacturing base often found their exports excluded from industrialized country markets by non-tariff barriers and by tariffs that escalated for processed commodities. COOTE, *supra* note 61, at 10-11. Contrary to free market orthodoxy, virtually all developed countries, including the United Kingdom, the United States, France, Germany, and Japan, used tariffs, subsidies, and other interventionist measures in order to promote industrialization. Ha-Joon Chang, *The Market, the State and Institutions in Economic Development*, in RETHINKING DEVELOPMENT ECONOMICS 41, 42-46. However, highly indebted developing countries are currently precluded from using these measures because they are subject to the neoliberal policy prescriptions of the IMF and the World Bank pursuant to structural adjustment programs designed to ensure loan repayment. See Finnegan, *supra* note 9, at 46. In Africa, for example, efforts to diversify exports and to develop a manufacturing base have been thwarted by the neoliberal reforms imposed by the IMF and the World Bank that emphasize comparative advantage in raw material and primary product exports. Howard Stein, *Rethinking African Development*, in RETHINKING DEVELOPMENT ECONOMICS 153, 156.

needs.<sup>69</sup> This trend gained momentum in the post-World War II period when the U.S. Congress passed Public Law 480, authorizing the sale of surplus agricultural commodities to developing countries on highly favorable terms or the distribution of these commodities free of charge to developing countries as food aid.<sup>70</sup> Public Law 480 bound developing countries more closely to U.S. interests, thereby serving Cold War foreign policy objectives, and enabled U.S. companies to establish a foothold in new foreign markets. Aid recipients developed a taste for food crops (such as wheat) alien to the local environment and eventually became major commercial purchasers of U.S. grain.<sup>71</sup> By 1978, when commercial grain sales had virtually eclipsed food aid shipments, a commission reviewing Public Law 480 described it as “an integral part of U.S. efforts to promote exports and expand markets for its agricultural products.”<sup>72</sup> United States food aid, along with agricultural subsidies that lowered the price of commercially purchased U.S. grain, eroded the production-based entitlements of developing countries by depressing food prices, undercutting local farmers, reducing domestic food production, and creating long-term dependence on cheap imported food.<sup>73</sup> Reliance on imports to satisfy domestic nutritional needs promotes food insecurity by subjecting

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<sup>69</sup> See JAMES WESSEL, *TRADING THE FUTURE: FARM EXPORTS AND THE CONCENTRATION OF ECONOMIC POWER IN OUR FOOD SYSTEM* 166-67 (1983).

<sup>70</sup> See M.C. HALLBERG, *POLICY FOR AMERICAN AGRICULTURE: CHOICES AND CONSEQUENCES* 152-54 (1992); Edward Clay, *Food Aid, Development and Food Security*, in *AGRICULTURE AND THE STATE* 202, 210-13 (C. Peter Timmer ed., 1991). As early as the 19th century, U.S. agriculture had been plagued by overproduction and low agricultural prices. WESSEL, *supra* note 69, at 16-23, 151-52. The Agricultural Adjustment Act of 1933 succeeded in stabilizing farm incomes and prices by creating a federal agency, the Commodity Credit Corporation, to purchase surplus production, establish price supports, and enter into production control contracts with farmers. However, stable prices, along with growing wartime food demand, encouraged rapid increases in agricultural production. DE JANVRY, *supra* note 63, at 149. World War II, the Marshall Plan, and the Korean War temporarily absorbed some of these agricultural surpluses, but grain exports and farm income dropped sharply after the Korean War. By the 1950s, U.S. dumping of grain on European markets was viewed as unwelcome competition rather than a form of aid. Public Law 480 enabled the United States to maintain amicable relations with Europe by disposing of its surplus production in the developing world. WESSEL, *supra* note 69, at 151-53; DE JANVRY, *supra* note 63, at 149.

<sup>71</sup> See WESSEL, *supra* note 69, at 153. As developing countries grew more prosperous, many became major commercial buyers of U.S. agricultural products. Indeed, some of the Public Law 480 contracts explicitly required aid recipients to agree to subsequent commercial purchases as a precondition for receipt of aid. *Id.* Food aid also facilitated the efforts of U.S. producers and multinational grain traders to actively shape dietary preferences in the developing world so as to create markets for U.S. agricultural products. For example, the Western Wheat Association, a trade association of U.S. wheat producers, came to South Korea in 1967 to spearhead a campaign, in cooperation with the U.S. Department of Agriculture, to promote wheat consumption. The campaign included technical advice to new bakeries and attempts to make wheat rolls a staple of school lunches. The strategy was wildly successful. By 1975, seven thousand bakeries had been established in South Korea despite the fact that almost no wheat was cultivated there. By 1978, South Korea was importing over \$1 billion of U.S. farm products, consisting largely of wheat. *Id.* at 155, 168-73.

<sup>72</sup> *Id.* at 155.

<sup>73</sup> See Clay, *supra* note 70, at 213-23; HALLBERG, *supra* note 70, at 156-57.

developing countries to the vicissitudes of world market prices for imported food and for developing country exports and by making developing countries vulnerable to economically devastating trade embargoes imposed by exporting countries in order to further diplomatic goals, such as the U.S. embargo on Cuba.<sup>74</sup>

Finally, colonialism institutionalized inequitable patterns of land tenure that deprived rural smallholders and landless laborers of the land and income necessary to obtain sufficient food.<sup>75</sup> Plantation agriculture concentrated landholding in the hands of national elites and required the enslavement of vast numbers of people to provide cheap labor.<sup>76</sup> When slavery was abolished, the former slaves often had little recourse but to accept wage labor on the plantations or to eke out a living on marginal lands.<sup>77</sup> During the colonial period, land was often a symbol of social status.<sup>78</sup> After independence, agriculture became a profitable industry.<sup>79</sup> Those with capital, literacy, and access to political power expanded their landholdings at the expense of tenants and small farmers and shifted some of the best land in the developing world to the production of export crops (coffee, cotton, beef, bananas, vegetables, and feed grains) rather than food for domestic consumption.<sup>80</sup> As farms expanded, dispossessed tenants and smallholders swelled the ranks of landless laborers and depressed rural wages.<sup>81</sup> As a consequence of this history, land ownership in the developing world continues to be skewed in favor of traditional landholding elites and large-scale foreign and domestic agro-export enterprises, many of which effectively obstruct or dilute efforts at land reform.<sup>82</sup> Moreover, the most malnourished people in

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<sup>74</sup> See DE JANVRY, *supra* note 63, at 160-61.

<sup>75</sup> See YOUNG, *supra* note 21, at 66.

<sup>76</sup> See FOWLER & MOONEY, *supra* note 61, at 95-96. Indeed, the need for labor was so great that plantation owners often augmented the local labor force by importing indentured laborers from India, China, and Europe. WOLF, *supra* note 61, at 368-74.

<sup>77</sup> See FOWLER & MOONEY, *supra* note 61, at 95-96.

<sup>78</sup> See WESSEL, *supra* note 69, at 166.

<sup>79</sup> See *id.*

<sup>80</sup> *Id.* at 166-67. As a consequence of the land grab by large commercial farmers, small farmers were often relegated to the least fertile and most ecologically fragile lands. DE JANVRY, *supra* note 63, at 86.

<sup>81</sup> See WESSEL, *supra* note 69, at 167.

<sup>82</sup> See YOUNG, *supra* note 21, at 67; FOWLER & MOONEY, *supra* note 61, at 95. Over time, many of the export-oriented plantations in the developing world came under the direct ownership and control of corporations headquartered in developed countries (including United Fruit, the United Africa Company, and Brooke Bond) as the rural elite found itself unable to compete with the superior technology and capitalization of the foreign corporations. WOLF, *supra* note 61, at 317, 335-36. The domination of agricultural production and trade by transnational corporations has become an important feature of the contemporary world economy. See Halweil, *supra* note 11, at 68 (Table 3-2); William D. Heffernan, *Concentration of Ownership and Control in Agriculture*, in HUNGRY FOR PROFIT: THE AGRIBUSINESS THREAT TO FARMERS, FOOD, AND THE ENVIRONMENT 61-75 (Fred Magdoff et al. eds., 2000) [hereinafter HUNGRY FOR PROFIT]; SOPHIA MURPHY, INST. FOR

Asia, Africa, and Latin America are rural smallholders and landless laborers whose production-based entitlements (ability to grow their own food) and labor-based entitlements (ability to earn sufficient income to purchase food) have been eroded by inequitable land ownership.<sup>83</sup> According to the U.N. Food and Agricultural Organization, approximately eighty percent of the world's malnourished people reside in rural areas in the developing world.<sup>84</sup> Half of these malnourished individuals are rural smallholders whose livelihoods depend on selling their agricultural output, while twenty percent are landless laborers.<sup>85</sup>

From an environmental standpoint, the chief legacy of colonialism was the displacement of local biodiversity by monocultures in order to provide raw materials for distant, affluent markets.<sup>86</sup> The resulting genetic uniformity increased the vulnerability of entire crops to pests and disease, thereby jeopardizing the livelihoods of millions of farmers throughout the developing world.<sup>87</sup> For example, in the 1870s, the coffee industry in Ceylon (now Sri Lanka), India, East Asia, and parts of Africa was decimated by coffee rust.<sup>88</sup> In Costa Rica, banana plantations suffered severe economic losses as a consequence of a series of diseases: Panama disease in the 1930s, Yellow Sigatoka in the 1950s, and Black Sigatoka from the 1970s through the 1990s.<sup>89</sup> In India, an epidemic of brown spot disease in 1942 destroyed the rice crop and precipitated the infamous Bengal famine.<sup>90</sup> In order to mitigate the vulnerability of large-scale, genetically uniform crops, farmers

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AGRIC. AND TRADE POLICY, MANAGING THE INVISIBLE HAND: MARKETS, FARMERS AND INTERNATIONAL TRADE 21-29 (2002), *available at* [http://www.tradeobservatory.org/library/uploadedfiles/Managing\\_the\\_Invisible\\_Hand\\_2.pdf](http://www.tradeobservatory.org/library/uploadedfiles/Managing_the_Invisible_Hand_2.pdf) (last visited Sept. 29, 2004). Vertically integrated corporations currently control almost every aspect of the production and distribution of agricultural commodities, from the sale of inputs (seeds, fertilizers, pesticides, and equipment) to the processing, shipping, and marketing of agricultural output. MADELEY, FOOD FOR ALL, *supra* note 23, at 121-23.

<sup>83</sup> See YOUNG, *supra* note 21, at 66. International lending agencies and developing countries' governments exacerbated the problem of inequitable land tenure by funneling agricultural credit to wealthier farmers, who expanded their holdings at the expense of tenants and small farmers and shifted production from food staples to more lucrative export crops. As a result, the production of basic grains for domestic consumption declined. Many developing countries became increasingly dependent on food aid and on commercial food imports. The influx of cheap food dealt another blow to smallholders, tenant farmers, and sharecroppers by depressing the prices they received for their crops. WESSEL, *supra* note 69, at 166-68.

<sup>84</sup> FAO, STATE OF FOOD INSECURITY 2004, *supra* note 1, at 25.

<sup>85</sup> *Id.*

<sup>86</sup> See Shiva, *Monocultures of the Mind*, *supra* note 61, at 78-79.

<sup>87</sup> See FOWLER & MOONEY, *supra* note 61, at 180-81.

<sup>88</sup> *Id.* at 47.

<sup>89</sup> LORI ANN THRUPP, CULTIVATING DIVERSITY: AGROBIODIVERSITY AND FOOD SECURITY 28-29 (1998) [hereinafter THRUPP, CULTIVATING DIVERSITY].

<sup>90</sup> *Id.*

increasingly resorted to the use of agrochemicals that endanger human health and the environment.<sup>91</sup>

*B. The Post-World War II Boom in Agrochemical Production*

The second factor that contributed to the adoption of industrial agriculture in the developing world was the post-World War II agrochemical production boom. At the end of the Second World War, most farms in the United States relied on crop rotation and other biological means for pest control.<sup>92</sup> However, the U.S. chemical industry expanded rapidly after the war, and developed a variety of cheap and effective synthetic pesticides.<sup>93</sup> In the 1960s, chemical companies entered the seed production business,<sup>94</sup> and soon came to market seeds and agrochemicals as a package.<sup>95</sup> From the late 1940s until 1990, pesticide use in the United States increased fifty-fold.<sup>96</sup>

Over the last fifty years, the market for pesticides has undergone world-wide expansion.<sup>97</sup> Indeed, the amount of pesticides used in both developed and developing countries “doubled every decade between 1945 and 1985,”<sup>98</sup> and developing countries quickly became the fastest growing pesticide market.<sup>99</sup> The United States is now one of the world’s leading manufacturers

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<sup>91</sup> See FOWLER & MOONEY, *supra* note 61, at 180-81. Plantation agriculture also produced massive deforestation throughout the developing world. In Cuba, for example, sugar plantations, ranching, and ship-building resulted in the destruction of half of the country’s forests by 1900. Furthermore, inequitable land ownership created incentives for landless and jobless individuals to invade tropical forests in order to obtain access to arable land. *Id.* at 93-95.

<sup>92</sup> NATIONAL RESEARCH COUNCIL, *ALTERNATIVE AGRICULTURE* 54 (1989).

<sup>93</sup> JOHN HARTE ET AL., *TOXICS A TO Z: A GUIDE TO EVERYDAY POLLUTION HAZARDS* 113 (1991).

<sup>94</sup> THRUPP, *CULTIVATING DIVERSITY*, *supra* note 89, at 35.

<sup>95</sup> See FOWLER & MOONEY, *supra* note 61, at 128-37.

<sup>96</sup> HARTE ET AL., *supra* note 93, at 113. While farmers initially obtained a 400% rate of return on every pesticide dollar, the gains were not sustained over the long run because pesticides induced genetic resistance in target pests and destroyed beneficial insects that had previously kept pest populations under control. Indeed, the United States lost the same percentage of crops to pests in 1987 as it did in 1900 despite the application in 1987 of approximately 430 million pounds of pesticides. Donald T. Hornstein, *Lessons from Federal Pesticide Regulation on the Paradigms and Politics of Environmental Law Reform*, 10 *YALE J. ON REG.* 369, 393-394 (1993).

<sup>97</sup> James H. Colopy, *Poisoning the Developing World: The Exportation of Unregistered and Severely Restricted Pesticides from the United States*, 13 *UCLA J. ENVTL. L. & POL’Y* 7 167, 169 (1994/95); Roger E. Meiners & Andrew P. Morriss, *DDT: An Issue of Property Rights*, PERC REPORTS, Sept. 2001, at 5, available at <http://www.perc.org/pdf/sept01.pdf> (last visited Sept. 29 2004).

<sup>98</sup> Colopy, *supra* note 97, at 169-70; Meiners & Morriss, *supra* note 97, at 5.

<sup>99</sup> David A. Andow & David P. Davis, *Agricultural Chemicals: Food and Environment*, in *FOOD AND NATURAL RESOURCES* 194-95 (David Pimentel & Carl W. Hall eds., 1989).

and exporters of pesticides, producing 1.6 billion pounds of pesticides per year and exporting 700 million pounds of this amount.<sup>100</sup>

The growing demand for pesticides in the developing world is a function of several related factors. As a general matter, the cultivation of export monocultures to earn foreign exchange necessitated high levels of pesticide use.<sup>101</sup> Furthermore, U.S. international aid programs actively promoted pesticide use in developing countries by specifically earmarking loans and grants for the purchase of pesticides.<sup>102</sup> Finally, as discussed below, the Green Revolution encouraged much of the developing world to adopt high-yielding, genetically uniform seed varieties that were more susceptible to pests and disease and required massive applications of both pesticides and fertilizers.<sup>103</sup>

### *C. The Green Revolution: Supply-Side Approach to Food Security*

The third factor that contributed to the adoption of industrial agriculture in the developing world was the Green Revolution. The primary objective of the Green Revolution was to reduce world hunger by applying modern science and technology to the task of boosting crop yields.<sup>104</sup> The Green Revolution had its genesis in the international crop-breeding institutions established in Mexico and the Philippines between the 1940s and 1960s with the support of the Rockefeller and Ford Foundations for the purpose of improving the yield of basic food crops.<sup>105</sup> These institutions produced new varieties of rice,

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<sup>100</sup> DAVID DONALDSON ET AL., U.S. ENVT. PROT. AGENCY, PESTICIDE INDUSTRY SALES AND USAGE: 1998 AND 1999 MARKET ESTIMATES 9 (2002), available at [http://www.epa.gov/oppead1/pestsales/99pestsales/market\\_estimates1999.pdf](http://www.epa.gov/oppead1/pestsales/99pestsales/market_estimates1999.pdf) (last visited Sept. 29, 2004).

<sup>101</sup> See FOWLER & MOONEY, *supra* note 61, at 180-81. Between fifty and seventy percent of the pesticides used in the developing world were applied to exports crops such as coffee, cotton, bananas, sugar, and tea. DAVID WEIR & MARK SCHAPIRO, CIRCLE OF POISON: PESTICIDES AND PEOPLE IN A HUNGRY WORLD 32 (1981). In Central America, as much as eighty-five percent of all pesticides used were applied to cotton, almost all of which was grown for export. DOUGLAS L. MURRAY, CULTIVATING CRISIS: THE HUMAN COST OF PESTICIDES IN LATIN AMERICA 23 (1994).

<sup>102</sup> See MURRAY, *supra* note 101, at 21-23. "Between 1969 and 1974, USAID provided an annual average of \$17.5 million in grants and loans for the purchase of pesticides" in Central America alone. Furthermore, there is much evidence that agricultural assistance, including Alliance for Progress aid intended for basic grain production, was in fact used for the purchase of pesticides for the cotton industry. *Id.*

<sup>103</sup> See LAPPE ET AL., *supra* note 22, at 58-90.

<sup>104</sup> See KEITH GRIFFIN, ALTERNATIVE STRATEGIES FOR ECONOMIC DEVELOPMENT 144 (2nd ed. 1990) [hereinafter GRIFFIN, ALTERNATIVE STRATEGIES]; CONWAY, *supra* note 27, at 44.

<sup>105</sup> See CONWAY, *supra* note 27, at 47-52, 61; FOWLER & MOONEY, *supra* note 61, at 56. The first research institution was established in 1943 as a joint venture between the Mexican Ministry of Agriculture and the Rockefeller Foundation. It produced new high-yielding varieties of corn and wheat that resulted in record harvests. Following the success of the new wheat and corn varieties, a second research institution was established in the Philippines as a joint venture between the Philippine government and the Rockefeller and Ford Foundations. The second research institution produced new rice varieties that dramatically increased rice yields in the Philippines and throughout the developing world. CONWAY, *supra* note 27, at 47-57. Research

wheat, and corn that were more responsive than traditional varieties to synthetic fertilizers and controlled irrigation.<sup>106</sup> The new varieties were quickly adopted in many parts of the developing world, and resulted in dramatic increases in food production.<sup>107</sup> By the 1990s, about 70% of the world's corn, over 50% of the wheat produced in Asia and Latin America, and almost 75% of the rice cultivated in Asia consisted of the new varieties.<sup>108</sup>

### 1. The Green Revolution's Socioeconomic Impact

From a technological perspective, the Green Revolution was immensely successful. Total food production in developing countries more than doubled between 1960 and 1985, and food production more than kept pace with burgeoning population growth.<sup>109</sup> However, the Green Revolution was less successful from a social and economic perspective because it was a supply-side technocratic solution to a distributional problem grounded in political

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institutions were subsequently established in Colombia, Peru, Cote d'Ivoire, Nigeria, Kenya, Sri Lanka, India, Indonesia, Malaysia, Syria, Italy, the United States, and The Netherlands. The work of these research centers is currently funded by an association of public and private sector donors known as the Consultative Group on International Agricultural Research (CGIAR). See CGIAR ONLINE, at <http://www.cgiar.org> (last visited Sept. 29, 2004).

<sup>106</sup> See CONWAY, *supra* note 27, at 47-52, 61. While these new varieties are frequently referred to as "high-yielding varieties," this term is a misnomer. What distinguished the new seeds from traditional varieties was their responsiveness to chemical fertilizers and irrigation. In the absence of these inputs, the new seeds often performed worse than traditional varieties. VANDANA SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION: THIRD WORLD AGRICULTURE, ECOLOGY AND POLITICS* 72 (1991) [hereinafter SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION*]. Furthermore, comparisons of the yield of new and traditional seed varieties were often biased in favor of the marketable component of the crop, and ignored the contribution of traditional varieties to soil fertility, pest control, and fodder production. Traditional agricultural systems are based on the mixed and rotational cropping of cereals, pulses, and oilseeds, whereas the Green Revolution is based on the cultivation of genetically uniform varieties of a single crop. Comparisons of yield typically single out a particular crop, such as wheat, and compare the yields of traditional and new varieties while disregarding the yield of the other crops grown on the same soil. "Even if the yields of all the crops were included, it is difficult to convert a measure of pulse into an equivalent measure of wheat, for example, because in the diet and in the ecosystem, they have distinctive functions." Shiva, *Monocultures of the Mind*, *supra* note 61, at 9, 40 (1993). Even though the protein supplied by pulses and the calories supplied by wheat are both critical to a balanced diet, the nitrogen fixing capacity of pulses represents an important contribution to soil fertility. Moreover, traditional agricultural practices, such as crop rotation, intercropping (the simultaneous cultivation of two or more different kinds of crops), and planting several varieties of a particular crop contribute to non-chemical pest control because certain crops are resistant to particular types of pest infestation. These practices also ensure that some crops will survive even if others succumb to new and existing pests and diseases. Finally, traditional varieties produce not just food for humans but fodder for farm animals and organic material for fertilization. By contrast, the Green Revolution's new varieties were specifically designed to maximize the edible output while minimizing the output of non-edible biomass that could be used for other purposes on the farm. Thus, yield comparisons are misleading to the extent that they fail to take into account the multiple ways that traditional varieties are integrated into the production system. *Id.* at 40-46, 56-57.

<sup>107</sup> See CONWAY, *supra* note 27, at 44-45; FOWLER & MOONEY, *supra* note 61, at 60.

<sup>108</sup> See LAPPE ET AL., *supra* note 22, at 59.

<sup>109</sup> See CONWAY, *supra* note 27, at 44; GRIFFIN, *ALTERNATIVE STRATEGIES*, *supra* note 104, at 148.



and economic inequality.<sup>110</sup> Indeed, as detailed below, the Green Revolution exacerbated food insecurity by disproportionately benefiting large farmers without countervailing social and economic reforms to improve the status of the rural poor.<sup>111</sup>

The Green Revolution failed to solve the problem of world hunger because it focused on improving the supply of food without addressing the issue of inequitable distribution of food and food-producing resources.<sup>112</sup> Despite the improvement in global food production, food insecurity persisted.<sup>113</sup> As the World Bank acknowledged in an influential 1986 report on world hunger:

The growth of global food production has been faster than the unprecedented population growth of the past forty years . . . . Enough food is available so that countries that do not produce all the food they want can import it if they can afford to. Yet many poor countries and hundreds of millions of poor people do not share in this abundance. They suffer from a lack of food security, caused mainly by a lack of purchasing power.<sup>114</sup>

The Green Revolution promoted food insecurity by favoring wealthy farmers at the expense of poor farmers and landless laborers.<sup>115</sup> The Green Revolution was inherently biased in favor of wealthy farmers because it required significant capital investment.<sup>116</sup> The new seed varieties only produced high yields in response to the application of key inputs, such as fertilizers and irrigation.<sup>117</sup> These inputs tended to promote weed growth as

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<sup>110</sup> See LAPPE ET AL., *supra* note 22, at 59-60.

<sup>111</sup> See *id.* at 60; CONWAY, *supra* note 27, at 69-72, 81; YOUNG, *supra* note 21, at 72.

<sup>112</sup> See GRIFFIN, *ALTERNATIVE STRATEGIES*, *supra* note 104, at 160; FOWLER & MOONEY, *supra* note 61, at 58-59; LAPPE ET AL., *supra* note 22, at 59-60; ANDREW PEARSE, *SEEDS OF PLENTY, SEEDS OF WANT* 216-18 (1980).

<sup>113</sup> See FOWLER & MOONEY, *supra* note 61, at 58. Between 1970 and 1990, the two decades of significant Green Revolution advances, the number of undernourished people in the world dropped from 946 million to 786 million. However, the greatest progress in reducing hunger was made in China. If China is excluded from this analysis, the number of hungry people in the world actually increased by 66 million during this period. This increase in undernourishment is not a function of population growth. Indeed, total food availability per person actually increased by eleven percent between 1970 and 1990. Rather, the increase in world hunger is due to the failure of the Green Revolution to address inequalities in access to food and food-producing resources. See LAPPE ET AL., *supra* note 22, at 61; VANDANA SHIVA, *STAYING ALIVE: WOMEN, ECOLOGY AND DEVELOPMENT* 129 (1989) [hereinafter SHIVA, *STAYING ALIVE*].

<sup>114</sup> WORLD BANK, *POVERTY AND HUNGER*, *supra* note 20, at 1.

<sup>115</sup> See KEITH GRIFFIN, *THE POLITICAL ECONOMY OF AGRARIAN CHANGE: AN ESSAY ON THE GREEN REVOLUTION* 51-52 (1974) [hereinafter GRIFFIN, *POLITICAL ECONOMY*]; YOUNG, *supra* note 21, at 72; see also LAPPE ET AL., *supra* note 22, at 60.

<sup>116</sup> See CONWAY, *supra* note 27, at 66; YOUNG, *supra* note 21, at 72; SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION*, *supra* note 106, at 45; FRANCINE R. FRANKEL, *INDIA'S GREEN REVOLUTION* 193-94 (1971); PEARSE, *supra* note 112, at 161-63.

<sup>117</sup> See GRIFFIN, *ALTERNATIVE STRATEGIES*, *supra* note 104, at 146; SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION*, *supra* note 106, at 72; FOWLER & MOONEY, *supra* note 61, at 58; FRANKEL,

well as crop growth, thus necessitating the application of chemical herbicides.<sup>118</sup> Furthermore, since the genetic uniformity of the new varieties rendered them vulnerable to insects and disease, it was also necessary to apply insecticides and fungicides.<sup>119</sup> Poor farmers generally lacked the capital to invest in the requisite irrigation, fertilizers, and pesticides to successfully cultivate the new seed varieties.<sup>120</sup> Moreover, the government institutions responsible for providing agricultural credit, technical assistance, and marketing support were often biased against the poor.<sup>121</sup> Consequently, the Green Revolution disproportionately benefited wealthy farmers.<sup>122</sup>

Notwithstanding the Green Revolution's tendency to favor affluent farmers, one might expect that the increase in food production would improve food security overall by lowering food prices. This assumption is problematic for two reasons. First, as explained in Part II.A, nearly eighty percent of world's poor and hungry live in rural areas in the developing world.<sup>123</sup> Many of the rural poor are smallholders, tenant farmers, and sharecroppers whose livelihoods depend on selling their agricultural output.<sup>124</sup> When agricultural prices decline, the income of these farmers is depressed.<sup>125</sup> While higher yields may compensate wealthy farmers for the price drop, yields do not increase for small farmers unable to take advantage of the new technology.<sup>126</sup> Consequently, declining agricultural prices reduce the cash income necessary for small farmers to purchase agricultural inputs, to buy vital consumer

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*supra* note 116, at 6; MICHAEL PERLEMAN, *FARMING FOR PROFIT IN A HUNGRY WORLD* 145 (1977); Frederick H. Buttel & Laura T. Reynolds, *Population Growth, Agrarian Structure, Food Production and Distribution*, in *FOOD AND NATURAL RESOURCES* 325, 344 (David Pimentel & Carl W. Hall eds., 1989).

<sup>118</sup> See FOWLER & MOONEY, *supra* note 61, at 58.

<sup>119</sup> See *id.*; GRIFFIN, *POLITICAL ECONOMY*, *supra* note 115, at 78, 205.

<sup>120</sup> See FOWLER & MOONEY, *supra* note 61, at 58. Indeed, farmers who could not afford the fertilizers, pesticides, and irrigation necessary to successfully cultivate the new varieties found that the production increases promised by the Green Revolution were illusory. THRUPP, *CULTIVATING DIVERSITY*, *supra* note 89, at 23-24; PEARSE, *supra* note 112, at 166-67; Buttel & Reynolds, *supra* note 117, at 344.

<sup>121</sup> See GRIFFIN, *POLITICAL ECONOMY*, *supra* note 115, at 52-58, 78; LAPPE ET AL., *supra* note 22, at 63; FRANKEL, *supra* note 116, at 194-98; PEARSE, *supra* note 112, at 166-67.

<sup>122</sup> See GRIFFIN, *POLITICAL ECONOMY*, *supra* note 115, at 128; CONWAY, *supra* note 27, at 66; YOUNG, *supra* note 21, at 72; SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION*, *supra* note 106, at 45; FRANKEL, *supra* note 116, at 191-93.

<sup>123</sup> See FAO, *STATE OF FOOD INSECURITY 2004*, *supra* note 1, at 25. Moreover, most of the food-insecure urban dwellers are former farmers. MARCEL MAZOYER, *PROTECTING SMALL FARMERS AND THE RURAL POOR IN THE CONTEXT OF GLOBALIZATION* 3 (2001), available at <http://www.fao.org/worldfoodsummit/msd/Y1743e.pdf> (last visited Sept. 29, 2004).

<sup>124</sup> See FRANCES MOORE LAPPE & JOSEPH COLLINS, *FOOD FIRST: BEYOND THE MYTH OF SCARCITY* 135 (1978).

<sup>125</sup> See LAPPE ET AL., *supra* note 22, at 62.

<sup>126</sup> See *id.*; LAPPE & COLLINS, *supra* note 124, at 135-36.

goods not produced on the farm, and to pay taxes.<sup>127</sup> Small farmers survive by selling their assets (livestock and farm implements), by expanding cash crop production at the expense of subsistence food crops (resulting in undernourishment), by cultivating illegal crops (such as coca and poppy), or by simply abandoning the land.<sup>128</sup> Indeed, one of the major unintended consequences of the Green Revolution was the dispossession of many small farmers in the developing world.<sup>129</sup> Second, the Green Revolution worsened the lot of landless laborers, the poorest segment of the rural population, because the adoption of labor-saving technology by the large farmers (herbicides and mechanization in lieu of hand weeding and labor-intensive land preparation) tended to eliminate jobs and to depress rural wages.<sup>130</sup>

A 1995 study reviewing over 300 published reports on the Green Revolution produced over a thirty-year period found that eighty percent of the reports concluded that the Green Revolution exacerbated rural poverty and inequality.<sup>131</sup> In the language of entitlements, the Green Revolution eroded the production-based entitlements (right to grow food), trade-based entitlements (right to purchase food on the market based on farm earnings), and labor-based entitlements (right to income obtained through the sale of labor) of smallholders, tenant farmers, sharecroppers, and landless laborers.

The Green Revolution's emphasis on boosting food production reduced pressure for land reform and other redistributive measures in Asia, Africa,

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<sup>127</sup> See MAZOYER, *supra* note 123, at 14.

<sup>128</sup> *Id.* at 4-5, 14-15.

<sup>129</sup> SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION*, *supra* note 106, at 177. As the adoption of Green Revolution technology by wealthier farmers increased land values, speculators purchased farmland from destitute farmers, thus decreasing the number of self-provisioning farmers and swelling the ranks of landless laborers. In other instances, large landowners evicted sharecroppers and tenant farmers from the land in order to mechanize production and to avoid potential claims under land-to-the-tiller reform movements. LAPPE & COLLINS, *supra* note 124, at 135-48; GRIFFIN, *ALTERNATIVE STRATEGIES*, *supra* note 104, at 158; Buttel & Reynolds, *supra* note 117, at 344.

<sup>130</sup> See CONWAY, *supra* note 27, at 72-78; POTTIER, *supra* note 27, at 75-76; GRIFFIN, *ALTERNATIVE STRATEGIES*, *supra* note 104, at 136-37; PERLEMAN, *supra* note 117, at 149-50; Buttel & Reynolds, *supra* note 117, at 344.

<sup>131</sup> Donald K. Freebairn, *Did the Green Revolution Concentrate Incomes?: A Quantitative Study of Research Reports*, 23 *WORLD DEV.* 265, 265-79 (1995). See YOUNG, *supra* note 21, at 72; CONWAY, *supra* note 27, at 69-72. As the Freebairn analysis acknowledges, a significant minority of studies concluded that the Green Revolution's overall social impact was positive. See, e.g., RITA SHARMA & THOMAS T. POLEMAN, *THE NEW ECONOMICS OF INDIA'S GREEN REVOLUTION: INCOME AND EMPLOYMENT DIFFUSION IN UTTAR PRADESH* 16-18, 239-244 (1993); YUJIRO HAYAMI & MASAO KIKUCHI, *A RICE VILLAGE SAGA: THREE DECADES OF GREEN REVOLUTION IN THE PHILIPPINES* 121-24, 227-38 (2000); MURRAY J. LEAF, *SONG OF HOPE: THE GREEN REVOLUTION IN A PUNJAB VILLAGE* 46-58, 64, 94-95, 104-05, 131-33, 140-41 (1984); PETER B. R. HAZELL & C. RAMASAMY, *THE GREEN REVOLUTION RECONSIDERED: THE IMPACT OF HIGH-YIELDING RICE VARIETIES IN SOUTH INDIA* 239-44 (1991); Robert W. Herdt, *A Retrospective View of Technological and Other Changes in Philippine Rice Farming 1965-1982*, 35 *ECON. DEV. & SOC. CHANGE* 329, 347-448 (1989).

and Latin America.<sup>132</sup> In so doing, the Green Revolution may have forestalled the very reforms that have been found in hindsight to promote food security. As the FAO acknowledged in its 2002 report on the state of food insecurity in the world, numerous studies have confirmed the importance of land reform in benefiting both smallholders and landless laborers by reducing rural poverty, stimulating growth in rural wages, and combating hunger.<sup>133</sup> Indeed, according to FAO data, countries where land was more equitably distributed in 1980 made more rapid progress in reducing food insecurity over the last two decades than countries where land ownership was more concentrated.<sup>134</sup>

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<sup>132</sup> The Green Revolution coincided with the coming to power of the Chinese Communist Party and with the growth of peasant movements in the Philippines, Indonesia, Malaysia, Vietnam, and India. It began just years after the first land reform program in Latin America under the populist Cardenas regime in Mexico. See SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION*, *supra* note 106, at 50-57; FOWLER & MOONEY, *supra* note 61, at 56; TOM BARRY, *ZAPATA'S REVENGE: FREE TRADE AND THE FARM CRISIS IN MEXICO* 22-25, 27-29 (1995). Critics of the Green Revolution have emphasized that the very purpose of the Green Revolution was to reduce pressure for radical political change in Asia and Latin America by promoting technological innovation and market integration. See LAPPE ET AL., *supra* note 22, at 64-65. GRIFFIN, *ALTERNATIVE STRATEGIES*, *supra* note 104, at 147; FOWLER & MOONEY, *supra* note 61, at 56-57; SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION*, *supra* note 106, at 47; ELLEN MESSER ET AL., *INT'L FOOD POLICY RESEARCH INST., FOOD FROM PEACE: BREAKING THE LINKS BETWEEN HUNGER AND CONFLICT* 12 (1998), available at <http://www.ifpri.org/2020/dp/dp24.pdf> (last visited Sept. 29, 2004).

<sup>133</sup> See FAO, *STATE OF FOOD INSECURITY 2002*, *supra* note 3, at 26. Indeed, even World Bank analysts acknowledge, based on studies from all over the world, that land reform reduces poverty, increases efficiency, and lays the groundwork for sustained economic growth. KLAUS DEININGER ET AL., *HOW LAND REFORM CAN CONTRIBUTE TO ECONOMIC GROWTH AND POVERTY REDUCTION: EMPIRICAL EVIDENCE FROM INTERNATIONAL AND ZIMBABWEAN EXPERIENCE* (2002), available at <http://Inweb18.worldbank.org/ESSD/ardext.nsf/24ByDocName/HowlandreformcancontributetoeconomicgrowthandpovertyreductionEmpiricalevidencefrominternationalandZimbabweanexperience/SFILE/Zimbabwe.pdf> (last visited Sept. 29, 2004); see also INT'L FUND FOR AGRIC. DEV. (IFAD), *RURAL POVERTY REPORT 2001* at 76 (2001), available at [http://www/ifad.org/poverty/chapter\\_3.pdf](http://www.ifad.org/poverty/chapter_3.pdf) (last visited Sept. 29, 2004) (concluding that land reform has demonstrably increased both rural income and employment in a variety of countries); DANIEL MAXWELL & KEITH WIEBE, *LAND TENURE CTR., LAND TENURE AND FOOD SECURITY: A REVIEW OF CONCEPTS, EVIDENCE AND METHODS* 4-6 (1998), available at [http://agecon.lib.umn.edu/cgi-bin/pdf\\_view.p13paperid=1044&ftype=.pdf](http://agecon.lib.umn.edu/cgi-bin/pdf_view.p13paperid=1044&ftype=.pdf) (last visited Sept. 29, 2004) (summarizing the studies that find that land reform reduces poverty, increases employment, and enhances equity and productivity); TIMOTHY BESLEY & ROBIN BURGESS, *SUNTORY & TOYOTA INT'L CTRS. FOR ECON. & RELATED DISCIPLINES, LAND REFORM, POVERTY REDUCTION, AND GROWTH: EVIDENCE FROM INDIA* 20-21 (1998), available at <http://sticerd.lse.ac.uk/dps/de/dedps13.pdf> (last visited Sept. 29, 2004) (explaining that land reform in India reduced rural poverty and increased agricultural wages); PETER M. ROSSET, *THE MULTIPLE FUNCTIONS AND BENEFITS OF SMALL FARM AGRICULTURE IN THE CONTEXT OF GLOBAL TRADE NEGOTIATIONS* 11-14 (1999), available at <http://www.foodfirst.org/pubs/policybs/pb4.pdf> (last visited Sept. 29, 2004) (discussing the studies that conclude that land reform improves social welfare).

<sup>134</sup> FAO, *STATE OF FOOD INSECURITY 2002*, *supra* note 3, at 26-27.

## 2. The Green Revolution's Environmental and Food Security Impact

From an environmental and food security perspective, the most significant impact of the Green Revolution was the loss of crop genetic diversity.<sup>135</sup> As a consequence of the Green Revolution, indigenous wheat varieties had virtually disappeared by the 1970s in North Africa, the Himalayas, Turkey, Spain, and Pakistan.<sup>136</sup> Staples such as “barley, rice, millet, sorghum, [and] potatoes” had also undergone serious erosion of genetic diversity.<sup>137</sup> Genetic erosion occurred even in export crops, such as coffee, bananas, cacao, and cotton, as uniform varieties replaced traditional, diverse varieties.<sup>138</sup>

The loss of crop genetic diversity resulted in outbreaks of pests and disease that caused severe damage to food crops.<sup>139</sup> The application of pesticides often exacerbated the problem by destroying the pests' natural enemies and by enabling pests and pathogens to develop pesticide resistance.<sup>140</sup> Finally, genetic erosion resulted in the loss of the very genetic material that might confer resistance in the event of catastrophic pest and disease infestations, thus increasing the vulnerability of the world's food supply.<sup>141</sup>

The Green Revolution contributed to micronutrient malnutrition in the developing world by reducing the absorption of vital minerals into fruit,

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<sup>135</sup> See FOWLER & MOONEY, *supra* note 61, at 61-79.

<sup>136</sup> *Id.* at 68-69.

<sup>137</sup> *Id.* at 72. In Bangladesh, for example, the cultivation of new rice varieties resulted in the loss of nearly 7000 traditional rice varieties. THRUPP, CULTIVATING DIVERSITY, *supra* note 89, at 23. Other crops that experienced the extinction of traditional varieties include okra in Africa and India; sugar beets, lentils, beans, peaches, pears, sweet cherries, and apricots in Turkey; and broccoli, cauliflower, and brussel sprouts in Europe. The scientific literature also reports the extinction of traditional varieties of “apple, lima bean, bitter gourd, Chinese cabbage, cotton, cucumber, eggplant, flax, forage grasses, corn, oats, onion, peas, pumpkin, soybean, squash . . . sweet pepper, sweet potato, tomato, watermelon, yam,” and various other crops. FOWLER & MOONEY, *supra* note 61 at 74.

<sup>138</sup> See THRUPP, CULTIVATING DIVERSITY, *supra* note 89, at 24.

<sup>139</sup> See CONWAY, *supra* note 27, at 208-09; THRUPP, CULTIVATING DIVERSITY, *supra* note 89, at 28-29 (box 5), 30 (tbl. 2). For example, in 1972, following widespread adoption of new, high-yielding varieties of wheat, half of the Brazilian wheat crop was lost to disease. Zambia's genetically uniform corn crop was likewise devastated in 1974 as a result of mold infestation. *Id.* at 29 (box 5).

<sup>140</sup> See CONWAY, *supra* note 27, at 209-13. By the mid-1980s, approximately 450 pest species had developed resistance to one or more insecticide, about 150 fungi had developed resistance to fungicides, and nearly fifty weeds had developed resistance to herbicides. *Id.* at 209. Plant breeders responded to this problem by building pest and disease resistance into the plant. This resistance was usually overcome in a matter of years and often resulted in the emergence of new, more virulent pest and disease strains. *Id.* at 213-14.

<sup>141</sup> See FOWLER & MOONEY, *supra* note 61, at 81-82; THRUPP, CULTIVATING DIVERSITY, *supra* note 89, at 31.

vegetables, and grains.<sup>142</sup> The intensive monocropping of Green Revolution varieties depleted the soil of important minerals such as “zinc, iron, copper, manganese, magnesium, molybdenum, [and] boron,”<sup>143</sup> and the application of synthetic pesticides and fertilizers (along with compaction of soil) destroyed the microorganisms necessary to make these minerals available to food crops.<sup>144</sup> While organic fertilizers counteract this problem because the organic matter contains and replenishes these micronutrients, synthetic fertilizers generally contain few or none of these minerals.<sup>145</sup> As a consequence of the Green Revolution, billions of people consume diets deficient in essential micronutrients.<sup>146</sup> Micronutrient malnutrition can produce serious impacts on human health, learning ability, and productivity.<sup>147</sup>

The Green Revolution also displaced traditional food crops in the developing world, thereby impoverishing the diets of many individuals and communities.<sup>148</sup> As a result of the Green Revolution, monocultures of wheat and corn replaced thousands of nutritious and robust traditional food crops, such as the Senegalese cereal known as *fonio* and the Indian *ragi* and *jowar* grains.<sup>149</sup> The immediate impact of this conversion from polycultural to monocultural production was a decline in the variety of foods consumed, increased reliance on frequently unaffordable and less nutritious purchased foods, and the loss of foods essential to a balanced diet.<sup>150</sup>

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<sup>142</sup> See HELENA PAUL & RICARDA STEINBRECHER, HUNGRY CORPORATIONS: TRANSNATIONAL BIOTECH COMPANIES COLONISE THE FOOD CHAIN 10-11 (2003).

<sup>143</sup> SHIVA, STAYING ALIVE, *supra* note 113, at 145-46.

<sup>144</sup> See PAUL & STEINBRECHER, *supra* note 142, at 10-11.

<sup>145</sup> See SHIVA, STAYING ALIVE, *supra* note 113, at 145-46.

<sup>146</sup> See PAUL & STEINBRECHER, *supra* note 142, at 10-11; GENETIC RES. ACTION INT'L (GRAIN), ENGINEERING SOLUTIONS TO MALNUTRITION (March 2000), available at <http://www.grain.org/seedling/?id=106> (last visited Sept. 29, 2004).

<sup>147</sup> See PAUL & STEINBRECHER, *supra* note 142, at 11; U.N. FOOD & AGRIC. ORG (FAO), PREVENTING MICRONUTRIENT MALNUTRITION: A GUIDE TO FOOD-BASED APPROACHES—A MANUAL FOR POLICY-MAKERS AND PROGRAM PLANNERS (1997), available at <http://www.fao.org/DOCREP/X5244E/X5244e00.htm> (last visited Sept. 29, 2004).

<sup>148</sup> See THRUPP, CULTIVATING DIVERSITY, *supra* note 89, at 23, 31.

<sup>149</sup> See *id.* at 23-24, 31; see also Shiva, *Monocultures of the Mind*, *supra* note 61, at 24-26.

<sup>150</sup> THRUPP, CULTIVATING DIVERSITY, *supra* note 89, at 31; SHIVA, STAYING ALIVE, *supra* note 113, at 128-31. Zambia's experience with high-yielding corn varieties is a classic example of this phenomenon. Following independence, Zambia promoted the cultivation of corn as a way of ending economic dependence on South Africa and Rhodesia. The Zambian government used revenues from the copper industry to provide generous subsidies to farmers, including fertilizer subsidies, credit, farmer training, and an expanded network of input supply and crop collection depots. In their zeal to “modernize” agriculture, policy-makers ignored the importance of traditional agricultural practices (such as intercropping) and traditional food products to the maintenance of balanced livelihoods and diets. The money earned by small farmers from corn cultivation was not sufficient to offset the shortfall in other crops, such as cassava, groundnuts, beans, sweet potato, pumpkin, and vegetables. The diet and health of Zambian children suffered greatly. The crisis point was reached when the copper industry collapsed and the Zambian government, under IMF pressure, phased out agricultural subsidies. Unable to earn sufficient

The adoption of new seed varieties, and of the irrigation systems, pesticides, and fertilizers required for their cultivation, displaced ecologically sustainable farming practices (such as intercropping, crop rotation, and agroforestry).<sup>151</sup> Moreover, it often resulted in the loss of local knowledge about traditional agroecological practices.<sup>152</sup> Pesticide use displaced traditional pest control techniques (such as crop rotation and fallowing) that also contributed to soil fertility.<sup>153</sup> Chemical fertilizers replaced the use of animal manure and crop residues.<sup>154</sup> The continuous planting of uniform crops in a given area replaced crop rotation and intercropping.<sup>155</sup> Green Revolution varieties displaced indigenous and traditional crops that required far less irrigation.<sup>156</sup> The ecological consequences were often severe. The heavy use of agrochemicals destroyed beneficial soil organisms and degraded soil quality.<sup>157</sup> The Green Revolution monocultures removed vital micro-nutrients from the soil, resulting in the long-term decline in agricultural yields.<sup>158</sup> Intensive irrigation resulted in water-logging and salinization of soils.<sup>159</sup> In sum, soil quality deteriorated, leading to a loss of agricultural productivity.<sup>160</sup>

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income from the sale of corn to meet their cash needs, farmers responded by selling to urban consumers the foodstuffs that formerly circulated in local markets. In sum, Zambia's transition to corn farming was accompanied by reduced crop diversification, an inability of local people to procure sufficient and nutritious food, and a decline in local market activity. In the words of one commentator, Zambia shifted "from subsistence to poverty, from complex and varied farming systems to an impoverished pseudo-traditional diet that [failed] to meet consumption needs." POTTIER, *supra* note 27, at 170-73.

<sup>151</sup> Intercropping is the cultivation of two or more crops simultaneously in the same field. This is useful because the crops utilize different resources or interact with one another in beneficial ways. For example, one crop, such as legumes, may provide soil fertility. Crop interactions may also help control pests since some crops will be more resistant to certain pests than others. Crop rotation involves the growing of two or more crops sequentially on the same piece of land, with benefits similar to those of intercropping. Agroforestry is a form of intercropping in which herbaceous crops are interspersed with trees. Trees with deeper roots can exploit water sources and nutrients unavailable to the crops and may provide shade or mulch. The crops, in turn, provide ground cover that reduces weeds and controls soil erosion. CONWAY, *supra* note 27, at 170.

<sup>152</sup> See *id.* at 32.

<sup>153</sup> See PAUL R. EHRLICH ET AL., *THE STORK AND THE PLOW: THE EQUITY ANSWER TO THE HUMAN DILEMMA* 185 (1995) (explaining how traditional pest control methods like fallowing and crop rotation had maintain soil fertilization while chemical pesticides do not).

<sup>154</sup> See THRUPP, *CULTIVATING DIVERSITY*, *supra* note 89, at 23, 31.

<sup>155</sup> See *id.* at 27.

<sup>156</sup> See SHIVA, *STAYING ALIVE*, *supra* note 113, at 146-47 (explaining that Green Revolution crops need much more water than indigenous and traditional patterns).

<sup>157</sup> See THRUPP, *CULTIVATING DIVERSITY*, *supra* note 89, at 27.

<sup>158</sup> See *id.*; SHIVA, *STAYING ALIVE*, *supra* note 113, at 145-46 (indicating that micro-nutrient deficiency in the soil threatens agricultural production).

<sup>159</sup> SHIVA, *STAYING ALIVE*, *supra* note 113, at 146-47; PERLEMAN, *supra* note 117, at 154. Green Revolution seeds produced water-logging and salinization because they required more water than traditional varieties. For example, the high-yielding varieties of wheat required three times

The use of pesticides to protect genetically uniform crops harmed the environment and increased pesticide-related deaths and illnesses in developing countries.<sup>161</sup> Pesticide and fertilizer runoff contaminated drinking water supplies and resulted in the eutrophication of rivers, lakes, and coastal waters.<sup>162</sup> Excessive pesticide use also killed cattle and livestock and eradicated important sources of protein for poor farmers, such as fish, shrimp, and crabs in rice paddies.<sup>163</sup> Nitrous oxide emissions from synthetic fertilizers contributed to global warming and to the depletion of the ozone layer.<sup>164</sup> In addition, fertilizer production, which increased tenfold between 1950 and 1990, required significant inputs of non-renewable petroleum, the extraction and processing of which posed serious environmental risks.<sup>165</sup>

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as much water as traditional varieties. Furthermore, since these new varieties were planted continuously rather than for short durations, irrigation was required throughout the year. Waterlogging occurs when the amount of water introduced into an ecosystem by irrigation exceeds drainage capacity. Waterlogging reduces soil aeration, restricts the growth of roots and can have a severe adverse impact on plant growth. Salinization occurs when irrigation is introduced into areas of scarce rainfall. In these areas, the soil contains high levels of unleached salts, which are brought to the surface by irrigation. As the irrigation water evaporates, a white residue of salt is left behind, rendering the land less productive. SHIVA, *STAYING ALIVE*, *supra* note 113, at 146-47.

<sup>160</sup> See THRUPP, *CULTIVATING DIVERSITY*, *supra* note 89, at 27; LAPPE ET AL., *supra* note 22, at 70-71 (explaining that yields had declined or leveled off by the 1990s in a number of Green Revolution areas as a consequence of soil degradation).

<sup>161</sup> See CONWAY, *supra* note 27, at 86-88. This was the result of the large quantity of pesticides used and of pesticide misuse, including inadequate labeling, lack of protective equipment, and the continued use of pesticides (such as DDT and chlordane) that were either banned or severely restricted in developed countries. *Id.* at 87-90. Although developing countries account for approximately 20% of global pesticide use, they experience 99% of pesticide deaths. Bartlett P. Miller, *The Effect of the GATT and the NAFTA on Pesticide Regulation: Hard Look at Harmonization*, 6 COLO. J. INT'L ENVTL. L. & POL'Y 201, 204 (1995). Farmers and agricultural laborers in developing countries are often exposed to high levels of pesticides due to inadequate domestic regulation, low literacy levels, lack of training in pesticide use, lack of proper safety equipment, indiscriminate spraying, and improper storage or disposal of pesticides. Andrew M. Cain, *Opportunities to Improve Pesticide Policy in Central America*, 11 COLO. J. INT'L ENVTL. L. & POL'Y 151, 156 (2000); see also Margo Brett Baender, *Pesticides and Precaution: The Bamako Convention as a Model for an International Convention on Pesticides Regulation*, 24 N.Y.U. J. INT'L L. & POL. 557, 559-60, 562-66 (1991) (describing the misuse of pesticides in developing countries and the pressure to use excessive amounts in order to maximize cash crop production).

<sup>162</sup> See EHRICH ET AL., *supra* note 153, at 184. Fertilizer runoff produced nitrate contamination in drinking water at levels likely to pose health hazards, including cancer and methemoglobinemia ("blue baby" syndrome). Fertilizer contamination also produced eutrophication of surface waters. Nutrients in fertilizers (such as nitrates and phosphates) generated dense blooms of algae and other surface plants. These blooms killed other aquatic plants by blocking access to sunlight. When these other aquatic plants died and decomposed, they removed oxygen from the water, thereby causing the death of fish and other aquatic organisms. CONWAY, *supra* note 27, at 90-93.

<sup>163</sup> See CONWAY, *supra* note 27, at 87; PERLEMAN, *supra* note 117, at 156-57.

<sup>164</sup> EHRICH ET AL., *supra* note 153, at 184; CONWAY, *supra* note 27, at 94-102.

<sup>165</sup> EHRICH ET AL., *supra* note 153, at 151, 184; SHIVA, *STAYING ALIVE*, *supra* note 113, at 143. Moreover, when energy prices increased, synthetic fertilizers (along with fossil fuels to operate irrigation pumps) became unaffordable in many developing countries, resulting in a decline in agricultural production. In India, for example, fuel and fertilizer shortages caused by the energy



Indeed, industrial agriculture is so dependent on fossil fuels that 9.8 kilocalories (kcal) of fossil fuel energy are required to produce one kcal of food energy.<sup>166</sup>

Finally, the conversion of forests, grasslands, and wetlands to monocultural farming systems destroyed or fragmented the habitats of various species of flora and fauna, producing a decline in biodiversity.<sup>167</sup> The loss of biodiversity resulted in a loss of ecosystem services (such as water purification, insect management, and climate regulation) as well as the loss of wildlife habitat products useful for medicine, food, and fodder.<sup>168</sup> Because extinction is irreversible, such losses have both global and local implications, and affect both present and future generations.<sup>169</sup>

### 3. Summary and Conclusion: The Green Revolution and Industrial Agriculture

In sum, the Green Revolution was a key step in the extension to food crops of the monocultural, chemical-intensive production techniques used for cash crops.<sup>170</sup> It represented a significant shift from a farming system controlled by local peasants based on resources produced on the farm to one dependent on seeds, fertilizers, pesticides, and machinery manufactured by multinational corporations headquartered in the developed world.<sup>171</sup>

While the Green Revolution increased agricultural production, it neglected to address the fundamental causes of food insecurity: poverty and inequality. Indeed, the Green Revolution exacerbated food insecurity by increasing rural poverty and by defusing pressure for agrarian reform and other redistributive measures. The Green Revolution also displaced traditional ecologically sustainable farming practices in many parts of the developing world and promoted reliance on genetically uniform seed varieties, fertilizers, pesticides, and extensive irrigation. The environmental and food security impacts of the Green Revolution included loss of crop genetic diversity, increased vulnerability to pests and disease, loss of

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crisis of the 1970s produced a drastic decline in agricultural production. In 1974, wheat production was twenty-five percent less than projected, and production continued to decline the following year. EHRICH ET AL., *supra* note 153, at 184-85.

<sup>166</sup> Laura L. Jackson, *Agricultural Industrialization and the Loss of Biodiversity*, in PROTECTION OF GLOBAL BIODIVERSITY: CONVERGING STRATEGIES 69 (Lakshman D. Guruswamy & Jeffrey A. McNeely eds., 1998).

<sup>167</sup> See THRUPP, CULTIVATING DIVERSITY, *supra* note 89, at 27-29.

<sup>168</sup> *Id.* at 30. See also MIGUEL ALTERI, AGROECOLOGY: THE SCIENCE OF SUSTAINABLE AGRICULTURE 369-70 (1995) (describing the importance of biodiversity in sustainable agriculture).

<sup>169</sup> See THRUPP, CULTIVATING DIVERSITY, *supra* note 89, at 30.

<sup>170</sup> See FOWLER & MOONEY, *supra* note 61, at 129-30.

<sup>171</sup> See SHIVA, THE VIOLENCE OF THE GREEN REVOLUTION, *supra* note 106, at 64. See also FOWLER & MOONEY, *supra* note 61, at 130-31 (discussing how the Green Revolution created new markets for giant agricultural corporations).

traditional food crops, pesticide and fertilizer contamination of surface waters and groundwater, increased pesticide-related death and illness, soil degradation, and loss of ecosystem biodiversity.

*D. Biotechnology: Will the Gene Revolution Reinforce the Harm of the Green Revolution?*

An analysis of industrial agriculture in the developing world would not be complete without a discussion of the rapidly expanding commercial cultivation of genetically modified crops. Although five countries (the United States, Canada, Argentina, China, and South Africa) currently cultivate ninety-nine percent of the world's genetically modified crops,<sup>172</sup> these crops are increasingly tested in and marketed to developing countries.<sup>173</sup> Notwithstanding the limitations of a technology-based supply-side approach to the problem of world hunger, proponents of biotechnology claim that genetically modified crops will enhance food security and protect the environment by increasing food production, reducing the use of pesticides and herbicides, and minimizing the need to cultivate new lands.<sup>174</sup> While a full-blown analysis of the risks and benefits of biotechnology is beyond the scope of this article, this section will present a brief overview of the food security and environmental implications of biotechnology in the developing world. The section will focus on the two types of genetically modified crops that have experienced the greatest commercial growth: herbicide-tolerant crops and insect-resistant crops.<sup>175</sup> Because genetically modified crops are not currently

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<sup>172</sup> See U.N. FOOD & AGRIC. ORG., THE STATE OF FOOD AND AGRICULTURE 2003-2004 36 (2004), available at [http://www.fao.org/documents/show\\_cdr.asp?url\\_file=/DOCREP/006/y5160e/y5160e00.htm](http://www.fao.org/documents/show_cdr.asp?url_file=/DOCREP/006/y5160e/y5160e00.htm) (last visited Sept. 29, 2004) [hereinafter FAO, THE STATE OF FOOD AND AGRICULTURE 2003-2004]. The United States grows just under two-thirds of the world's genetically modified crops. The most widely cultivated transgenic crops are soybeans, maize, cotton, and canola. *Id.*

<sup>173</sup> See PAUL & STEINBRECHER, *supra* note 142, at 184-220.

<sup>174</sup> See Lakshman D. Guruswamy, *Sustainable Agriculture: Do GMOs Imperil Biosafety?*, 9 IND. J. GLOBAL LEGAL STUD. 461, 469 (2002) (summarizing the arguments of the proponents of biotechnology); Norman E. Borlaug, *Ending World Hunger: The Promise of Biotechnology and the Threat of Antiscience Zealotry*, 124 PLANT PHYSIOLOGY 487-490 (2000), available at [http://www.plantphysiol.org/cgi/content/full/124/2/487?maxtoshow=&HITS=108&hits=10&RESU\\_LTFORMAT=&author1=Borlag&searchid=1096503064213\\_9994&stored\\_search=&FIRSTINDE\\_X=o&sortspec=relevance&journalcode=plantphysiol](http://www.plantphysiol.org/cgi/content/full/124/2/487?maxtoshow=&HITS=108&hits=10&RESU_LTFORMAT=&author1=Borlag&searchid=1096503064213_9994&stored_search=&FIRSTINDE_X=o&sortspec=relevance&journalcode=plantphysiol) (last visited Sept. 29, 2004); Mark Strauss, *When Malthus Meets Mendel*, 119 FOREIGN POL'Y, June 2000, at 105; see also William F. Kirk, Address at the American Society of Agronomy and Social Science (June 19, 2000), available at <http://www.dupont.com/biotech/resources/speeches/speeches.html> (last visited Nov. 9, 2004).

<sup>175</sup> Approximately ninety-nine percent of commercially grown genetically modified crops have been bred for just two traits: herbicide tolerance and insect resistance. See LIZ ORTON, GM CROPS—GOING AGAINST THE GRAIN 9 (May 2003), available at <http://www.actionaid.org> (last visited Sept. 29, 2004). Herbicide-tolerant crops allow the application of a broad-spectrum herbicide (such as Monsanto's Roundup) to all standing crops, thereby killing weeds without damaging the crop. Insect-resistant crops incorporate microbial pesticides (such as *Bacillus thuringiensis*—commonly known as Bt) that kill susceptible herbivorous pests and thereby reduce the need to apply conventional insecticides. See Jules Pretty, *The Rapid Emergence of Genetic Modification in World Agriculture: Contested Risks and Benefits*, 28(3) ENVTL. CONSERVATION 248, 249 (2001) [hereinafter Pretty, *RapidEmergence*].

cultivated in substantial amounts in the developing world, the following observations are necessarily preliminary and based on limited information.

From the standpoint of food security, the benefits of biotechnology are highly uncertain. First, there is widespread consensus that genetically modified crops, unlike their Green Revolution counterparts, have not increased yields.<sup>176</sup> Second, biotechnology threatens to exacerbate food insecurity by increasing rural inequality.<sup>177</sup> Biotechnology is being promoted by the same transnational corporations that engaged in the massive export of pesticides to developing countries.<sup>178</sup> These enterprises seek to maximize profits by marketing their products to large-scale, commercial farmers in affluent countries while neglecting the needs of small, resource-poor farmers in the developing world.<sup>179</sup> By focusing on lucrative export crops and favoring affluent farmers, biotechnology may force small-scale producers out of the market, thus depriving them of production-based entitlements.<sup>180</sup>

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<sup>176</sup> Pretty, *Rapid Emergence*, *supra* note 175, at 255; MADELEY, HUNGRY FOR TRADE: HOW THE POOR PAY FOR FREE TRADE 106 (2000) [hereinafter MADELEY, HUNGRY FOR TRADE]; MIGUEL ALTIERI, GENETIC ENGINEERING IN AGRICULTURE: THE MYTHS, ENVIRONMENTAL RISKS, AND ALTERNATIVES 7-10 (2001). Even where yields have increased, the costs of the new seeds have often been greater than the gains obtained, thus producing a net loss for farmers. ORTON, *supra* note 175, at 14.

<sup>177</sup> ORTON, *supra* note 175, at 16; DEVLIN KUYEK, GENETIC RES. ACTION INT'L., GENETICALLY MODIFIED CROPS IN AFRICA: IMPLICATIONS FOR SMALL FARMERS 4 (2002), available at <http://www.grain.org/briefings/?id=12> (last visited Sept. 29, 2004). In the 1990s, the pesticide industry purchased biotechnology, plant breeding, and seed production enterprises in the developed and developing world. As a consequence, six corporations headquartered in the United States and Europe control 98% percent of the market for genetically modified crops and 70% of the world's pesticide market. The leading agrochemical and biotechnology companies are Dupont, Monsanto, Dow, Syngenta, Bayer Aventa, and BASF (agrochemicals only). ORTON, *supra* note 175, at 11.

<sup>178</sup> *Id.* at 11.

<sup>179</sup> *Id.* at 12, 16. Biotechnology companies invest in a relatively small number of internationally traded commodities (maize, rice, wheat, cotton, soybeans, and canola) while ignoring crops grown by poor farmers (such as millet, yam, cassava, quinoa, and indigenous roots and tubers). *Id.* at 19. Moreover, the highly uniform and standardized seeds produced by the biotechnology industry are ill adapted to the range of stresses encountered by poor farmers (such as low soil fertility, unique pests and diseases, and erratic rainfall) and to the resource constraints of poor farmers (lack of credit and risk of falling into debt). *Id.* at 21-22. While some research is being performed to develop crops with properties useful to poor farmers, genetically modified crops for the poor are unlikely to be lucrative and are not a top commercial priority. *Id.* at 9-10. See also PER PINSTRUP-ANDERSON & EBBE SCHIOLER, SEEDS OF CONTENTION: WORLD HUNGER AND THE GLOBAL CONTROVERSY OVER GM CROPS 97 (2002) (discussing the different research priorities of industrialized countries and developing countries with respect to genetically modified crops); JANE RISLER & MARGARET MELLON, THE ECOLOGICAL RISKS OF GENETICALLY MODIFIED CROPS 19 (2000) (explaining that "virtually all transgenic crops . . . are aimed at the prosperous farmers of the [industrialized world]").

<sup>180</sup> ORTON, *supra* note 175, at 16. Biotechnology's neglect of the needs of small farmers threatens to reproduce the anti-poor bias of the Green Revolution and to exacerbate rural poverty and inequality. For example, in Argentina, which has adopted genetically modified crops more quickly and enthusiastically than any other developing country, cultivation of genetically modified soybeans displaced the production of many staples (including milk, rice, maize,

Furthermore, genetically modified crops may reduce the need for manual labor (for example, weeding and pesticide application), thus eroding the labor-based entitlements of poor rural dwellers.<sup>181</sup> Third, the patenting of genetically modified seeds by transnational corporations headquartered in the industrialized world threatens to reinforce the economic dominance of developed countries and to undermine the traditional agricultural practices of farmers, such as saving, breeding, and sharing seeds.<sup>182</sup> Instead of saving seeds from one season to the next and continually selecting and breeding seeds in response to changing growing conditions, farmers who purchase genetically modified seeds must purchase new seeds every season.<sup>183</sup> Thus, transnational corporations may increasingly determine what crop varieties will be planted, and farmers may lose access to locally-adapted seed varieties.<sup>184</sup> Furthermore, as farmers become increasingly reliant on external inputs (seeds and agrochemicals), they will be highly vulnerable to catastrophic supply disruptions or crippling debt in the event of input price increases or of declining prices for their output.<sup>185</sup> Finally, biotechnology may undermine the livelihoods of developing country farmers by producing transgenic substitutes for developing country exports, such as palm oil, coconut oil, and cocoa.<sup>186</sup>

From an environmental and food security standpoint, one of the greatest risks of industry-driven biotechnology is loss of agrobiodiversity—the continuation of the trend begun by the Green Revolution toward the cultivation of a limited number of high-input monocultures in lieu of diverse local varieties.<sup>187</sup> As explained in the preceding section, the cultivation of monocultures increases vulnerability to pests, disease, and climatic stresses and reduces the resilience of agroecosystems.<sup>188</sup>

A second environmental risk is gene transfer from the genetically modified crop to wild relatives through cross-pollination, a phenomenon known as gene flow or genetic contamination.<sup>189</sup> For example, the transfer of genes from herbicide tolerant crops to weeds might lead to the emergence of

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potatoes, and lentils) and drove approximately 150,000 small farmers off the land. Sue Branford, *Argentina's Bitter Harvest*, NEW SCIENTIST, April 17, 2004, at 41, 43.

<sup>181</sup> See ORTON, *supra* note 175, at 16.

<sup>182</sup> *Id.* at 23.

<sup>183</sup> *Id.*

<sup>184</sup> *Id.* at 23-24.

<sup>185</sup> *Id.* at 24.

<sup>186</sup> ORTON, *supra* note 175, at 18.

<sup>187</sup> *Id.* at 28.

<sup>188</sup> See *supra* notes 135-69 for a discussion of the importance of agrobiodiversity.

<sup>189</sup> *Id.*; Pretty, *Rapid Emergence*, *supra* note 175, at 250; FAO, THE STATE OF FOOD AND AGRICULTURE 2003-2004, *supra* note 172, at 66-67.

herbicide-resistant “superweeds.”<sup>190</sup> Because the risk of gene flow is greatest when a particular crop has numerous wild relatives, the magnitude of the risk will vary from crop to crop and region to region.<sup>191</sup> Gene flow may pose particular threats to biodiversity in countries that are the centers of genetic origin for certain crops.<sup>192</sup> Thus, Mexico, the place where maize originated, faces far greater risk from genetically modified maize than countries with no compatible wild maize relatives.<sup>193</sup> This threat was realized in 2001, when DNA from genetically modified maize was discovered in local maize varieties.<sup>194</sup> This gene flow occurred despite the fact that the Mexican government had banned the importation of genetically engineered seeds in 1998 in order to protect the genetic diversity of Mexico’s most important food crop.<sup>195</sup> The alarming news from Mexico produced concern among some scientists that genetic pollution might destroy the genetic diversity necessary to preserve the integrity of the global food supply.<sup>196</sup>

A third major concern is the risk that genetically modified crops will accelerate resistance to insecticides and herbicides.<sup>197</sup> For example, the cultivation of crops that contain the Bt toxin might accelerate the evolution of insect resistance, thus diminishing the utility of Bt not only for farmers growing Bt crops but also for resource-poor farmers who use Bt as a natural

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<sup>190</sup> Pretty, *Rapid Emergence*, *supra* note 175, at 250; RISSLER & MELLON, *supra* note 179, at 50-53.

<sup>191</sup> Pretty, *Rapid Emergence*, *supra* note 175, at 252.

<sup>192</sup> ORTON, *supra* note 175, at 29.

<sup>193</sup> Pretty, *Rapid Emergence*, *supra* note 175, at 252.

<sup>194</sup> ORTON, *supra* note 175, at 30. In November 2001, the prestigious scientific journal *Nature* published an article by a team of plant scientists from the University of California, Berkeley, asserting that genetically modified corn had contaminated native varieties grown in remote mountains in Oaxaca, Mexico. David Quist & Ignacio Chapela, *Transgenic DNA Introgressed Into Traditional Maize Landraces in Oaxaca, Mexico*, 414 NATURE 541 (2001). Publication of the article ignited a firestorm of controversy. In April, 2002, *Nature* retracted the article and published two letters claiming that the research was fatally flawed. These letters raised questions about the article’s claim that genes spliced into corn were unstable and scattered around the genome in unpredictable ways, but did not dispute the article’s central contention that genetically modified corn was growing in Mexico. When *Nature* demanded that the authors retract the whole article (and not just the part in dispute), the authors refused. *Nature*’s unprecedented decision to disavow the entire article in defiance of the authors and of the article’s peer reviewers prompted speculation that *Nature* may have been influenced by the powerful biotechnology industry. See Fred Pearce, *The Great Mexican Maize Scandal*, 174 NEW SCIENTIST 14 (2002); Sarah Graham, *Journal Retracts Support for Claims of Invasive GM Corn*, SCI. AM., Apr. 8, 2002, available at <http://www.sciam.com> (last visited Nov. 9, 2004). The genetic contamination was subsequently corroborated in a study commissioned by Mexico’s National Institute of Ecology. See Mark Schapiro, *Sowing Disaster? How Genetically Engineered American Corn Has Altered the Global Landscape*, NATION, Oct. 28, 2002, at 11.

<sup>195</sup> *Special Report: Genetic Contamination: Is it Worth Worrying About?*, 174 NEW SCIENTIST 17 (2002).

<sup>196</sup> *Id.*; see also RISSLER & MELLON, *supra* note 179, at 16-17.

<sup>197</sup> Pretty, *Rapid Emergence*, *supra* note 175, at 252; FAO, THE STATE OF FOOD AND AGRICULTURE 2003-2004, *supra* note 172, at 71-72.

insecticide on non-genetically modified crops.<sup>198</sup> Organic farmers, who rely on Bt-based microbial insecticides, are likely to be among those most affected.<sup>199</sup> Likewise, the planting of herbicide-resistant crops might accelerate herbicide resistance in weeds, forcing farmers to resort to more powerful weedkillers.<sup>200</sup> Finally, genetically modified crops might themselves become weeds in the context of crop rotation when seeds left in the fields from the previous season's crop germinate in the current crop (for example, herbicide tolerant cotton germinating in the current wheat crop).<sup>201</sup> The presence of these unwanted "volunteers" may require the application of a different herbicide.<sup>202</sup> In general, genetically modified crops have resulted in an *increase* in herbicide use, as farmers apply chemicals more frequently and in larger amounts.<sup>203</sup> While the cultivation of insect resistant crops (such as Bt cotton) has resulted in a decline in insecticide use, these gains may be short-lived once the insects develop resistance.<sup>204</sup> Thus, far from reducing herbicide and insecticide use, the cultivation of genetically modified crops might actually increase agrochemical use.

The fourth major environmental risk posed by biotechnology is harm to non-target organisms through direct or indirect contact with the toxins contained in insecticidal crops or through the overuse of herbicides.<sup>205</sup> For example, Bt crops may kill the natural enemies of the target pest and other beneficial insects, thus causing ecosystem disturbances.<sup>206</sup> Alternatively, farmers growing herbicide-resistant crops might increase their use of broad-spectrum herbicides that harm other plants, mammals, or birds.<sup>207</sup>

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<sup>198</sup>See *id.* at 252; ORTON, *supra* note 175, at 28; see also Miguel Altieri et al., *Biological Control and Agricultural Modernization: Towards Resolution of Some Contradictions*, 14 AGRIC. & HUM. VALUES 303, 307 (1997); RISSLER & MELLON, *supra* note 179, at 16-17.

<sup>199</sup> See Miguel Altieri, *The Ecological Impacts of Transgenic Crops on Agroecosystem Health*, 6 ECOSYSTEM HEALTH 13, 14 (2000).

<sup>200</sup> See Pretty, *Rapid Emergence*, *supra* note 175, at 252.

<sup>201</sup> See *id.*

<sup>202</sup> See *id.*

<sup>203</sup> See FAO, THE STATE OF FOOD AND AGRICULTURE 2003-2004, *supra* note 172, at 69; ORTON, *supra* note 175, at 14. In a highly publicized case in northern Argentina, soybean farmers drenched the land with a mixture of powerful herbicides in order to combat herbicide-resistant weeds. The careless spraying of herbicides resulted in harm to the health, crops, and livestock of neighboring farmers. Although the farmers obtained a court order halting the spraying, the spraying resumed as soon as new tenants took over the land. The incident highlighted emerging problems with genetically modified crops, including herbicide-resistant weeds and the destruction of the soil's natural microorganisms. Branford, *supra* note 180, at 41.

<sup>204</sup> ORTON, *supra* note 175, at 14; FAO, THE STATE OF FOOD AND AGRICULTURE 2003-2004, *supra* note 172, at 45.

<sup>205</sup> Pretty, *Rapid Emergence*, *supra* note 175, at 253; FAO, THE STATE OF FOOD AND AGRICULTURE 2003-2004, *supra* note 172, at 67-68.

<sup>206</sup> ORTON, *supra* note 175, at 29; RISSLER & MELLON, *supra* note 179, at 42.

<sup>207</sup> ORTON, *supra* note 175, 29; FAO, THE STATE OF FOOD AND AGRICULTURE 2003-2004, *supra* note 172, at 71.

In sum, industry-driven biotechnology may undermine food security and pose serious environmental risks by reinforcing industrial agriculture in the developing world rather than promoting alternative strategies that foster biodiversity, utilize renewable and locally available inputs, build on farmer knowledge, and give farmers greater control over the production process.<sup>208</sup> This is not to suggest that biotechnology is necessarily an evil to be avoided. On the contrary, if biotechnology research were conducted by independent bodies dedicated to the public interest, taking into account the socioeconomic causes of food insecurity, carefully testing transgenic crops to address potential environmental risks, and effectively involving poor farmers in the setting of research priorities, then such research might produce seeds capable of enhancing food security while minimizing environmental harm. Furthermore, in order to benefit resource-poor farmers, the resulting seeds would have to be inexpensive and not subject to prohibitions on seed saving, sharing, and breeding.

### III. THE NEOLIBERAL MODEL: INSTITUTIONALIZING INEQUALITY

This section examines the ways in which the neoliberal policy prescriptions of the IMF, the World Bank, and the WTO reinforce the economic specialization in agro-export production and the monocultural, chemical-intensive production techniques that produce hunger and environmental degradation in the developing world. Part A discusses agricultural policy in developed and developing countries in the period immediately preceding the reforms. Part B describes and evaluates the substance of the neoliberal reforms imposed through IMF- and World Bank-sponsored structural adjustment programs and through WTO-mandated trade liberalization. Parts C and D explain the impact of the neoliberal reforms on food security and on the environment. Part E summarizes the conclusions of this section. Because a full-blown analysis of the various elements of the neoliberal economic model is beyond the scope of this article, this section will focus on the particular aspects of structural adjustment and the particular WTO Agreements (primarily the WTO Agreement on Agriculture) that have had the most direct impact on agricultural production and agricultural trade.

#### *A. Background to the Neoliberal Reforms*

Beginning in the 1950s, most industrialized countries provided significant subsidies to agriculture while using a variety of tariff and non-

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<sup>208</sup> Contrary to popular misconception, sustainable agriculture is neither low output nor prohibitively expensive. On the contrary, studies have shown that sustainable agriculture has improved food production in Africa, Asia, and Latin America using low cost, locally available, and environmentally friendly practices and technologies. Pretty, *Reducing food poverty*, *supra* note 50, at 217-234; Jules Pretty & Rachel Hine, *The Promising Spread of Sustainable Agriculture in Asia*, 24 NAT. RESOURCES F. 107-121 (2000); Jules Pretty, *Can Sustainable Agriculture Feed Africa? New Evidence on Progress, Processes and Impacts*, 1 ENV'T. DEV. & SUSTAINABILITY 253-74 (1999) [hereinafter Pretty, *Can Sustainable Agriculture Feed Africa?*].

tariff barriers to protect domestic farmers from foreign competition—a practice that persisted despite the 1947 GATT due to gaps and weaknesses in that agreement.<sup>209</sup> By contrast, developing countries generally lacked the resources to subsidize agriculture and tended to tax agricultural producers in order to maintain affordable food prices for urban dwellers and to finance industrialization.<sup>210</sup> Because many developing countries rely on agriculture as a major source of export earnings, they were harmed by the tariff and non-tariff barriers that impeded access to developed country markets and by the subsidies that made developing country products less competitive in world agricultural markets.<sup>211</sup> Furthermore, the importation of cheap, subsidized food from developed countries undermined the livelihoods of developing country farmers, increased poverty and inequality, and depressed domestic food production.<sup>212</sup> Thus, the neoliberal reforms discussed below must be evaluated in light of these pre-existing inequities in global agricultural trade.

### B. The Neoliberal Reforms

The neoliberal economic model was imposed on the developing world in two distinct phases. The first phase began in response to the debt crisis of the 1980s.<sup>213</sup> Many developing countries adopted neoliberal economic reforms pursuant to structural adjustment policies mandated by the World Bank and the IMF in order to restructure existing debt or to obtain new loans.<sup>214</sup> The

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<sup>209</sup> See THE GATT URUGUAY ROUND: A NEGOTIATING HISTORY (1986-1992) 125, 155-56 (Terence P. Stewart ed., 1993) [hereinafter THE GATT URUGUAY ROUND]. The 1947 GATT contained a variety of exceptions and omissions that severely compromised its ability to curb industrialized country agricultural subsidies and import restrictions. See Jeffrey J. Steinle, *The Problem Child of World Trade: Reform School for Agriculture*, 4 MINN. J. GLOBAL TRADE 333, 333 (1995) (explaining that agricultural commodities were largely exempted from the requirements of the pre-Uruguay Round GATT); Gonzalez, *supra* note 13, at 440-46 (describing the variety of tools used by industrialized countries to subsidize and protect domestic agricultural production and explaining why these measures were permitted under the pre-Uruguay Round GATT); Jonathan Carlson, *Hunger, Agricultural Trade Liberalization, and Soft International Law: Addressing the Legal Dimensions of a Political Problem*, 70 IOWA L. REV. 1187, 1222-57 (1985) (explaining why the pre-Uruguay Round GATT was unable to curb agricultural subsidies and import barriers).

<sup>210</sup> See THE GATT URUGUAY ROUND, *supra* note 209, at 154-57. Unlike wealthy industrialized countries, most developing countries could not afford to subsidize agriculture. An important exception was Brazil, which provided significant subsidies to the sugar cane, wheat, and ethanol industries. *Id.* at 158.

<sup>211</sup> See Gonzalez, *supra* note 13, at 447-48.

<sup>212</sup> See YOUNG, *supra* note 21, at 46-47.

<sup>213</sup> See WALDEN BELLO ET AL., DARK VICTORY: THE UNITED STATES AND GLOBAL POVERTY 28 (3rd ed. 1999).

<sup>214</sup> See *id.* at 28-31; RICHARD PEET ET AL., UNHOLY TRINITY: THE IMF, WORLD BANK AND WTO 77-78, 121-25 (2003); WALDEN BELLO ET AL., THE FUTURE IN THE BALANCE: ESSAYS ON GLOBALIZATION AND RESISTANCE 10-12 (Anuradha Mittal ed., 2001) [hereinafter BELLO ET AL., THE FUTURE IN THE BALANCE]; MICHAEL CHOSSUDOVSKY, THE GLOBALIZATION OF POVERTY: IMPACTS OF IMF AND WORLD BANK REFORMS 45-69 (1997); MICHAEL E. CONROY ET AL., A CAUTIONARY TALE: FAILED U.S. DEVELOPMENT POLICY IN CENTRAL AMERICA 12-15 (1996); SUSAN GEORGE, A FATE WORSE THAN DEBT: THE WORLD FINANCIAL CRISIS AND THE POOR 49,



second phase began in the mid-1990s pursuant to the Uruguay Round trade agreements overseen by the WTO.<sup>215</sup>

The structural adjustment programs required by the IMF and the World Bank typically obligate developing countries to slash government spending and to increase exports in order to maximize the revenues available to service the foreign debt.<sup>216</sup> Developing countries are required to devalue their currencies, to privatize government enterprises, to drastically reduce social spending, to eliminate subsidies and price controls (including agricultural

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142-44 (1990). While a full discussion of the underlying reasons for the debt crisis is beyond the scope of this article, a brief chronology is in order. When the Organization of Petroleum Exporting Countries (OPEC) quadrupled the price of petroleum in 1973, non-oil producing developing countries that depended on petroleum-based agricultural inputs and on the importation of petroleum to spur industrialization had little recourse but to borrow money from the commercial banks in order to finance imports. PEET ET AL., *supra*, at 71; GEORGE, *supra*, at 28-29. The scale of lending increased dramatically as the commercial banks, eager to earn interest on the oil revenues deposited in their coffers (known as "petrodollars"), actively encouraged borrowing by middle-income industrializing countries viewed as particularly credit-worthy, including Brazil, Argentina, Chile, and South Korea. See PEET ET AL., *supra*, at 71; COOTE, *supra* note 61, at 33-34. Low-income developing countries, regarded as more risky, tended to borrow from multilateral lenders, such as the World Bank and the IMF. See DAVID M. ROODMAN, STILL WAITING FOR THE JUBILEE: PRAGMATIC SOLUTIONS FOR THE THIRD WORLD DEBT CRISIS, 155 WORLD WATCH PAPER 8 (2001). Unfortunately, much of that debt was contracted at variable or "market" rates (meaning that the rate could change over time), and the loan proceeds were squandered on ill-conceived industrialization projects, weapons purchases, corruption, and capital flight. GEORGE, *supra*, at 14-24, 27-28; ROODMAN, *supra*, at 8. In 1979-1980, the second OPEC oil price increase was accompanied by rising real interest rates and by a sharp decline in the world market price for agricultural commodities. GEORGE, *supra*, at 28; PEET ET AL., *supra*, at 74; COOTE, *supra* note 61, at 33-34. As interest payments and petroleum expenditures soared and foreign exchange earnings dropped, developing countries sought to borrow additional funds. GEORGE, *supra*, at 28-29. Over time, it became clear that many developing countries were borrowing money simply to repay interest on old loans and could not repay their debts. The debt crisis came to a head in 1982, when Mexico and Brazil announced that they could no longer make debt payments on time. By the mid-1980s, three quarters of Latin American countries and two-thirds of African countries were operating under structural adjustment programs overseen by the World Bank and the IMF in order to ensure loan repayment. See PEET ET AL., *supra*, at 72, 74-75.

<sup>215</sup> See MADELEY, HUNGRY FOR TRADE, *supra* note 176, at 60. The objective of the Uruguay Round negotiations was to amend the 1947 General Agreement on Tariffs and Trade (GATT or 1947 GATT). The negotiations were launched in 1986 in Punta del Este, Uruguay, and culminated with the 1994 signature by trade ministers from more than 100 countries of "The Final Act Embodying the Results of the Uruguay Round of Multilateral Negotiations." See *Over 100 Nations Sign GATT Accord to Cut Barriers to World Trade*, 11 INT'L TRADE REP. (BNA), at 61 (Apr. 20, 1994). The Final Act established a World Trade Organization to oversee the new multilateral trading system and included agreements pertaining to agriculture, sanitary and phytosanitary measures (SPS), textiles and clothing, technical barriers to trade (TBT), trade-related investment measures (TRIMS), anti-dumping, customs valuation, pre-shipment inspection, rules of origin, import licensing procedures, subsidies and countervailing measures, safeguards, trade in services, and trade-related aspects of intellectual property. WTO, A SUMMARY OF THE FINAL ACT OF THE URUGUAY ROUND, available at [http://www.wto.org/english/docs\\_e/legal\\_e/ursum\\_wp.htm](http://www.wto.org/english/docs_e/legal_e/ursum_wp.htm) (last visited Sept. 29, 2004).

<sup>216</sup> MADELEY, HUNGRY FOR TRADE, *supra* note 176, at 44; GEORGE, *supra* note 214, at 52.

input subsidies), and to liberalize trade by eliminating import quotas and reducing tariffs.<sup>217</sup>

By requiring developing countries to open their markets to foreign competition without any diminution in developed countries' subsidies and import barriers, structural adjustment policies reinforced the economic dominance of developed country producers in world agricultural markets.<sup>218</sup> Indeed, a study published while the WTO Agreement on Agriculture was under negotiation concluded that developing countries lost approximately \$35 billion a year due to declining market share for agricultural products as a consequence of the subsidies and import barriers of the industrialized world.<sup>219</sup>

The stated objective of the WTO Agreement on Agriculture was to reform agricultural trade by "correcting and preventing restrictions and distortions in world agricultural markets" in order to "establish a fair and market-oriented agricultural trading system."<sup>220</sup> The Agreement sought to accomplish this objective by expanding market access,<sup>221</sup> reducing export subsidies,<sup>222</sup> and curtailing trade-distorting domestic subsidies.<sup>223</sup>

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<sup>217</sup> CHOSSUDOVSKY, *supra* note 214, at 62-63; GEORGE, *supra* note 214, at 50-52; BELLO ET AL., *THE FUTURE IN THE BALANCE*, *supra* note 214, at 10-11. Currency devaluation is intended to make exports more competitive, thereby increasing the export revenues available to developing countries to service the foreign debt. Privatization of government enterprises and elimination of price controls and subsidies are designed to increase efficiency by inducing greater reliance on the market rather than on government. Reduction of government spending is calculated to control inflation and reduce the demand for capital from abroad. Trade liberalization is supposed to increase the efficiency of local industry by exposing it to foreign competition. BELLO ET AL., *THE FUTURE IN THE BALANCE*, *supra* note 214, at 11.

<sup>218</sup> See Gonzalez, *supra* note 13, at 446-47.

<sup>219</sup> *World Trade Talks Near Collapse over Farm Subsidies Row*, FIN. TIMES, Oct. 19, 1990, at 1.

<sup>220</sup> Agreement on Agriculture, April 15, 1994, pmbl. 2, 3, available at [http://www.wto.org/english/docs\\_ellegal\\_e/14-ag.pdf](http://www.wto.org/english/docs_ellegal_e/14-ag.pdf) (last visited Sept. 29, 2004) [hereinafter Agreement on Agriculture].

<sup>221</sup> The Agreement sought to expand market access by requiring the conversion of all non-tariff import restrictions (such as quotas) into tariffs that provide an equivalent level of protection (a process known as tariffication). These tariffs were then capped and reduced below a 1986-1988 base level over a period of several years. See Dale McNiel, *Agricultural Trade Symposium: Furthering the Reforms of Agricultural Policies in the Millennium Round*, 9 MINN. J. GLOBAL TRADE 41, 61 (2000); Kevin J. Brosch, *The Uruguay Round Agreement on Agriculture*, in *THE GATT, THE WTO, AND THE URUGUAY ROUND AGREEMENTS* 875-76 (H. Applebaum & L. Schlitt eds., 1995). The tariff reduction commitments and other market access obligations of specific countries are spelled out in individual country schedules rather than in the body of the Agreement. See Agreement on Agriculture, *supra* note 220, art. 4. In general, developed countries are required to reduce tariffs by 36% over six years (1995-2000), while developing countries are given ten years (1995-2004) to achieve tariff reductions of 24%. See McNiel, *supra*, at 62; Ian Sturgess, *The Liberalisation Process in International Agricultural Trade: Market Access and Export Subsidies*, in *NEGOTIATING THE FUTURE OF AGRICULTURAL POLICIES: AGRICULTURAL TRADE AND THE MILLENIUM WTO ROUND* 135, 147 (Sanoussi Bilal & Pavlos Pezaros eds., 2000).

<sup>222</sup> The Agreement required developed countries to reduce export subsidy expenditures by 36% and the volume of subsidized exports by 21% over six years (1995-2000) based on the 1986-1990 base period. In accordance with the principle of special and differential treatment, the

Despite its free market aspirations, the WTO Agreement on Agriculture did not correct the inequities in world agricultural markets that systematically favor industrialized country producers.<sup>224</sup> First, developed countries evaded the market access requirement by taking advantage of ambiguities in the Agreement's language to maintain protectionist barriers to developing country products.<sup>225</sup> By contrast, most developing countries had eliminated non-tariff barriers and had significantly reduced tariffs pursuant to structural adjustment programs mandated by the World Bank and the IMF.<sup>226</sup> Second, the Agreement allowed developed countries to continue to use export subsidies (subject to reduction over time) while flatly prohibiting their use by countries that had not used them in the past (most developing countries).<sup>227</sup> Compounding this double standard, developed countries avoided the mandated subsidy reductions by shifting resources to forms of support not expressly prohibited by the Agreement.<sup>228</sup> Third, the Agreement enabled developed countries to continue to provide massive domestic subsidies by conveniently exempting the very types of support used most often by the United States and the EU.<sup>229</sup> By contrast, the Agreement prohibits developing countries that did not utilize these trade-distorting subsidies in the past from using them in the future unless they fall below certain *de minimis* levels or are restricted to low-income or resource-poor

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comparable percentages for developing countries were 21% and 14% over a ten-year period (1995-2004). See Agreement on Agriculture, *supra* note 220, art. 15:2; Brosch, *supra* note 221, at 868; Joseph McMahon, *The Uruguay Round and Agriculture: Charting a New Direction?*, 29 INT'L L. 411, 429 (1995).

<sup>223</sup> The Agreement classified domestic subsidies based on the degree to which they distorted trade, and required the reduction over time of the most trade-distorting subsidies (known as Amber Box measures). See WTO SECRETARIAT, GUIDE TO THE URUGUAY ROUND AGREEMENTS 56 (1999).

<sup>224</sup> See Gonzalez, *supra* note 13, at 459-65.

<sup>225</sup> See *id.* at 460-63 (explaining the various devices used by developed countries evaded the market access requirements). For example, many developed countries engaged in "dirty tariffication," the setting of tariff equivalents for non-tariff barriers at levels far more import-restrictive than the non-tariff barriers they replaced. In many instances, the levels of protection were actually *higher* than under the pre-Uruguay Round GATT. The highest tariffs were often imposed on developing country agricultural exports that competed with domestically produced agricultural products. Furthermore, tariffs on developing country exports tended to escalate as the processing chain advanced, thereby relegating developing countries to the production of primary agricultural commodities by restricting access to developed country markets for processed goods.

<sup>226</sup> See *id.* at 479, 479 n. 292.

<sup>227</sup> See *id.* at 463-65.

<sup>228</sup> See Gonzalez, *supra* note 13, at 464-65. For example, the United States curtailed spending on programs that promoted the export of agricultural products by paying exporters the difference between the U.S. domestic price and the lower world market price. Instead, the United States provided direct aid to producers not contingent on export performance—a type of subsidy permitted by the Agreement. It also promoted exports by providing government credit on highly favorable terms to exporters. *Id.*

<sup>229</sup> See *id.* at 465-68, 483.

farmers.<sup>230</sup> The level of agricultural subsidies in Organization for Economic Cooperation and Development (OECD) countries *increased* in the aftermath of the Agreement, from approximately \$308 billion per year in 1986-1988<sup>231</sup> to \$318 billion per year in 2002.<sup>232</sup> Far from remedying the inequities in the global trading system that place developing country farmers at an enormous disadvantage, the WTO Agreement on Agriculture institutionalized these inequities by requiring market openness in developing countries while permitting protectionist policies in the industrialized world.<sup>233</sup>

A second WTO agreement, the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement),<sup>234</sup> threatens to preclude developing countries from banning or restricting the importation of genetically modified seeds. The SPS Agreement promotes liberalized trade in agricultural products by requiring that trade-restrictive measures to protect human, animal, or plant life or health be “based on scientific principles” and that these measures not be maintained “without sufficient scientific evidence.”<sup>235</sup> The SPS Agreement’s emphasis on scientific evidence appears to conflict with the Cartagena Protocol on Biosafety to the Convention on Biological Diversity (the Biosafety Protocol).<sup>236</sup> The Biosafety Protocol recognizes the precautionary principle and allows parties to restrict the importation of living genetically modified organisms (such as seeds) even in the absence of strict scientific proof regarding the extent of potential harm.<sup>237</sup>

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<sup>230</sup> See *id.* at 481-82.

<sup>231</sup> ORG. FOR ECON. COOPERATION & DEV. (OECD), AGRICULTURAL POLICIES IN OECD COUNTRIES: MONITORING AND EVALUATION 2000, tbl. III.1 (2000).

<sup>232</sup> OECD, AGRICULTURAL POLICIES IN OECD COUNTRIES, MONITORING AND EVALUATION 2003, Highlights, at 5, available at [http://www.oecdwash.org/PDFFILES/agr\\_me2003hl.pdf](http://www.oecdwash.org/PDFFILES/agr_me2003hl.pdf) (last visited Sept. 29, 2004).

<sup>233</sup> See Gonzalez, *supra* note 13, at 459-68, 478-84 (assessing the implementation of the WTO Agreement on Agriculture, and concluding that it enabled developed countries to maintain trade-distorting subsidies and import restrictions while restricting the options available to developing countries to promote food security).

<sup>234</sup> Agreement on the Application of Sanitary and Phytosanitary Measures, April 15, 1994, Marrakesh Agreement Establishing the World Trade Organization [hereinafter WTO Agreement], Annex 1A, available at [http://www.wto.org/english/trntop\\_e/sps\\_e/spsagr\\_e.htm](http://www.wto.org/english/trntop_e/sps_e/spsagr_e.htm) (last visited Sept. 29, 2004) [hereinafter SPS Agreement].

<sup>235</sup> *Id.* arts. 2.1-2.2. WTO members are encouraged to base their SPS measures on international standards. *Id.* art. 3.1. If these measures exceed international standards, they must be supported by a risk assessment that takes into account, *inter alia*, scientific evidence, relevant ecological and environmental conditions, economic factors, and the minimization of negative trade effects. *Id.* arts. 3.3, 5.1-5.4.

<sup>236</sup> Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Jan. 29, 2000, available at <http://www.biodiv.org/doc/legal/cartagena-protocol-en.pdf> (last visited Sept. 29, 2004) [hereinafter Cartagena Protocol].

<sup>237</sup> *Id.* pmbl., arts. 1, 10.6. The potential conflict between the Cartagena Protocol and the SPS Agreement has spawned voluminous scholarship. See, e.g., Guruswamy, *supra* note 174, at 490-500; Terence P. Stewart & David S. Johanson, *A Nexus of Trade and the Environment: The Relationship Between the Cartagena Protocol on Biosafety and the SPS Agreement of the World*

In May 2003, the United States, Canada, and Argentina initiated challenges to the EU's de facto moratorium on the approval and marketing of genetically modified organisms on the ground that the ban has no scientific basis and therefore violates a number of WTO Agreements, including the SPS Agreement.<sup>238</sup> In view of the scientific uncertainty surrounding the risks of genetically modified organisms and in light of the anti-regulatory bias of WTO dispute resolution panels,<sup>239</sup> it is unclear whether the EU will prevail. The outcome of the dispute will likely elucidate the relationship between the SPS Agreement and the Biosafety Protocol, and will have enormous consequences for developing countries that are currently resisting pressure from the U.S. government and from U.S. agribusiness to permit the importation of genetically modified seeds.<sup>240</sup>

Finally, a third WTO Agreement, the WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS),<sup>241</sup> may impair food security in the developing world by restricting the traditional rights of farmers to save, sell, and exchange seeds if the seeds are protected by patents or patent-

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*Trade Organization*, 14 COLO. J. INT'L ENVTL. L. & POL'Y 1 (2003); Sabrina Safrin, *Treaties in Collision? The Biosafety Protocol and the World Trade Organization Agreements*, 96 AM. J. INT'L L. 606 (2002); John S. Applegate, *The Prometheus Principle: Using the Precautionary Principle to Harmonize the Regulation of Genetically Modified Organisms*, 9 IND. J. GLOBAL LEGAL STUD. 207, 237-40 (2001); Brett Grosko, *Genetic Engineering and International Law: Conflict or Harmony? An Analysis of the Biosafety Protocol, GATT, and the WTO Sanitary and Phytosanitary Agreement*, 20 VA. ENVTL. L.J. 295 (2001); Robert Howse & Petros C. Mavroidis, *Europe's Evolving Regulatory Strategy for GMOs—The Issue of Consistency with WTO Law: of Kine and Brine*, 24 FORDHAM INT'L L.J. 317 (2000).

<sup>238</sup> See John W. Boscarior & Orlando E. Silva, *Genetically Modified Organisms at the Centre of Major WTO Dispute*, LAW. WKLY., Mar. 26, 2004. The complaining countries contended that the EU's de facto moratorium on approving and marketing genetically modified products violates the 1994 GATT, the WTO Agreement on Agriculture, the SPS Agreement, and the WTO Agreement on Technical Barriers to Trade (TBT). *Id.*

<sup>239</sup> Guruswamy, *supra* note 174, at 493-94; Applegate, *supra* note 237, at 238.

<sup>240</sup> In a move reminiscent of Public Law 480's deployment of food aid to create markets for U.S. agribusiness, the United States has been shipping genetically modified food aid to African countries afflicted by drought. Five African countries (Lesotho, Swaziland, Mozambique, Zimbabwe, and Zambia) refused the unmilled genetically modified grain out of concern that it would contaminate domestic seed. All of the countries but Zambia later accepted the grain as long as it was milled before delivery to prevent its use as seed. Zambia, citing health concerns, rejected the grain in both milled and unmilled form. The United States claimed that African countries rejected high-yielding genetically modified seeds for fear of being shut out of EU markets. The European Union accused the United States of exploiting the humanitarian needs of starving people to create markets for genetically modified food and pointed out that African countries have legitimate concerns about the local impacts of biotechnology. The EU's position has been echoed by numerous environmental and development groups in Africa and elsewhere in the developing world. See *WTO Agreement on Agriculture Silent on GMOs*, AFR. NEWS, June 19, 2003; Katrin Dauenhauer, *Africans Challenge Bush Claim that GM Food Good for Them*, INTER PRESS SERVICE, June 19, 2003; Robert Weissman, *Biotech Food Fight: The Front*, MULTINATIONAL MONITOR, June 1, 2003, at 6.

<sup>241</sup> Agreement on Trade Related Aspects of Intellectual Property Rights, April 15, 1994, WTO Agreement, Annex 1C, available at [http://www.wto.org/english/tratop\\_e/trips\\_e/t\\_agm3\\_e.htm](http://www.wto.org/english/tratop_e/trips_e/t_agm3_e.htm) (last visited Sept. 29, 2004) [hereinafter TRIPS Agreement].

like intellectual property legislation.<sup>242</sup> The TRIPS Agreement requires WTO members to utilize either patents or *sui generis* legislation to protect the intellectual property rights of the seed industry.<sup>243</sup> Most developing countries have opted for *sui generis* systems that preserve farmers' traditional rights.<sup>244</sup> By contrast, the United States, Canada, and the EU have opted for patent protection, thereby permitting biotechnology companies to bring patent infringement actions against farmers who replant, sell, or breed patented seeds—and even against farmers whose crops are accidentally contaminated by another farmer's patented seeds.<sup>245</sup> Developing countries are under intense pressure to adopt *sui generis* systems that restrict farmers' traditional rights.<sup>246</sup> If developing countries accede to these demands, biotechnology companies will be able to insist that farmers purchase new seeds every year and will be able to penalize them for replanting, breeding, or selling patented seed.<sup>247</sup> Many developing countries have resisted this pressure out of concern that strong intellectual property protection will facilitate the ongoing domination of agricultural production by transnational corporations, will undermine the livelihoods of poor farmers in the developing world, and will interfere with the crop breeding practices essential to continuous agricultural innovation.<sup>248</sup> The TRIPS Agreement raises many

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<sup>242</sup> Ruchi Tripathi, Food Patenting—A Threat to Food Security 3-4 (July 12-13 2001), *available at* <http://www.actionaid.org/resources/pdfs/patenting.doc> (last visited Dec. 5, 2004) (unpublished paper presented at the Launch Meeting of the Regional Programme on Farmers' Rights to Livelihood in Kathmandu).

<sup>243</sup> See TRIPS Agreement, *supra* note 241, art. 27.3(b).

<sup>244</sup> Tripathi, *supra* note 242, at 4.

<sup>245</sup> See *id.* at 4; Keith Aoki, *Weeds, Seeds & Deeds: Recent Skirmishes in the Seed Wars*, 11 CARDOZO J. INT'L & COMP. L. 247, 286-304 (2003) (describing the leading U.S. and Canadian cases regarding patent protection of seeds and other living organisms). One of the more disturbing implications of patent protection of seed technology is the possibility that an innocent farmer whose crops are contaminated by genetically modified seeds from a neighbor's field may be faced with a patent infringement lawsuit. This is precisely what happened to Percy Schmeiser, a Canadian farmer whose neighbors adopted Monsanto's genetically modified canola. When private investigators hired by Monsanto discovered genetically modified canola growing on his farm, Monsanto brought a patent infringement action. The hapless Mr. Schmeiser was found liable for patent infringement, and was ordered to pay Monsanto damages. *Id.* at 292-98. In May 2004, the Canadian Supreme Court, by a 5-4 vote, upheld the validity of Monsanto's patent, and affirmed the determination that Mr. Schmeiser had infringed the patent. However, the court denied Monsanto's request for monetary damages on the ground that Mr. Schmeiser's profits were no greater than they would have been if he had planted and harvested ordinary canola rather than genetically modified canola. See *Schmeiser v. Monsanto*, [2004] S.C.R. 902, 2004 SCC 34, *available at* 2004 S.C.R. LEXIS 30.

<sup>246</sup> Tripathi, *supra* note 242, at 4-5.

<sup>247</sup> *Id.* at 11.

<sup>248</sup> *Id.* at 7-9, 11; Meetali Jain, *Global Trade and the New Millennium: Defining the Scope of Intellectual Property Protection of Plant Genetic Resources and Traditional Knowledge in India*, 22 HASTINGS INT'L & COMP. L. REV. 777, 789-94 (1999).

other significant issues, but these issues are beyond the limited scope of this article.<sup>249</sup>

As the foregoing narrative illustrates, the neoliberal model, properly understood, is a system of double standards foisted upon poor countries by wealthy countries in order to perpetuate and reinforce the economic dominance of the latter. The WTO Agreement on Agriculture, for example, enables industrialized countries to continue to dominate world agricultural markets by requiring market openness in the developing world while permitting lavish subsidies and import-restrictive tariffs in the industrialized world. The SPS Agreement creates lucrative business opportunities for U.S.-based transnational corporations by prying open the markets of developed and developing countries that would prefer to proceed cautiously with genetically modified organisms.<sup>250</sup> The TRIPS Agreement threatens to reinforce the dependence of developing countries on agricultural inputs generated in the industrialized world by depriving farmers of their traditional right to save, sell, and exchange seeds. Finally, the IMF and the World Bank, which operate almost entirely in the developing world, do not impose structural adjustment on the industrialized world. As one astute

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<sup>249</sup> For example, another important issue raised by the TRIPS provision discussed above is biopiracy—the appropriation of the traditional knowledge and genetic resources of local and indigenous communities by transnational biotechnology companies without prior informed consent and without compensation. This practice is inconsistent with the Convention on Biological Diversity's (CBD) requirement of prior informed consent and benefit sharing. Developing country governments and non-governmental organizations are demanding that the TRIPS Agreement be made consistent with the CBD. *See generally* Tripathi, *supra* note 242, at 5-7, 9-11; CARLOS N. CORREA, INTELLECTUAL PROPERTY RIGHTS, THE WTO AND DEVELOPING COUNTRIES: THE TRIPS AGREEMENT AND POLICY OPTIONS 167-205 (2000); Charles R. McManis, *Intellectual Property, Genetic Resources and Traditional Knowledge Protection: Thinking Globally, Acting Locally*, 11 CARDOZO J. INT'L & COMP. L. 547 (2003); Erin Donovan, *Beans, Beans, The Patented Fruit: The Growing International Conflict over the Ownership of Life*, 25 LOY. L.A. INT'L & COMP. L. REV. 117 (2002); Graham Dutfield, *TRIPS-Related Aspects of Traditional Knowledge*, 33 CASE W. RES. J. INT'L L. 233 (2001).

<sup>250</sup> If the United States prevails in its WTO challenge of the EU's de facto ban on genetically modified organisms (GMOs), developing countries will be under increasing pressure to open their markets to GMOs. However, based on recent history, there is a strong possibility that the EU will refuse to comply with an unfavorable GMO ruling. In 1998, the WTO Appellate Body concluded that the EU violated the SPS Agreement by prohibiting the importation of beef treated with growth hormones without conducting the required risk assessment. The EU refused to lift its ban. As a result, the United States subjected EU products to trade sanctions of \$125 million per year. Most developing countries do not have the financial resources to withstand U.S. trade sanctions or even to contest a WTO complaint by the United States. In the end, the response of developing countries will be influenced by their trading relationship with the United States and the EU. Countries highly dependent on trade with the EU may be reluctant to accept GMO seeds for fear of being shut out of EU markets if GMOs contaminate the country's agricultural exports. *See* Report of the Appellate Body (WTO), *EC-Measures Concerning Meat and Meat Products (Hormones)*, WT/DS/48/AB/R, para. 124 (1998), available at 1998 WL 25520 (WTO); Jan Johaness, *Risk Regulation in WTO Law: A Procedure-Based Approach to the Precautionary Principle*, 40 COLUM. J. TRANSNAT'L L. 323, 336 (2002); Shelley Emling, *U.S., European Union Toe-to-Toe Over Trade Issues*, ATLANTA J. CONST., Nov. 2, 2003, at D1.

commentator observed, the neoliberal model is quite simply “an economics of empire.”<sup>251</sup>

Proponents of the neoliberal model might concede the previously-referenced inequities but nevertheless argue that the solution is to level the playing field by requiring industrialized countries to eliminate agricultural subsidies and reduce tariffs. There is no question that developing countries would benefit enormously from trade liberalization in the industrialized world. However, it is dangerous to conflate formal equality with substantive equality. Trade liberalization in the industrialized world will not eliminate the economic advantages conferred by decades of protectionism and centuries of colonialism. Free trade among equals may be mutually advantageous. However, free trade among vastly unequal parties is akin to a boxing match between a featherweight wearing handcuffs and a heavyweight. Removing the featherweight’s handcuffs (like eliminating industrialized world subsidies and tariff barriers) will certainly enhance the fairness of the competition. Nevertheless, the underlying boxing match remains inherently unfair, and the outcome is entirely predictable. This theme will be developed further in Part V of this article.<sup>252</sup>

### *C. Impact of the Neoliberal Reforms on Food Security*

The neoliberal economic reforms of the last two decades exacerbated food insecurity in the developing world by eliminating social safety nets, increasing poverty and inequality, reducing domestic food production, and depressing export earnings.<sup>253</sup>

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<sup>251</sup> Finnegan, *supra* note 9, at 42.

<sup>252</sup> The boxing match described in this paragraph is not precisely analogous to the situation of developed and developing countries because the heavyweight’s size and strength were not acquired at the expense of the featherweight. By contrast, the economic dominance of the industrialized world was acquired as a direct consequence of the colonial and post-colonial integration of developing countries into the world economy on highly disadvantageous terms. Leveling the playing field is a necessary first step, but it is by no means sufficient.

<sup>253</sup> See generally, STRUCTURAL ADJUSTMENT PARTICIPATORY REVIEW INT’L NETWORK (SAPRIN), THE POLICY ROOTS OF ECONOMIC CRISIS AND POVERTY: A MULTI-COUNTRY PARTICIPATORY ASSESSMENT OF STRUCTURAL ADJUSTMENT 111-27 (2002), available at [http://www.saprin.org/SAPRI\\_Findings.pdf](http://www.saprin.org/SAPRI_Findings.pdf) (last visited Sept. 29, 2004) [hereinafter SAPRIN]; The SAPRIN report was a multi-country study of structural adjustment sponsored by the World Bank and by a network of civil society groups. Based on a four-year process of consultation and research in nine countries located on four continents, the study analyzed the economic and social consequences of structural adjustment in seven distinct areas: manufacturing, finance, employment, agriculture, mining, state enterprise privatization, education, and health care. *Id.* at i-ii. The section of the report focusing on agriculture was based on research performed in Bangladesh, Uganda, Zimbabwe, Mexico, and the Philippines. *Id.* at 13. MADELEY, HUNGRY FOR TRADE, *supra* note 176, at 73-90; JOHN MADELEY, FORUM SYD, TRADE AND HUNGER: AN OVERVIEW OF CASE STUDIES ON THE IMPACT OF TRADE LIBERALIZATION ON FOOD SECURITY (2002), available at <http://www.environmentalobservatory.org/library/cfm?RefID=36097> (Oct. 2000) [hereinafter MADELEY, TRADE AND HUNGER]. The Madeley publications summarize studies performed by U.N. agencies and non-governmental organizations on the consequences of trade liberalization under structural adjustment and under multilateral trade agreements in a variety of developing countries. U.N. FOOD & AGRIC. ORG., FAO SYMPOSIUM ON AGRICULTURE, TRADE



First, the slashing of social spending under structural adjustment exacerbated food insecurity by producing massive reductions in the entitlements of the poor.<sup>254</sup> As government price controls and subsidies were removed, the cost of basic necessities exceeded the means of many people in the developing world.<sup>255</sup> This sparked food riots (known as “IMF riots”) in numerous developing countries, including Morocco, Madagascar, the Dominican Republic, Venezuela, Zambia, and, most recently, Argentina.<sup>256</sup> Indeed, structural adjustment inflicted such intense suffering, stirred such passionate opposition, and generated so much adverse publicity that the World Bank and the IMF have recently renamed the program “development policy support lending.”<sup>257</sup>

Second, the lowering of tariff barriers and the elimination of non-tariff barriers in developing countries increased rural poverty and depressed domestic food production by exposing developing country farmers to ruinous competition from industrialized country producers.<sup>258</sup> When the influx of

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AND FOOD SECURITY, PAPER NO. 3: EXPERIENCE WITH IMPLEMENTATION OF THE URUGUAY ROUND AGREEMENT ON AGRICULTURE: DEVELOPING COUNTRY EXPERIENCES (Sept. 1999), *available at* <http://www.fao.org/DOCREP/meeting/x3065E.htm> (last visited Sept. 29, 2004) [hereinafter FAO, Paper No. 3]. The FAO report assessed the impact of the WTO Agreement on Agriculture in sixteen developing countries: Bangladesh, Botswana, Brazil, Egypt, Fiji, Guyana, India, Jamaica, Kenya, Morocco, Pakistan, Peru, Senegal, Sri Lanka, Tanzania, and Thailand.

<sup>254</sup> YOUNG, *supra* note 21, at 44.

<sup>255</sup> *Id.* at 44-45.

<sup>256</sup> See YOUNG, *supra* note 21, at 44-45; GEORGE, *supra* note 214, at 78-80, 153-54; Roger Burbach, “Throw Them All Out:” *Argentina’s Grassroots Rebellion*, 36 N.A.C.L.A. REPORT ON THE AMERICAS 38-40 (July/Aug. 2002) (describing the protests in December 2001 known as *cacerolazos*, in which protesters banged on empty pots and pans to dramatize their inability to purchase the basic necessities of life). See also JOSEPH E. STIGLITZ, *GLOBALIZATION AND ITS DISCONTENTS* 18-20 (2002) (explaining that the free market prescriptions of the IMF increased poverty and produced social and political unrest in the developing world).

<sup>257</sup> See Finnegan, *supra* note 9, at 52. In its 1989 annual report, the United Nations Children’s Fund (UNICEF) blamed the structural adjustment policies of the 1980s for the death of hundreds of thousands of children in the developing world. Putting aside the bland jargon of U.N. relief agencies, UNICEF condemned structural adjustment in the following unequivocal terms:

It is essential to strip away the niceties of economic parlance and say that what has happened is simply an outrage against a large segment of humanity. The developing world’s debt, both in the manner in which it was incurred and in the manner in which it is being ‘adjusted to’ is an economic stain on the second half of the twentieth century. Allowing world economic problems to be taken out on the growing minds and bodies of young children is the antithesis of all civilized behavior. Nothing can justify it. And it shames and diminishes us all. UNICEF, *STATE OF THE WORLD’S CHILDREN* (1989).

<sup>258</sup> See MADELEY, *FOOD FOR ALL*, *supra* note 23, at 120; CONROY ET AL., *supra* note 219, at 14; SAPRIN, *supra* note 253, at 114, 118-19; SUSAN STONICH, “I AM DESTROYING THE LAND!” THE POLITICAL ECOLOGY OF POVERTY AND ENVIRONMENTAL DESTRUCTION IN HONDURAS 73-77 (1992). Cheap food imports increase poverty and promote food insecurity because the vast majority of the 1.2 billion poor people in the developing world are small farmers who depend on agricultural revenues to purchase agricultural inputs, pay taxes, buy food in times of shortage, and purchase items not produced on the farm. See MADELEY, *HUNGRY FOR TRADE*, *supra* note 176, at 76-80; Kevin Watkins & Joachim von Braun, *Time to Stop Dumping on the World’s Poor*,

cheap, subsidized food from the United States and the EU depressed domestic food prices, wealthy farmers shifted from food production to the cultivation of more lucrative export crops.<sup>259</sup> However, poor farmers found their livelihoods threatened as declining agricultural prices coincided with the withdrawal of agricultural subsidies, the reduction of extension services, and the elimination of subsidized credit.<sup>260</sup> Many farmers abandoned the land, resulting in a concentration of land ownership in the hands of wealthier farmers.<sup>261</sup> Domestic food production on both large and small farms declined, and dependence on imported food increased.<sup>262</sup>

Third, the emphasis on export production increased rural inequality by reinforcing the privileged status of large farmers at the expense of

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in INT'L FOOD POLICY RESEARCH INST. (IFPRI), *TRADE POLICIES AND FOOD SECURITY* 2 (2002-2003), available at [http://www.ifpri.org/pubs/bodes/ar2002/ar2002\\_essay01.htm](http://www.ifpri.org/pubs/bodes/ar2002/ar2002_essay01.htm) (last visited Sept. 29, 2004); INT'L FUND FOR AGRIC. DEV. (IFAD), *RURAL POVERTY REPORT 2001: THE CHALLENGE OF ENDING RURAL POVERTY* 15-17, 20 (2001), available at <http://www.ifad.org/poverty/index.htm> (last visited Sept. 29, 2004); INST. FOR AGRIC. TRADE & POLICY (IATP), *CANCUN SERIES PAPER NO. 1, UNITED STATES DUMPING ON WORLD AGRICULTURAL MARKETS* 14 (2003), available at <http://www.tradeobservatory.org/library.cfm?RefID=25825> (last visited Sept. 29, 2004) [hereinafter IATP, U.S. DUMPING]; COOTE, *supra* note 61, at 116.

<sup>259</sup> See CONROY ET AL., *supra* note 214, at 14; MADELEY, *HUNGRY FOR TRADE*, *supra* note 176, at 54, 58, 75-83; SAPRIN, *supra* note 253, at 14, 114, 118-19. In Chile, for example, the amount of land under basic food crops dropped by nearly thirty percent between 1989 and 1993 as a consequence of export-oriented agricultural production. Fruit, flowers, and other export crops replaced wheat, beans, and other food staples. MADELEY, *HUNGRY FOR TRADE*, *supra* note 176, at 54.

<sup>260</sup> See SAPRIN, *supra* note 253, at 116-18.

<sup>261</sup> See *id.* at 13, 118-20; ROSSET, *supra* note 133, at 15; LORI ANN THRUPP, *BITTERSWEET HARVESTS FOR GLOBAL SUPERMARKETS: CHALLENGES IN LATIN AMERICA'S AGRICULTURAL EXPORT BOOM* 84 (1995) [hereinafter THRUPP, *BITTERSWEET HARVESTS*].

<sup>262</sup> See MADELEY, *HUNGRY FOR TRADE*, *supra* note 176, at 58; SAPRIN, *supra* note 253, at 118-19; STONICH, *supra* note 258, at 73-77; FAO PAPER NO. 3, *supra* note 253, paras. 15, 42, 49, 57, 77, and 82. In a recently published twenty-three country study on developing country implementation of the Agreement on Agriculture, the UN Food and Agriculture Organization found that expenditure on food imports increased significantly in the aftermath of the Agreement. For example, the amount spent on food imports more than doubled from 1990-1994 (just before the Agreement) to 1995-2000 (just after the Agreement) in seven countries (Bangladesh, Costa Rica, Honduras, India, Indonesia, Philippines, and Uganda). Indeed the value of food imports in Uganda increased more than three times. Dependence on food imports can be particularly problematic if a country is likely to experience difficulty paying for them. An important indicator of food import capacity is the ratio of food import expenditures over total exports of goods and services. Because a proportion of export revenues in developing countries is usually set aside for debt service and is therefore not available to import food, the ratio can also be expressed as food imports over total exports of goods and services minus debt service payments. The FAO study found that the ratio had increased for fourteen of the twenty-three countries over the past decade. In other words, for these fourteen countries, the burden of paying for food imports had increased in the 1995-2000 period relative to 1990-1994. FAO, *WTO AGREEMENT ON AGRICULTURE: THE IMPLEMENTATION EXPERIENCE, DEVELOPING COUNTRY CASE STUDIES* 36, 49 (2003) [hereinafter FAO, *WTO AGREEMENT ON AGRICULTURE* (2003)].

smallholders.<sup>263</sup> Large farmers generally had better access to capital and credit with which to finance cash crop production and were provided with tax breaks, subsidized credit, and other incentives to convert to export production.<sup>264</sup> As cash crop production increased land values, landowners raised rents, revoked peasant tenancy and sharecropping rights, or simply evicted tenants in order to rent the land to more affluent farmers who could grow high-value crops.<sup>265</sup> These wealthy landowners also expanded their holdings by purchasing the plots of smallholders who lacked the capital to produce for the export market and who found it increasingly difficult to live off traditional food crop production.<sup>266</sup> The net result was increasing economic polarization in rural areas, with an ever-growing poor majority and an ever-wealthier elite.<sup>267</sup>

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<sup>263</sup> See SAPRIN, *supra* note 253, at 13, 114. In Latin America, transnational corporations have played an enormous role in shifting production away from staple foods to exports, including non-traditional agricultural exports such as vegetables, fruits, flowers, and animal feed. These patterns of production have had a negative impact on staple food production and have sharpened rural inequality. While some farmers have prospered and have evolved into "capitalist farmers," many smallholders have been displaced from the land or have become "proletarians in disguise"—nominally smallholders, but completely dependent on agribusiness through contract farming. See Cristobal Kay, *Rural Development and Agrarian Issues in Contemporary Latin America*, in STRUCTURAL ADJUSTMENT AND THE AGRICULTURAL SECTOR IN LATIN AMERICA AND THE CARIBBEAN 9, 12-13. (John Weeks ed., 1995).

<sup>264</sup> See CONROY ET AL., *supra* note 214 at 29, 37-41, 43, 54, 58; THRUPP, BITTERSWEET HARVESTS, *supra* note 261, at 67-70 (explaining that transnational corporations and large national and foreign investors are the main beneficiaries of the shift to non-traditional agricultural exports in Latin America); David Reed, *Conclusions: Short-term Environmental Impacts of Structural Adjustment Programs*, in STRUCTURAL ADJUSTMENTS, THE ENVIRONMENT, AND SUSTAINABLE DEVELOPMENT 310, 313 (David Reed ed., 1996) [hereinafter Reed, *Conclusions*] (discussing the tendency of export production to benefit large farmers); Michael R. Carter et al., *Agricultural Export Booms and the Rural Poor in Chile, Guatemala, and Paraguay*, 31 LATIN AM. RES. REV. 33, 57-60 (1996) (summarizing the factors that favor medium- and large-scale producers in the agricultural export booms in Chile, Guatemala, and Paraguay).

<sup>265</sup> See CONROY ET AL., *supra* note 214, at 37-38 (explaining the changes in land tenure in Central America as a consequence of high-value, export-oriented agricultural production); THRUPP, BITTERSWEET HARVESTS, *supra* note 261, at 70 (discussing the growing concentration of landholding in many Latin American countries as a consequence of export-oriented production); STONICH, *supra* note 258, at 69-72, 81-82 (describing changes in land tenure in Honduras between 1952 and 1974 resulting from the boom in cotton exports as well as similar changes resulting from shrimp farming in the 1980s in the aftermath of structural adjustment).

<sup>266</sup> See CONROY ET AL., *supra* note 214, at 38; MADELEY, HUNGRY FOR TRADE, *supra* note 176, at 59. These displaced landowners became landless laborers or migrated to the cities. In some parts of Central America, this displacement of small farmers has resulted in high unemployment rates. CONROY ET AL., *supra* note 219, at 38.

<sup>267</sup> See CONROY ET AL., *supra* note 214, at 62; FAO PAPER NO. 3, *supra* note 253, ¶18; SAPRIN, *supra* note 253, at 120-22 (discussing the ways in which import liberalization and export-oriented production reinforced rural inequality). In its 2003 report on the implementation of the Agreement on Agriculture in twenty-three developing countries, the FAO acknowledged that the poor often suffer the most from trade liberalization. Small farmers are typically unable to participate in export production, and many are marginalized as export production creates competition for scarce resources. The FAO report expressed concern that export opportunities might lead to the reallocation of land and other resources away from domestic food production,

Finally, the neoliberal reforms exacerbated food insecurity by depressing developing country export earnings. Structural adjustment shifted investment to the export sector in order to generate the revenue with which to service the foreign debt.<sup>268</sup> However, as competing developing country exports simultaneously glutted the market, the benefits of export expansion were almost completely nullified by declining prices.<sup>269</sup> In addition, the neoliberal reforms harmed developing countries by requiring them to open their markets while permitting developed countries to maintain trade-distorting subsidies and import-restrictive tariffs.<sup>270</sup> According to a study released in 2003 by the International Food Policy Research Institute (IFPRI), industrialized country subsidies and protectionism displaced about \$40 billion in net agricultural exports per year from developing countries and cost developing countries approximately \$24 billion per year in foregone agricultural and agro-industrial income.<sup>271</sup> This foregone income reverberated throughout the economy, as lost agricultural revenues resulted in the depression of employment in farming and farming-related activities and in reduced investment in the agricultural sector.<sup>272</sup>

These observations are consistent with the results of twenty-seven case studies examining the impact in thirty-nine developing countries of agricultural trade liberalization resulting from IMF and World Bank structural adjustment programs, regional trade agreements, and the WTO Agreement on Agriculture.<sup>273</sup> The case studies concluded that cheap food imports depressed agricultural prices, thereby reducing small farmer revenues and placing domestic food production at risk.<sup>274</sup> Because this drop in prices was frequently accompanied by government cuts in agricultural input subsidies, small farmers were forced to pay more for agricultural inputs while receiving less for their output.<sup>275</sup> The case studies found that trade liberalization resulted in a shift toward export production and a decrease in

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thereby adversely affecting household food security. FAO, WTO AGREEMENT ON AGRICULTURE (2003), *supra* note 262, at 50.

<sup>268</sup> GEORGE, *supra* note 214, at 59-60, 78; MADELEY, FOOD FOR ALL, *supra* note 23, at 117.

<sup>269</sup> GEORGE, *supra* note 214, at 60-61; COOTE, *supra* note 61, at 34-35; MADELEY, HUNGRY FOR TRADE, *supra* note 176, at 91-92.

<sup>270</sup> See *supra* notes 223-38 and accompanying text for a discussion of this issue.

<sup>271</sup> INT'L FOOD POLICY RESEARCH INST. (IFPRI), HOW MUCH DOES IT HURT? THE IMPACT OF AGRICULTURAL TRADE POLICIES ON DEVELOPING COUNTRIES 2-3 (2003), *available at* <http://www.ifpri.org/media/trade/trade.pdf> (last visited Sept. 29, 2004). Latin America and the Caribbean experienced the largest losses (approximately \$8.3 billion in annual income), while Asia and Africa experienced less severe but nevertheless significant harm (annual losses of about \$6.6 billion in Asia and almost \$2 billion in Africa) [hereinafter IFPRI]. *Id.*

<sup>272</sup> *Id.* at 4.

<sup>273</sup> MADELEY, TRADE AND HUNGER, *supra* note 253, at 7-13.

<sup>274</sup> *Id.* at 2-3, 8, 17-18, 21, 25-26, 43, 45, 52, 62, 71, 77.

<sup>275</sup> *Id.* at 8.

land and resources devoted to domestic food production.<sup>276</sup> Large enterprises, including transnational corporations and large-scale domestic farms, benefited from trade liberalization.<sup>277</sup> Poor farmers and rural laborers saw their livelihoods endangered by declining commodity prices and by the loss of rural employment.<sup>278</sup> Many small farmers abandoned agricultural production and migrated to the cities and towns, thereby placing additional strain on limited urban amenities.<sup>279</sup> In general, trade liberalization had a negative impact on food security.<sup>280</sup>

#### *D. Impact of the Neoliberal Reforms on the Environment*

The shift from domestic food cultivation to export production degraded the environment in the developing world by promoting the expansion of monocultures<sup>281</sup> and the extensive use of agrochemicals.<sup>282</sup> This, in turn, eroded crop genetic diversity,<sup>283</sup> produced higher levels of pesticide-related illness,<sup>284</sup> and resulted in the contamination of ground and surface waters by pesticides and fertilizers.<sup>285</sup> The intensive irrigation schemes favored by

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<sup>276</sup> *Id.* at 3, 8-9, 26, 28-29, 34, 65.

<sup>277</sup> *Id.* at 3-4, 8, 15, 34-35, 72.

<sup>278</sup> MADELEY, TRADE AND HUNGER, *supra* note 253, at 9, 16, 27, 50, 58, 69, 72.

<sup>279</sup> *Id.* at 5-6.

<sup>280</sup> *Id.* at 5.

<sup>281</sup> SAPRIN, *supra* note 253, at 124. In response to the glut of traditional agricultural export products (coffee, bananas, cotton, beef, and sugar) on world markets, policymakers in Asia, Africa, and Latin America promoted the cultivation of non-traditional agricultural exports, such as fruits, vegetables, flowers, nuts, oils, and spices. While the cultivation of nontraditional agricultural exports diversified export production, reduced reliance on one or two traditional export products, and offset market fluctuations in any single commodity, this diversification did not necessarily result in crop diversity at the farm level. On the contrary, farms were usually planted in monocultures and were therefore highly vulnerable to pests and disease. See David Reed, *An Instrument of Global Economic Policy*, in STRUCTURAL ADJUSTMENT, THE ENVIRONMENT, AND SUSTAINABLE DEVELOPMENT 17 (David Reed ed., 1996); CONROY ET AL., *supra* note 214, at 13-14, 18-19; THRUPP, BITTERSWEET HARVESTS, *supra* note 261, at 17-18, 94-95.

<sup>282</sup> SAPRIN, *supra* note 253, at 124. Indeed, pesticides constitute a significant percentage of total operating costs in the export sector (especially in flower production), and their high cost represents yet another barrier to the participation of small farmers in export production. THRUPP, BITTERSWEET HARVESTS, *supra* note 261, at 96.

<sup>283</sup> THRUPP, BITTERSWEET HARVESTS, *supra* note 261, at 112.

<sup>284</sup> CONROY ET AL., *supra* note 214, at 138-39. The expansion of pesticide use resulted in additional incidents of acute pesticide poisoning as well as chronic health problems. THRUPP, BITTERSWEET HARVESTS, *supra* note 261, at 107-08. Structural adjustment programs often impeded the ability of regulatory agencies in developing countries to monitor and regulate pesticide use because these programs imposed sharp cuts in the budgets and staff of government agencies charged with environmental protection. See PATRICIA LUNDY, DEBT AND ADJUSTMENT: SOCIAL AND ENVIRONMENTAL CONSEQUENCES IN JAMAICA 61-62 (1999).

<sup>285</sup> SAPRIN, *supra* note 253, at 124; STONICH, *supra* note 258, at 85. In addition, excessive pesticide use destroyed beneficial insects that preyed upon other pests, thus promoting secondary pest infestations. CONROY ET AL., *supra* note 214, at 124-25; THRUPP, BITTERSWEET

structural adjustment programs often caused excessive extraction of groundwater, thereby diverting scarce water resources from local communities to large-scale farming operations and threatening to deplete local aquifers.<sup>286</sup> Finally, the decreasing ability to purchase agricultural inputs (due to the elimination of input subsidies and credit) caused farmers to attempt to maintain existing levels of production by expanding the land under cultivation, thereby accelerating deforestation and overtaxing and degrading marginal lands.<sup>287</sup>

*E. Summary and Conclusion: The Neoliberal Model and Industrial Agriculture*

In sum, the neoliberal reforms of the last two decades exacerbated hunger and environmental degradation in the developing world by reinforcing pre-existing inequities in agricultural trade and production that have their genesis in colonialism. Specifically, the neoliberal policy prescription of the World Bank, the IMF, and the WTO reinforced debilitating specialization in agro-export production, accelerated the adoption of ecologically harmful monocultures, and increased rural poverty and inequality.

Structural adjustment exacerbated hunger in the developing world by obligating developing countries to open their markets to foreign competition without requiring corresponding reforms in the industrialized world. As developing countries lowered import barriers and slashed subsidies, developing country farmers were exposed to economically devastating competition from highly subsidized U.S. and EU agribusiness. Structural adjustment's emphasis on cash crop production (to generate the revenue with which to service the foreign debt) aggravated rural inequality by favoring affluent farmers (who could afford the necessary inputs) at the expense of smallholders (who lacked the resources to shift to export production). Furthermore, the cash crop specialization promoted by structural adjustment glutted world markets and depressed commodity prices, thereby impairing the ability of developing countries to generate the steady and reliable revenue streams needed to finance food imports, service the foreign debt, and undertake economic diversification. Finally, structural adjustment intensified chemical-intensive monocultural farming techniques that eroded biodiversity, contaminated water supplies, depleted aquifers, accelerated deforestation, and degraded marginal lands.

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HARVESTS, *supra* note 261, at 102, 106. When farmers responded to these infestations by increasing the dose and frequency of pesticide applications, many pests developed pesticide resistance. Farmers were thus caught in a "pesticide treadmill," where increasing pesticide use only exacerbated the pest problem and resulted in mounting crop losses. CONROY ET AL., *supra* note 214, at 124-25; THRUPP, BITTERSWEET HARVESTS, *supra* note 261, at 106.

<sup>286</sup> SAPRIN, *supra* note 253, at 124-25; STONICH, *supra* note 258, at 85.

<sup>287</sup> Reed, *Conclusions*, *supra* note 264, at 314.

Structural adjustment, in conjunction with the WTO Agreement on Agriculture, institutionalized a double standard that afflicts the agricultural sector to this day: protectionism in wealthy countries and liberalized trade in poor countries. This double standard aggravates food security at the household level by allowing cheap, subsidized food imports from the United States and the EU to undermine the livelihoods of millions of poor farmers in the developing world. This double standard also intensifies food insecurity at the national level in two distinct but complementary ways. First, the agricultural subsidies maintained by the industrialized world create disincentives to domestic food production in developing countries. Second, the trade-distorting subsidies and protectionist import barriers depress the export revenues necessary to finance food imports. Food security is compromised at the national level as developing countries produce less food and have less income with which to purchase food. The WTO SPS Agreement and the WTO TRIPS Agreement threaten to exacerbate the plight of small farmers and to reinforce chemical-intensive, monocultural production techniques by making farmers increasingly dependent on agricultural inputs (including patented seeds marketed with specific pesticides and herbicides) produced by transnational corporations based in the industrialized world.

In short, the neoliberal economic model institutionalized the tendency of colonialism, the post-war agrochemical production boom, and the Green Revolution to favor large-scale, chemical-intensive agricultural production at the expense of the poor and of the natural world.<sup>288</sup> The devastation wrought by this development model provides the necessary context for appreciating the historic significance of Cuba's unique experiment in ecologically sustainable agriculture.

#### IV. CUBA: AN ALTERNATIVE MODEL?

In an earlier article, I examined the evolution of Cuban agriculture from the colonial period to the present through the framework of food security and

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<sup>288</sup> In the words of physicist and environmental activist, Vandana Shiva:

It is true that cutting down forests or converting natural forests into monocultures of pine and eucalyptus for industrial raw material generates revenues and growth. But this growth is based on robbing the forest of its biodiversity and its capacity to conserve soil and water. This growth is based on robbing forest communities of their sources of food, fodder, fuel, fiber, medicine, and security from floods and drought. While most environmentalists can recognize that converting a natural forest into a monoculture is an impoverishment, many do not extend this insight to industrial agriculture. A corporate myth has been created, shared by most mainstream environmentalists and development organizations, that industrial agriculture is necessary to grow more food and reduce hunger. Many also assume that intensive, industrial agriculture saves resources and, therefore, saves species. But in agriculture as much as in forestry, the growth illusion hides theft from nature and the poor, masking the creation of scarcity as growth.

VANDANA SHIVA, *STOLEN HARVEST: THE HIJACKING OF THE GLOBAL FOOD SUPPLY* 1 (2000).

ecological sustainability.<sup>289</sup> I argued that Cuba, prior to the collapse of the socialist trading bloc, was food insecure and ecologically compromised as a consequence of the export-oriented capital-intensive agricultural production model adopted by the Cuban government during the first three decades of the socialist revolution.<sup>290</sup> Like the neoliberal economic model discussed in Part III.B above, Cuba's post-revolutionary agricultural production strategy reinforced patterns of economic specialization imposed during the colonial period that created dependence on one agricultural commodity (sugar) to generate the foreign exchange necessary to purchase manufactured goods and imported food.<sup>291</sup> This strategy rendered Cuba acutely vulnerable to fluctuations in world market prices for agricultural commodities and to political and economic pressure from its primary trading partner.<sup>292</sup> When the collapse of the socialist trading bloc in 1990 coincided with low world market prices for sugar, the Cuban economy plunged into a state of crisis known as the Special Period in Peacetime.<sup>293</sup> In response to the crisis, the Cuban government implemented an unprecedented series of reforms that decentralized and diversified agricultural production, emphasized production for the domestic market, and promoted organic and semi-organic techniques.<sup>294</sup> These reforms enhanced food security and ecological sustainability by diversifying Cuba's productive base and by utilizing natural pest, nutrient, and soil management technologies in lieu of non-renewable, environmentally damaging inputs.<sup>295</sup>

Once the U.S. economic embargo is lifted, Cuba will face extraordinary pressure from international trade and financial institutions to adopt neoliberal policies that may jeopardize Cuba's agricultural transformation. Cuba is, therefore, a superb vehicle for exploring the constraints imposed by global trade and financial institutions on the development strategies of small, trade-dependent developing countries. This section outlines the origins of industrial agriculture in Cuba, discusses the transformation of Cuban agriculture in the aftermath of the demise of the socialist trading bloc, and examines the ways in which neoliberal economic policies may undermine Cuba's post-1990 reforms.

#### *A. Origins of Industrial Agriculture in Cuba*

In Cuba, as in much of the developing world, export-oriented agricultural production was imposed during the colonial period and reinforced by post-

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<sup>289</sup> See Gonzalez, *supra* note 13, at 685-732.

<sup>290</sup> *Id.* at 703-09.

<sup>291</sup> *Id.* at 689-96.

<sup>292</sup> *Id.* at 703-05.

<sup>293</sup> *Id.* at 686, 705.

<sup>294</sup> Gonzalez, *supra* note 13, at 712-28 (describing and evaluating Cuba's agricultural reforms).

<sup>295</sup> See *id.* at 721-28.



colonial trade and investment practices.<sup>296</sup> Under the auspices of the Spanish crown, the sugar monoculture became the defining feature of the Cuban economy.<sup>297</sup> Sugar production displaced domestic food production and was accompanied by increasing reliance on food imports to satisfy the nutritional needs of the population.<sup>298</sup> As the sugar plantations expanded, land ownership became increasingly concentrated.<sup>299</sup> By 1899, 70% of Cuba's cultivated land was controlled by 16% of Cuba's farmers.<sup>300</sup>

After political independence, sugar remained Cuba's economic mainstay.<sup>301</sup> Sugar was cultivated on nearly half of Cuba's irrigated land and generated over 80% of export revenues.<sup>302</sup> The sugar monoculture fostered economic dependence on the United States.<sup>303</sup> By the 1920s, U.S. investors owned 60% of the Cuban sugar industry and controlled 95% of the Cuban sugar harvest.<sup>304</sup> From 1903 to 1948, Cuban sugar was given preferential access to the U.S. market in exchange for similar treatment of U.S. exports to Cuba.<sup>305</sup> This trade reciprocity frustrated efforts to diversify the Cuban

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<sup>296</sup> See FRANKLIN W. KNIGHT, *SLAVE SOCIETY IN CUBA DURING THE NINETEENTH CENTURY* 3-46 (1970) (describing the evolution of export-oriented sugar production in Cuba during Spanish colonial rule); MARIFELI PEREZ-STABLE, *THE CUBAN REVOLUTION: ORIGINS, COURSE AND LEGACY* 15-24 (1999) (explaining how post-independence trade and investment practices reinforced Cuba's economic dependence on sugar exports).

<sup>297</sup> See KNIGHT, *supra* note 296, at 3-46.

<sup>298</sup> See Max Zeuske, *Notas retrospectivas sobre la sociedad agraria cubana en los siglos XIX y XX*, in *LA ULTIMA REFORMA AGRARIA DEL SIGLO: LA AGRICULTURA CUBANA ENTRE EL CAMBIO Y EL ESTANCAMIENTO* 23-26 (Hans-Jurgen Burchardt ed., 2000) [hereinafter *LA ULTIMA REFORMA AGRARIA DEL SIGLO*].

<sup>299</sup> See *id.* at 23-25.

<sup>300</sup> HUGH THOMAS, *CUBA: THE PURSUIT OF FREEDOM* 1562 (1998).

<sup>301</sup> PEREZ-STABLE, *supra* note 296, at 15. After the 1895-1898 war of independence, the sugar industry in Cuba lay in ruins. *Id.* While Cuba achieved nominal independence from Spain in 1898, Cuba was under U.S. military occupation from 1899 to 1902 and did not achieve full political independence from U.S. administration until May 20, 1902. THOMAS, *supra* note 300, at 436, 460. HOWARD I. BLUTSTEIN ET AL., *AREA HANDBOOK FOR CUBA* 23 (1971). Between 1900 and 1925, the Cuban sugar industry experienced a seventeenfold expansion due to substantial investment and preferential tariff treatment from the United States. In the post-1925 period, sugar would represent over eighty percent of Cuba's exports. PEREZ-STABLE, *supra* note 296, at 15-16.

<sup>302</sup> THOMAS, *supra* note 300, at 1151-52.

<sup>303</sup> See PEREZ-STABLE, *supra* note 296, at 14-27. The sugar industry in post-colonial Cuba operated as a foreign enclave highly dependent on foreign capital, machinery, and, to a lesser extent, foreign workers. THOMAS, *supra* note 300, at 1150.

<sup>304</sup> See THOMAS, *supra* note 300, at 557.

<sup>305</sup> See BLUTSTEIN ET AL., *supra* note 301, at 384. Cuba was also included in the U.S. sugar quota system designed to stabilize sugar prices in the U.S. market. Under this system, Cuba was allotted a substantial portion of the U.S. sugar market (approximately twenty-eight percent) and was thereby guaranteed prices that substantially exceeded world market sugar prices. *Id.*

economy<sup>306</sup> and encouraged continued reliance on the importation of food products (such as oil, lard, rice, vegetables, and fruit) that could easily be produced in Cuba.<sup>307</sup> Although U.S. investment in the sugar industry had declined by the decade preceding the 1959 revolution, the United States continued to dominate Cuba's foreign trade, supplying 75% of Cuba's imports and receiving 66% of Cuba's exports.<sup>308</sup>

The sugar monoculture produced economic instability in Cuba and contributed to rural poverty and inequality.<sup>309</sup> When world sugar prices were high, the Cuban economy prospered; when they were low, all economic sectors stagnated.<sup>310</sup> In the decades following political independence, land ownership became increasingly skewed. By 1946, 70% of Cuba's cultivated land was owned by 8% of Cuba's farmers, while the remaining land was owned primarily by small-scale single-family subsistence farmers.<sup>311</sup> The sugar industry employed approximately 500,000 landless laborers (one-third of the Cuban labor force) during the four-month sugar harvest, but these workers remained unemployed or underemployed for the remainder of the year.<sup>312</sup> Living conditions in rural Cuba were very poor.<sup>313</sup> The overwhelming majority of rural Cubans lived in homes without electricity, running water,

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<sup>306</sup> See PEREZ-STABLE, *supra* note 296, at 25-26. For example, the influx of cheap manufactured goods from the United States at preferential tariff rates impeded the development of Cuba's manufacturing industry. See JULES R. BENJAMIN, *THE UNITED STATES AND THE ORIGINS OF THE CUBAN REVOLUTION* 69 (1990). Likewise, Cuba's preferential tariff arrangement with the United States thwarted efforts to stimulate domestic rice production. When Cuban rice growers increased rice production, U.S. rice growers protested declining rice imports and the U.S. Department of Agriculture hinted that Cuba's sugar quota might be reduced. In order to protect the sugar quota, the Cuban government agreed to import massive quantities of U.S. rice over the vehement objections of Cuban producers. Between 1955 and 1959, Cuban rice imports from the United States jumped by more than 40%, while domestic rice production grew a modest 10%. On the eve of the revolution, the United States was exporting 75% of its rice output to Cuba, and Cuban farmers produced less than half of the rice consumed in Cuba. The preferential arrangement forced Cuba to rely on imports for the single most important item in the Cuban diet. PEREZ-STABLE, *supra* note 296, at 25-26.

<sup>307</sup> See THOMAS, *supra* note 300, at 1186-88.

<sup>308</sup> *Id.* at 557, 1187-88. In the decades preceding the revolution, Cuba became increasingly dependent on both U.S. investment and U.S. trade. By 1958, U.S. investment in Cuba amounted to \$1 billion, nearly one third of which was concentrated in public utilities. U.S. firms produced over thirty percent of Cuba's sugar, and were substantially involved in Cuban mining and manufacturing industries. Most cars, trucks, buses, trains, and aircraft were supplied by the United States, and most of the machinery used in Cuba was designed according to U.S. specifications. The U.S. influence was so powerful that most exports were shipped from tiny ports designed for quick trips to the United States. These ports could not accommodate the large vessels required for trade with Europe. Cuba's economic dependence on the United States made the U.S. embargo (imposed in stages from 1960 to 1963) particularly devastating. *Id.* at 384-85.

<sup>309</sup> See PEREZ-STABLE, *supra* note 296, at 14; THOMAS, *supra* note 300, at 1152.

<sup>310</sup> THOMAS, *supra* note 300, at 1152.

<sup>311</sup> *Id.* at 1562.

<sup>312</sup> *Id.* at 1565-66; PEREZ-STABLE, *supra* note 296, at 14.

<sup>313</sup> PEREZ-STABLE, *supra* note 296, at 27-31.

indoor or outdoor toilets, or a refrigerator.<sup>314</sup> The sugar monoculture, the concentration of landholding, and economic dependence on the United States would remain key features of the Cuban economy through the 1959 revolution.<sup>315</sup>

Ironically, the socialist revolution did not transform the patterns of trade and production imposed during the colonial era that were so devastating to the Cuban economy. The first three decades of the Cuban revolution (1959-1989) did not alter Cuba's economic dependence on sugar, its highly centralized pattern of landholding, or its dangerous reliance on one primary trading partner.<sup>316</sup> After an early attempt at agricultural diversification created serious balance-of-payment difficulties, the Cuban government opted to maintain the country's historic dependence on sugar for export earnings.<sup>317</sup> Cuba's decision was influenced by significant subsidies from the socialist trading bloc, including long-term contracts with China, the Soviet Union, and several Eastern European countries to purchase Cuban sugar at stable, above world market prices, and the Soviet Union's sale of petroleum and other commodities to Cuba below world market prices.<sup>318</sup> Likewise, while Cuba's initial land reform expropriated large farms and distributed land to more than 100,000 farmers, the second land reform expropriated additional private lands, but concentrated these in the hands of the state.<sup>319</sup> Henceforth, state farms would be the preferred means of organizing agricultural production, and private farmers would be pressured to incorporate their property into the

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<sup>314</sup> *Id.* at 29.

<sup>315</sup> Gonzalez, *supra* note 13, at 692, 694-95.

<sup>316</sup> *Id.* at 696-705.

<sup>317</sup> See BLUTSTEIN ET AL., *supra* note 301, at 321; CARMEN DIANA DEERE, SOCIALISM ON ONE ISLAND? CUBA'S NATIONAL FOOD PROGRAM AND ITS PROSPECTS FOR FOOD SECURITY 8-9 (Inst. of Soc. Studies, Working Paper No. 124, 1992). Between 1959 and 1976, sugar accounted for 81% of Cuba's exports. After 1976, sugar's contribution to total exports ranged from a high of 86.7% in 1978 to a low of 73.2% in 1989. See Robert A. Packenham, *Cuba and the Soviet Union: What Kind of Dependency?*, in CUBAN COMMUNISM 130, 134 (Irving Louis Horowitz & Jaime Suchlicki eds., 9th ed. 1998); CARMELO MESA-LAGO, MARKET, SOCIALIST AND MIXED ECONOMIES 370-71 (2000).

<sup>318</sup> See Andrew Zimbalist & Susan Eckstein, *Patterns of Cuban Development: The First Twenty-Five Years*, in 15 WORLD DEV. 7 (1987); Hector Saez, *Resource Degradation, Agricultural Policies, and Conservation in Cuba*, 27 CUBAN STUD. 40, 53 (1997); BLUTSTEIN ET AL., *supra* note 301, at 321; MESA-LAGO, *supra* note 317, at 257-58. It is important to recognize that the international division of labor within the socialist bloc was highly beneficial to Cuba in the short term. In the first three decades of the revolution, Cuba was highly ranked among developing countries in terms of per capita GNP, life expectancy, nutrition, infant mortality, availability of doctors, and secondary school enrollment. However, the long-term consequences of this division of labor were disastrous and laid the groundwork for the crisis of the Special Period. See Peter M. Rosset, *Cuba: A Successful Case Study for Sustainable Agriculture*, in HUNGRY FOR PROFIT, *supra* note 82, at 205-06.

<sup>319</sup> See Gonzalez, *supra* note 13, at 696-701 (describing the first and second agrarian reforms of the Cuban revolutionary government).

state farms.<sup>320</sup> By 1992, 80% of Cuba's arable land was in the hands of state farms, while the remaining 20% was divided between private farmers and agricultural production cooperatives.<sup>321</sup> Finally, revolutionary Cuba exchanged its pre-revolutionary trade dependence on the United States for trade dependence on the Soviet Union and the other members of the Council for Mutual Economic Assistance (CMEA).<sup>322</sup> While the United States accounted for 69% percent of Cuba's foreign trade between 1946 and 1958, the comparable figure for the CMEA countries between 1977 and 1988 was approximately 80%.<sup>323</sup>

Notwithstanding the continuities in the Cuban agricultural sector from colonialism to 1990, the Cuban revolution did introduce one important innovation: capital-intensive, chemical-dependent agricultural production techniques strikingly similar to the industrial agriculture practiced in capitalist countries.<sup>324</sup> While agriculture in pre-revolutionary Cuba relied on traditional low-input, labor-intensive methods,<sup>325</sup> the revolutionary government embarked on an ambitious plan to "modernize" Cuban agriculture by developing large-scale, capital-intensive industrial farms specializing in the production of sugar cane and livestock.<sup>326</sup> The government constructed hundreds of dairy farms, significantly increased the amount of land under sugar cultivation, invested in major irrigation projects, and sponsored massive increases in agrochemical use and mechanization.<sup>327</sup> Between 1959 and 1989, pesticide use increased four-fold, tractor use nine-fold, and fertilizer use ten-fold.<sup>328</sup> Cuba's adoption of industrial agriculture produced serious environmental harm, including agrochemical contamination

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<sup>320</sup> See *id.* at 699-701. There are various explanations for the Cuban government's decision to adopt state farms as the favored means of organizing agricultural production. First, expropriation of medium to large farms may have been a political offensive against private farmers who opposed the new regime. Second, state farms may have been favored in order to ensure government control of the food supply and avoid shortages or disruptions in production. Third, the predominance of state farms may be explained by Cuban efforts to emulate the Soviet model. Fourth, state farms may have been preferred in order to facilitate the introduction of mechanization, agrochemicals and large-scale irrigation. Finally, state control of agricultural production may have facilitated the diversion of arable land from food production to cash crop production in order to address the government's urgent need for foreign exchange. *Id.* at 699-700.

<sup>321</sup> Saez, *supra* note 318, at 49. State farms were generally operated by the Ministry of Agriculture and the Ministry of Sugar and were known for their inefficiency and low productivity. *Id.*

<sup>322</sup> See Packenham, *supra* note 317, at 135.

<sup>323</sup> *Id.* at 134; MESA-LAGO, *supra* note 317, at 374-75.

<sup>324</sup> See SERGIO DIÁZ-BRIQUETS & JORGE PÉREZ-LÓPEZ, CONQUERING NATURE: THE ENVIRONMENTAL LEGACY OF SOCIALISM IN CUBA 6 (2000).

<sup>325</sup> *Id.* at 97; Gonzalez, *supra* note 13, at 696.

<sup>326</sup> See Saez, *supra* note 318, at 51.

<sup>327</sup> See *id.* at 50-51; DIÁZ-BRIQUETS & PÉREZ-LÓPEZ, *supra* note 324, at 105, 165-66.

<sup>328</sup> See Saez, *supra* note 318, at 50-51; DIÁZ-BRIQUETS & PÉREZ-LÓPEZ, *supra* note 324, at 105.

of lakes, rivers, and drinking water supplies and significant erosion, compaction, acidification, and salinization of soils.<sup>329</sup>

Despite the ecological harm produced by industrial agriculture, food security proved to be the Achilles heel of the revolution.<sup>330</sup> While socialist Cuba was able to produce or import the food necessary to satisfy domestic nutritional requirements, its food security was nevertheless precarious because it relied on a single commodity to generate the bulk of export earnings, depended on a single group of countries for most of its foreign trade, and required imported food and agricultural inputs to feed its population and maintain agricultural production.<sup>331</sup> When the socialist trading bloc collapsed in 1990, Cuba experienced severe shortages of food, fuel, agrochemicals, spare parts, and other inputs needed for agricultural production.<sup>332</sup> Food imports and food production were sharply curtailed.<sup>333</sup> Average caloric, protein, and vitamin intake plummeted to levels thirty

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<sup>329</sup> See DIÁZ-BRIQUETS & PÉREZ-LÓPEZ, *supra* note 324, at 95-97, 105-06, 132-33. Erosion affected approximately 64% of Cuban farmland, whereas poor drainage affected 41%, soil compaction 21%, acidification 17%, and salinization 12%. *Id.* at 168. Soil compaction, a consequence of using heavy tillage equipment, reduces the soil's ability to absorb water and nutrients, limits plant growth, and increases vulnerability to erosion. Soil salinization is a function of irrigation in the absence of proper drainage. Soil acidification, which depletes nutrients and impairs plant growth, results from excessive reliance on agrochemicals. *See id.* at 105-06; 132-33; Saez, *supra* note 318, at 45-48. The most serious environmental degradation occurred in the state farms as a consequence of monocropping, heavy application of pesticides and fertilizers, significant mechanization, poorly designed irrigation projects, intense pressure to fulfill production quotas, lack of incentives to protect the environment, planting and harvesting deadlines imposed by high level officials without regard to local ecological conditions, and limited ecological awareness of workers, managers, and planners. Natural resource degradation on some state farms was so severe that it resulted in declining agricultural productivity. By contrast, private farmers had greater incentives to conserve the natural resource base necessary for long-term productivity because they could transfer the land to their children by inheritance and could consume surplus agricultural output in excess of state production quotas. In addition, the Cuban government's neglect of private agriculture in favor of state farms limited private farmers' access to tractors and agrochemical inputs, thereby fostering reliance on traditional farming techniques and human and animal labor. Private farmers generally planted a wide variety of crops in order to enhance biodiversity and maintain soil fertility, utilized natural pest control and fertilization techniques, and implemented labor-intensive anti-erosion measures. Agricultural production cooperatives tended to occupy an intermediate position between the state farms and the private farms in their use of ecologically sustainable farming techniques. *See generally* Hector Saez, *Property Rights, Technology, and Land Degradation: A Case Study of Santo Domingo, Cuba*, 7 CUBA IN TRANSITION 472 (1997), available at <http://lanic.utexas.edu/la/cb/cuba/asce/cuba/7/saez.pdf> (last visited Sept. 29, 2004).

<sup>330</sup> *See* THE GREENING OF THE REVOLUTION, *supra* note 18, at 4.

<sup>331</sup> *See* Gonzalez, *supra* note 13, at 706. On the eve of the Special Period, Cuba depended on imported food to supply over 50% of the Cuban population's protein consumption, 55% of its caloric consumption, and 90% of its consumption of oil and lard. Julio A. Diaz-Vazquez, *Consumo y distribución normada de alimentos y otros bienes en Cuba*, in LA ÚLTIMA REFORMA AGRARIA DEL SIGLO, *supra* note 298, at 47. Cuba imported 49% of its rice, 90% of its beans, and 100% of its cereals. It also imported 82% of its pesticides, 98% of its herbicides, 48% of its fertilizers, and 97% of its animal feed. *See* THE GREENING OF THE REVOLUTION, *supra* note 18, at 18-19.

<sup>332</sup> MESA-LAGO, *supra* note 317, at 289-90.

<sup>333</sup> Diaz-Vazquez, *supra* note 331, at 50.

percent below those achieved in the 1980s.<sup>334</sup> The economic crisis was exacerbated by relatively low world market prices for sugar and by the tightening of the U.S. economic embargo.<sup>335</sup>

*B. Cuban Agriculture After the Collapse of the Socialist Trading Bloc*

In response to the economic crisis occasioned by the demise of the socialist trading bloc, the Cuban government introduced a series of reforms that radically transformed Cuba's highly centralized, export-oriented, chemical-intensive agricultural production strategy.<sup>336</sup> The first reform was the conversion of the large, inefficient state farms into smaller, self-managed agricultural production cooperatives (UPBCs) in order to enhance the efficiency and productivity of Cuban agriculture.<sup>337</sup> Agricultural production was further decentralized by the distribution of idle state lands in usufruct to private farmers, pensioners, and state workers for the cultivation of food crops and cash crops, and by state support for the booming urban agriculture movement.<sup>338</sup> The second reform was the opening of agricultural markets throughout the country in order to improve food distribution, boost food

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<sup>334</sup> *Id.*

<sup>335</sup> See MESA-LAGO, *supra* note 317, at 575 n.2; Gonzalez, *supra* note 13, at 712.

<sup>336</sup> See Gonzalez, *supra* note 13, at 712-25.

<sup>337</sup> See *id.* at 713. On September 20, 1993, the Cuban Council of State enacted Decree Law No. 142, which converted the state farms into agricultural production units known as Basic Units of Cooperative Production (or UBPCs, their Spanish acronym). The UBPCs were organized as self-managing production cooperatives and were given state land in permanent usufruct free of charge. Other assets (buildings, machinery, and tools) were sold to the UBPCs on favorable terms and constituted private UBPC property. UBPCs were required to sell to the state marketing agency 80% of their production target (plus 20% of any amount in excess of the production goal) and, as a production incentive, could sell the remaining surplus at the newly established farmer's markets. The track record of UBPCs has been mixed. On the one hand, production of staple crops rebounded to just under 1988 peak levels by 1996. On the other hand, over one third of UBPCs were operating at a loss by 1999-2000 and required state subsidies. *Id.* at 714-15.

<sup>338</sup> *Id.* at 716-18. In addition to authorizing the conversion of state farms to UBPCs, Decree Law No. 142 and subsequent implementing resolutions authorized the distribution of thousands of hectares of idle state lands in usufruct to private farmers, pensioners, and state workers for self-provisioning or for the cultivation of specific crops. These reforms were enacted to regulate and encourage the self-help measures taken by ordinary Cubans to cope with the food shortages of the Special Period. For example, Cubans had begun to seize and cultivate private plots on state farms as well as unused land along roads and highways in order to maximize food production. As a consequence of the land distributions authorized by Decree Law No. 142, membership in Cuba's National Association of Small Farmers (ANAP) increased by 35,000, and now includes college-educated urban dwellers who have abandoned cities and towns in order to earn a living from the land. In urban areas, self-help took the form of growing food on balconies, rooftops, patios, and on any available public or private land, including vacant lots and garbage dumps. The Ministry of Agriculture responded to this initiative by creating an Urban Agriculture Department to help secure land use rights for urban gardeners and to provide technical assistance and information. Urban gardening relieved the pressure on rural areas to feed the entire nation and reduced energy-intensive transportation and refrigeration costs. Moreover, because the use of synthetic agrochemicals was prohibited within city limits, urban gardens became models of organic agriculture, relying on low cost and locally available resources. *Id.*

production, and combat the black market.<sup>339</sup> Once they had satisfied their state-mandated production quotas, state farms, UBPCs, and private farmers were among those entitled to sell their surplus production in these markets at prices determined by supply and demand.<sup>340</sup> The third reform was the aggressive promotion by the state of low-input, ecologically sustainable farming techniques, such as biopesticides, biofertilizers, and animal traction, as substitutes for inputs (such as tractors, synthetic fertilizers, and pesticides) that were no longer available.<sup>341</sup>

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<sup>339</sup> Gonzalez, *supra* note 13, at 718-21. On September 19, 1994, the Council of Ministers enacted Decree Law No. 191, which established agricultural markets where farmers could sell agricultural output in excess of mandatory state production quotas at prices determined by supply and demand. Among the individuals and entities authorized to sell their products at the agricultural markets are state farms, non-sugar cane UBPCs, cooperative farms, private farmers, individuals farming formerly idle state lands distributed pursuant to Decree Law No. 142, and tillers of private subsistence plots. While Cuban president Fidel Castro was adamantly opposed to the establishment of free agricultural markets, the food shortages of the Special Period forced his hand. In particular, the state food rationing system was in severe disarray as a consequence of the diversion of agricultural production to the black market. Because black market prices were high and transactions were conducted almost entirely in dollars, Cubans without access to U.S. dollars were precluded from using the black market to supplement their meager food rations. While Cubans responded favorably to the agricultural markets, prices remained high, and many consumers opted to purchase food from a variety of other sources, including urban gardeners and small farmers cultivating land on the periphery of urban areas. In August 2000, the Cuban government attempted to regulate this informal commercial activity and to increase food availability and affordability by authorizing the sale of food in other outlets, including fixed maximum price agricultural markets, urban gardens, organoponics, and state-run food fairs. These outlets eventually came to handle about fifty percent of all fruit and vegetable purchases in Cuba. However, the Cuban government maintained important social safety nets designed to promote food security, including targeted food assistance to the unemployed, low-income workers, children, pregnant women, and the elderly. *Id.*

<sup>340</sup> *Id.* at 719.

<sup>341</sup> *Id.* at 721-25. The Cuban experiment with organic agriculture rested on three pillars: private farmers, scientists, and the state. Private farmers played a critical role in enabling Cuba to recover from the ravages of the Special Period. Unlike workers on state farms, private farmers possessed incentives to protect the land they cultivated. These incentives included the right to transfer land by inheritance to their children and the right to exchange surplus production for other goods. Furthermore, because private farmers had been denied access to capital-intensive inputs in order to encourage them to join the state sector, these farmers had preserved traditional low-input agricultural production techniques and were not dependent on imported petroleum, animal feed, or fertilizers. When the collapse of the socialist trading bloc and the consequent decline in food imports and in state sector food production created enormous food demand, the productivity of many private farms remained steady or increased. The second pillar of organic agriculture was the cadre of scientists developed by the Cuban government in the aftermath of the revolution. Many of these scientists had been critical of industrial agriculture even before the Special Period and had directed their research toward ecologically sustainable alternatives. During the Special Period, the Cuban government quickly mobilized its highly developed scientific infrastructure to develop substitutes for unavailable agricultural inputs. By 1993, Cuba had 222 mini-centers for the production of biopesticides and biofertilizers and was experimenting with other nonchemical fertilization techniques, such as crop residues, composted municipal waste, and sugar cane wastes. The third pillar of organic agriculture was the state. The shift to organic agriculture was spearheaded by the Ministry of Agriculture, which launched a national program to convert the agricultural sector to low-input self-reliant farming practices. *Id.*

The conversion of state farms to cooperatives, the increase in the number of small producers, the burgeoning of urban agriculture, and the availability of agricultural free markets enhanced agricultural productivity and diversified the agricultural sector.<sup>342</sup> Yields of staple crops such as plantains, beans, corn, cereals, potatoes, and tomatoes increased relative to 1994 levels, and in many cases surpassed pre-Special Period levels.<sup>343</sup> Export crops such as tobacco, citrus, and coffee also rebounded.<sup>344</sup> In sharp contrast to the prevalence of monocropping on state farms prior to the Special Period, Cuban farmers currently practice intercropping of food and cash crops.<sup>345</sup> Cuban farmers routinely intercrop soybean and sugarcane, coffee and taro, and corn and cassava, thereby boosting food production, increasing soil fertility, and minimizing pest infestations.<sup>346</sup> For the first time in Cuban history, another industry, tourism, has eclipsed sugar as the prime generator of foreign exchange.<sup>347</sup> In the terminology of entitlements, Cuba has promoted food security by enhancing its production-based entitlements and diversifying its trade-based entitlements.

Cuba's economic reforms have resulted in better nutrition and increased caloric intake. Between 1989 and 1994, per capita daily caloric intake in Cuba dropped from 2908 to 1863 calories, resulting in weight loss of twenty pounds for the average Cuban.<sup>348</sup> By 2000-2002, per capita daily caloric intake had rebounded to 3000.<sup>349</sup> Likewise, the proportion of undernourished Cubans had dropped from 18% in 1995-1997 to 3% in 1999-2001.<sup>350</sup>

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<sup>342</sup> See Gonzalez, *supra* note 13, at 725-27.

<sup>343</sup> SINCLAIR & THOMPSON, *supra* note 19, at 33.

<sup>344</sup> *Id.* at 35-36.

<sup>345</sup> *Id.* at 27.

<sup>346</sup> *Id.*

<sup>347</sup> According to the report prepared for President Bush by the Commission for Assistance to a Free Cuba (chaired by Secretary of State Colin Powell), "tourism is Cuba's largest single source of revenue, generating some \$1.8-2.2 billion in annual gross revenues. Of this amount, it is estimated that the regime nets 20 percent, although its take may be greater given the Cuban regime's routine failure to pay creditors or honor contracts with foreign investors." COMMISSION FOR ASSISTANCE TO A FREE CUBA, REPORT TO THE PRESIDENT 29 (2004), available at <http://www.state.gov/documents/organization/32834.pdf> (last visited Sept. 29, 2004). Approximately 2 million tourists visit Cuba each year (including 160,000 to 200,000 legal and illegal visitors from the United States), and the Cuban government hopes to receive 7.5 million tourists by 2010 and 10 million by 2025. The majority of tourists are from Spain, Italy, Germany, and Canada. *Id.* at 28-29. By contrast, gross revenues from sugar exports have declined from \$4.3 billion in 1989-90 to \$441 million in 2001-2002, as a consequence of falling world prices and lower Cuban productivity. Indeed, these factors caused Cuba to downsize its sugar industry in 2002, closing nearly half of its sugar mills and causing some 200,000 workers to lose their jobs. Tracey Eaton, *In Cuba, Sugar Mills' Closing is Sweet Sorrow, Nearly Half of Facilities Shifting; Workers See Jobs "Gone Forever,"* DALLAS MORNING NEWS, July 5, 2002, at 1A.

<sup>348</sup> SINCLAIR & THOMPSON, *supra* note 19, at 10, 49.

<sup>349</sup> FAO, STATE OF FOOD INSECURITY 2004, *supra* note 1, at 37.

<sup>350</sup> *Id.* at 34.



The reforms undertaken during the Special Period enhanced ecological sustainability by replacing capital-intensive, chemical-dependent production techniques with low-input organic and semi-organic methods. The emphasis on organic soil management techniques (such as organic fertilization, crop rotation, and intercropping) promises to restore the fertility of agricultural lands degraded by chemical-intensive practices.<sup>351</sup> Intercropping of food and cash crops boosted food production while improving soil condition and enhancing the control of harmful pests and diseases.<sup>352</sup> According to one estimate, nearly 50% of Cuba's fresh vegetable production and 65% of its rice production are currently organic.<sup>353</sup> Cuba has also experimented with the organic production of sugar, coffee, cocoa, and citrus, and with organic fruit production for the tourism sector and for export.<sup>354</sup> However, Cuba continues to utilize chemical-intensive methods in the cultivation of export crops such as sugar and tobacco, and it is unclear whether the majority of Cuban agronomists and technicians view organic and semi-organic production as anything but a temporary accommodation to current economic exigencies.<sup>355</sup>

Finally, Cuba has diversified its trading partners and is no longer dangerously dependent on a single trading partner. In the year 2000, Cuba's primary trading partners were Venezuela (13.9% of trade), Spain (13.4%), Canada (9%), the Netherlands (8.3%), China (7.6%), Russia (6.7%), Mexico (5.1%), France (5.1%), and Italy (4.8%).<sup>356</sup>

In sum, the post-1990 reforms increased food security, enhanced ecological sustainability, and reduced Cuba's dangerous reliance on a single trading partner. The reforms also diversified Cuba's economic base and reduced Cuba's historic dependence on a single agricultural commodity (sugar) to generate the bulk of export revenues. Finally, the decentralization of agricultural production (through the distribution of land in usufruct to UBPCs and to private farmers) enhanced agricultural productivity and represented a significant shift from the patterns established in the colonial

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<sup>351</sup> Eolia Treto et al., *Advances in Organic Soil Management*, in SUSTAINABLE AGRICULTURE AND RESISTANCE, *supra* note 12, at 184-85.

<sup>352</sup> SINCLAIR & THOMPSON, *supra* note 19, at 27-28.

<sup>353</sup> See NICHOLAS PARROTT & TERRY MARSDEN, THE REAL GREEN REVOLUTION: ORGANIC AND AGROECOLOGICAL FARMING IN THE SOUTH 12 (2002), available at <http://archive.greenpeace.org/geneng/reports/hunger/realgreenrevwhole.pdf> (last visited Sept. 29, 2004).

<sup>354</sup> See Fernando Funes, *The Organic Farming Movement in Cuba*, in SUSTAINABLE AGRICULTURE AND RESISTANCE, *supra* note 12, at 19-20. Indeed, Cuba is on the verge of exploiting a highly lucrative market niche for organic products. Cuba has obtained organic certification for coffee, cocoa, honey, and citrus and has begun to export these products to Europe and Japan. See Raisa Pages, *Cuba Enters the Market for Organic Products*, HAVANA J., 2003, available at [http://HavanaJournal.com/business\\_comments/A465\\_0\\_4\\_0\\_m/](http://HavanaJournal.com/business_comments/A465_0_4_0_m/) (last visited Sept. 29, 2004).

<sup>355</sup> DÍAZ-BRIQUETS & PÉREZ-LÓPEZ, *supra* note 324, at 272-74.

<sup>356</sup> Carmelo Mesa-Lago, *The Cuban Economy in 1999-2001: Evaluation of Performance and Debate on the Future*, 11 CUBA IN TRANSITION 1, 5 (2001), available at <http://lanic.utexas.edu/project/asce/pdfs/volume11/mesa-lago.pdf> (last visited Sept. 29, 2004).

period and maintained after political independence and during the first three decades of the revolution.

### *C. Cuban Agriculture in a Neoliberal World*

The greatest challenge to Cuba's unique agricultural experiment is the eventual renewal of trade relations with the United States and the re-integration of Cuba into the global trading system. At the behest of the United States, Cuba was excluded from major trade and financial institutions, including the IMF, the World Bank, and regional trade organizations.<sup>357</sup> Paradoxically, while Cuba's economic isolation produced enormous hardship, it also gave Cuba free rein to respond to the crisis of the Special Period in ways that diverged radically from the prevailing neoliberal model.

One of the most significant decisions that Cuba will face after the lifting of the U.S. economic embargo is whether to join the World Bank, the IMF, and the Inter-American Development Bank.<sup>358</sup> With an external debt of approximately \$12 billion as well as an additional \$15 billion to \$20 billion debt to Russia,<sup>359</sup> Cuba might be tempted to avail itself of concessional loans and debt restructuring assistance from the IMF and the World Bank in order to normalize relations with external creditors and to obtain badly needed infusions of capital.

Debt relief, however, will come at a very high price. Cuba, like other developing countries, will be compelled to implement neoliberal reforms pursuant to structural adjustment programs overseen by the World Bank and the IMF. These programs will require Cuba to maximize the revenues available for debt service by slashing social spending and vigorously promoting exports. In light of Cuba's "comparative advantage" in agricultural production, it is likely that structural adjustment will result in renewed emphasis on sugar production or on the cultivation of non-traditional agricultural exports (such as flowers, fruits, and vegetables). Cuba will be required to prioritize agricultural exports over domestic food production, to

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<sup>357</sup> Due to U.S. pressure, Cuba has been excluded from membership in the IMF, the World Bank, and the Inter-American Development Bank. Cuba has also failed to reach full membership in any regional trade association and has been excluded from the ongoing FTAA negotiations. See SINCLAIR & THOMPSON, *supra* note 19, at 45; Mesa-Lago, *supra* note 356, at 5. However, Cuba has been a member of the WTO since April 20, 1995, and it was one of the earliest members of the 1947 GATT. See WTO, MEMBER INFORMATION: CUBA AND THE WTO, available at [http://www.wto.org/english/thewto\\_e/countries\\_e/cuba\\_e.htm](http://www.wto.org/english/thewto_e/countries_e/cuba_e.htm) (last visited Sept. 29, 2004). WTO, For the 128 countries that had signed GATT by 1994, see [http://www.wto.org/english/thewto\\_e/gattmem\\_e.htm](http://www.wto.org/english/thewto_e/gattmem_e.htm) (last visited Sept. 29, 2004).

<sup>358</sup> Under Section 104(a) of the Helms-Burton Act, the United States is obligated to oppose Cuba's membership in the IMF, the World Bank, and the Inter-American Development Bank until it finds that a democratically elected government is in power in Cuba. See Cuban Liberty and Democratic Solidarity (Helms-Burton) Act of 1996, Pub.L. No. 104-114, 110 Stat. 785 (1996).

<sup>359</sup> U.S. CENTRAL INTELLIGENCE AGENCY (CIA), THE WORLD FACTBOOK: CUBA (2003), available at <http://www.cia.gov/cia/publications/factbook/print/cu.html> (last visited Sept. 29, 2004).

drastically reduce subsidies and social safety nets (including agricultural subsidies and food aid), to privatize state lands and government-owned enterprises, and to open its markets to foreign competition. These reforms would be enacted in conjunction with pre-existing commitments under the WTO Agreement on Agriculture to eliminate non-tariff barriers and reduce tariffs, to phase out domestic subsidies, and to eliminate export subsidies. Cuba would also be obligated under the SPS Agreement to permit the cultivation of genetically modified crops unless Cuba could present strict scientific proof that such cultivation will harm human health or the environment. Since such proof is unlikely given scientific uncertainty regarding the effects of genetically modified organisms, it is likely that Cuba, like Argentina, would become a major cultivator of genetically modified crops.

Based on the track record of the neoliberal model in the developing world, it appears that Cuba's adoption of the standard package of neoliberal reforms would jeopardize food security at the national level. First, the neoliberal reforms would undercut domestic food production by diverting prime agricultural land to export production and by requiring Cuba to open its markets to cheap, subsidized food from the United States. This would reduce Cuba's food self-sufficiency and would reinstate Cuba's dangerous dependence on food imports to satisfy basic nutritional needs. Second, renewed emphasis on agricultural exports to generate foreign exchange would make Cuba's trade-based entitlements highly vulnerable to fluctuations in world market agricultural prices and to the declining terms of trade for agricultural products. In the terminology of entitlements, Cuba's production-based entitlements would be eroded in favor of highly precarious trade-based entitlements.<sup>360</sup> In addition, a significant percentage of Cuba's export earnings would be earmarked for debt service and thus unavailable for investment or for the importation of food and other vital items. Finally, the cultivation of genetically modified crops would reinstate Cuba's trade dependence on the United States (and subordinate Cuba's food security to U.S. political and economic interests) by shutting Cuba out of lucrative EU markets.

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<sup>360</sup> It is unclear whether Cuba's burgeoning tourism industry, if subjected to requirements of the global trade regime, would generate sufficient foreign exchange earnings to mitigate Cuba's renewed dependence on agricultural export production. According to the WTO, as much as 50% of tourism revenues "leak" out of the developing world in the form of profits earned by foreign-owned businesses, advertising, and payments for imported goods and labor. Leakage is particularly severe in the Caribbean, where 50 to 70% of tourism revenues are earmarked for the acquisition of foreign inputs. Cuba's adherence to the WTO General Agreement on Trade in Services (GATS) and the WTO Agreement on Trade Related Investment Measures (TRIMS) would make it easier for foreign businesses to establish franchises and repatriate profits and harder for Cuba to require foreign companies to use local inputs in order to build linkages to the local economy. See Lisa Mastny, *Redirecting International Tourism*, in THE WORLDWATCH INST., STATE OF THE WORLD 2002 101, 106-07 (2002). Likewise, the Cuban biotechnology industry may fail to provide the necessary economic diversification if it is absorbed by transnational pharmaceutical companies after the lifting of the U.S. embargo. See AMINA AITSISELMI, DESPITE U.S. EMBARGO, CUBAN BIOTECH BOOMS, 35(5) NACLA REPORT ON THE AMERICAS, 38-39 (Mar./Apr. 2002) (describing the development of the Cuban biotechnology industry).

The neoliberal model would also jeopardize food security at the household level by fueling rural poverty and inequality. The promotion of export production is likely to provoke a land grab by elite Cubans and transnational corporations at the expense of Cuban smallholders. Export production tends to favor wealthy farmers with ready access to capital who can benefit from economies of scale in both production and marketing and can withstand the dramatic price fluctuations that plague many export commodities.<sup>361</sup> Furthermore, the opening of Cuba's markets to cheap food imports from the United States, in conjunction with the slashing of agricultural subsidies and social safety nets, will threaten the livelihoods of the majority of Cuban farmers and produce economic polarization in rural areas. Finally, the cultivation of genetically modified crops is likely to accelerate the dispossession of small farmers by disrupting the traditional practice of saving, sharing, and breeding seeds. As farmers become increasingly dependent on seeds and other inputs produced by transnational corporations, they may suffer severe economic dislocation if input prices increase or if farm revenues drop. Dispossessed farmers are likely to migrate en masse to towns and cities, thereby straining limited urban amenities. In the terminology of entitlements, Cuban smallholders are likely to be deprived of production-based entitlements (land with which to grow food), trade-based entitlements (the ability to buy food on the market with the income generated by agricultural production), labor-based entitlements (due to the loss of jobs to mechanization on the large farms), and transfer-based entitlements (state subsidies and food aid).

Neoliberal economic reforms may also jeopardize Cuba's experiment in sustainable agriculture. Export production tends to reinforce ecologically unsustainable monocultures that require extensive application of agrochemicals. These monocultures displace traditional food crops that contribute to soil fertility, pest control, and fodder production. The cultivation of genetically modified crops may exacerbate the problems associated with industrial agriculture by reinforcing monocultural production, eroding biodiversity, and increasing the use of herbicides and insecticides (by accelerating resistance to these products). Even if Cuba is able to capture an export niche in the lucrative market for certified organic products, the introduction of genetically modified organisms may undermine Cuba's efforts by producing genetic contamination. Moreover, the cultivation of Bt crops may injure organic farmers by accelerating resistance to one of the most widely used natural pesticides. Finally, if the cultivation of genetically modified crops results in *increased* use of herbicides and insecticides, this may harm organic agriculture by killing non-target organisms (including the

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<sup>361</sup> See CONROY ET AL., *supra* note 214, at 29, 37-59 (discussing why export agriculture benefits wealthy farmers at the expense of poor farmers); THRUPP, BITTERSWEET HARVESTS, *supra* note 261, at 67-77 (explaining why transnational corporations and large national and foreign investors have been the main beneficiaries of the shift to non-traditional agricultural exports in Latin America); Reed, *Conclusions*, *supra* note 264, at 310, 313 (discussing the tendency of export production to favor large farmers).

natural enemies of the target pest and other beneficial insects) and by producing ecosystem-wide disturbances.

In short, Cuba's adoption of neoliberal economic reforms threatens to recreate colonial and post-colonial patterns of land tenure and production, whereby the ruling elite and transnational corporations grow export crops on large industrial farms while small-scale producers are relegated to marginal subsistence plots or forced to abandon agriculture altogether. Furthermore, the cultivation of genetically modified crops may re-introduce trade dependency on the United States by foreclosing access to the lucrative European market. The prospects for food security and ecological sustainability under neoliberalism are grim.

#### *D. Summary and Conclusion: The Symbolic Significance of Cuba*

The saga of Cuban agriculture illustrates the ways in which developing countries are structurally disadvantaged in the global trading system by the colonial and post-colonial division of labor that relegates them to the production of primary agricultural commodities. Cuba's integration into the world economy as an exporter of sugar and an importer of manufactured goods and food products so deeply constrained its development options that not even a socialist revolution could alter these pre-existing trade and production patterns. It was not until the collapse of the socialist trading bloc and the tightening of the U.S. economic embargo that Cuba was forced by external circumstances to diversify its exports, diversify its trading partners, decentralize agricultural production, prioritize domestic food production, and promote organic and semi-organic farming techniques.

Cuba is symbolically important because it demonstrates that there is an alternative to the dominant export-oriented industrial agricultural model and that this alternative can boost agricultural productivity, enhance food security, and protect the environment.<sup>362</sup> However, the transformation of Cuban agriculture was a response to the crisis of the Special Period and was made possible by Cuba's relative economic isolation. Once the U.S. embargo is lifted and Cuba is reintegrated into the global trading system, Cuba, like every other developing country, will face intense pressure to restructure its economy along neoliberal lines. The results could be devastating. It is therefore important to recognize the neoliberal threat, to consider whether neoliberalism can ever be made compatible with food security and ecological sustainability, and to explore alternative strategies for sustainable rural development.

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<sup>362</sup> While Cuba is the only developing country to promote sustainable agriculture on a nation-wide scale, many successful small-scale experiments throughout the developing world have demonstrated that food production and household food security can be increased through the use of low-cost, locally available, environmentally friendly technologies. See MADELEY, HUNGRY FOR TRADE, *supra* note 176, at 143-52; Pretty, *Reducing Food Poverty*, *supra* note 50; Pretty & Hine, *supra* note 208, at 107-21; Pretty, *Can Sustainable Agriculture Feed Africa?*, *supra* note 208.

## V. CONFRONTING THE NEOLIBERAL THREAT

The neoliberal economic model reinforces the economic dominance of the industrialized world through double standards that systematically benefit transnational agribusiness at the expense of poor farmers and the environment in the developing world. The WTO Agreement on Agriculture, for example, permits industrialized countries to continue to practice protectionism while requiring market openness in developing countries. The SPS Agreement bolsters the economic might of agribusiness by overriding health and safety measures that limit access to developed and developing country markets.<sup>363</sup> The TRIPS Agreement promotes dependence on agricultural inputs produced in the industrialized world by protecting the intellectual property rights of the seed industry at the expense of farmers' traditional rights to save, sell, and exchange seeds. Finally, structural adjustment programs mandated by the IMF and the World Bank impose socially and economically devastating austerity measures on developing countries without any corresponding obligation on the part of industrialized countries to implement free market reforms.

Proponents of neoliberalism might argue that further liberalization in the industrialized world will redress most of the inequities in the global trading system by establishing a level playing field that imposes identical obligations

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<sup>363</sup> As explained in Part III of this article, the United States' WTO challenge of the EU's de facto ban on genetically modified organisms will have a major impact on the EU and on other countries that currently prohibit or restrict the importation of GMOs. Developed countries are the prime beneficiaries of the SPS Agreement despite its ostensible benefit to developing countries. The SPS Agreement is designed to ensure that health and safety measures (SPS measures) are supported by sound scientific evidence and do not function as disguised protectionist barriers. See Stewart & Johanson, *supra* note 237, at 25. Because SPS measures frequently result in the exclusion of developing country agricultural products from industrialized country markets, the SPS Agreement should, in theory, benefit developing countries by enabling them to challenge SPS measures maintained without adequate scientific justification. Regrettably, this benefit may be illusory without fundamental changes in the WTO dispute resolution process. Although they comprise eighty percent of the WTO membership, developing countries have historically initiated only one third of the WTO dispute settlement proceedings. Moreover, a dozen developing countries in Asia and Latin America, led by India and Brazil, account for almost all of these cases. The obstacles are two-fold. First, developing countries frequently lack the technical, scientific, and legal resources needed to mount or defend a case. Second, even if a developing country brings a case and prevails, its remedy is to apply trade sanctions (equivalent to the foregone revenue from the illegal SPS measure) if the non-prevailing developed country refuses to change its trade practices. This remedy would inflict enormous harm on the prevailing developing country by raising the cost of essential imports from the non-prevailing developed country. Moreover, the remedy would be entirely ineffective against wealthy countries such as the United States and the EU. Consequently, the prime beneficiaries of the SPS Agreement are the transnational corporations whose governments can afford to bring a WTO claim and can apply trade sanctions against a non-complying losing party. One obvious solution is to amend the dispute resolution process to require the non-complying losing party to pay monetary damages. See Frances Williams, *WTO Minnows Cry Foul on Mediation: Poor Countries Claim the System to Challenge Unfair Practices by Richer Nations is Stacked Against Them*, FIN. TIMES (London), Oct. 24, 2002, at 8; Prema-chandra Athukorala & Sisira Jayasuriya, *Food Safety Issues, Trade and WTO Rules: A Developing Country's Perspective*, 26 WORLD ECON. 1935 (2003).

on developed and developing countries. For example, reduction of industrialized country import barriers and subsidies is widely regarded as a critical step in promoting food security in the developing world and has been forcefully demanded by developing countries in the WTO negotiations.<sup>364</sup> Furthermore, non-governmental organizations have criticized the non-reciprocal nature of trade liberalization under structural adjustment and have urged that industrialized countries match the liberalization previously undertaken by developing countries.<sup>365</sup>

This section considers whether extension of the neoliberal model to the industrialized world would enhance food security and ecologically sustainable farming practices in developing countries. Part A examines the benefits to developing countries of agricultural trade liberalization in the industrialized world. Part B argues that the neoliberal model, even if applied in an even-handed manner, is inherently incompatible with sustainable rural development.

#### *A. Taking Neoliberalism Seriously: Leveling the Playing Field*

Phasing out agricultural subsidies in the United States and the EU may improve food security in the developing world by putting an end to the dumping of agricultural commodities on world markets at below the cost of production.<sup>366</sup> The elimination of export dumping is likely to raise food prices, thereby increasing the incomes of developing country farmers and creating economic incentives for domestic food production.<sup>367</sup> In the language of entitlements, agricultural trade liberalization in the industrialized world is likely to boost the production-based entitlements of developing countries by encouraging greater food self-sufficiency.<sup>368</sup>

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<sup>364</sup> See Carlson, *supra* note 209, at 1209-20; Elizabeth Becker, *Poorer Countries Pull Out of Talks Over World Trade*, N.Y. TIMES, Sept. 15, 2003, at A1. [hereinafter Becker, *Poorer Countries Pull Out*]; Gretchen Peters, *In Cancun, a Blow to World Trade*, CHRISTIAN SCIENCE MONITOR, Sept. 16, 2003, at 6; TEO BALLVÉ, GLOBALIZING RESISTANCE IN CANCUN, 37 NACLA REPORT ON THE AMERICAS 16-19 (Nov/Dec. 2003), available at [http://www.nacla.org/art\\_display.php?art=2285](http://www.nacla.org/art_display.php?art=2285) (last visited Nov. 9, 2004) (noting that developing countries' focus at WTO's Fifth Ministerial Meeting was on "domestic support and export subsidies by rich countries").

<sup>365</sup> See OXFAM, RIGGED RULES AND DOUBLE STANDARDS: TRADE, GLOBALIZATION AND THE FIGHT AGAINST POVERTY 5-6, 147-48 (2002) (calling on the IMF and the World Bank to consider the consequences of short-term poverty and long-term development when establishing loan conditions) [hereinafter OXFAM, RIGGED RULES AND DOUBLE STANDARDS].

<sup>366</sup> See IATP, U.S. DUMPING, *supra* note 258, at 17; OXFAM, RIGGED RULES AND DOUBLE STANDARDS, *supra* note 365, at 114-15, (presenting OXFAM's findings on dumping of major commodities in world markets using its Export Dumping Estimate indicator).

<sup>367</sup> See Carlson, *supra* note 209, at 1216-20.

<sup>368</sup> In order to ensure that agricultural trade liberalization in the industrialized world promotes food security at the household level, developing countries would have to strengthen small-scale agriculture and related industries. This would entail, *inter alia*, providing subsidized credit and crop insurance, promoting more equitable land tenure, and investing in roads, electrification, water supply, irrigation, and other economic infrastructure in rural areas. See generally, MICHAEL BAILEY, OXFAM GB, AGRICULTURAL TRADE AND THE LIVELIHOODS OF SMALL FARMERS

Likewise, improving market access in the industrialized world would enhance the trade-based entitlements of developing countries by increasing export revenues.<sup>369</sup> The elimination of U.S. and EU tariff barriers and the slashing of subsidies would increase the market share of developing country exporters.<sup>370</sup> Moreover, because industrialized country tariffs often escalate as commodities are processed, the phasing out of tariffs would foster the growth of labor-intensive, low-cost food processing industries, thereby providing the economic diversification necessary to cushion developing countries against commodity price fluctuations.<sup>371</sup>

Enhanced export opportunities, however, can be a two-edged sword. If not complemented by domestic strategies to strengthen small-scale agriculture and promote sustainable farming practices, export-oriented production may hinder sustainable rural development by increasing rural poverty and by degrading the environment. In the absence of major redistributive measures to increase the market participation of small farmers (such as land reform and the provision of subsidized inputs and credit), the prime beneficiaries of enhanced export opportunities are likely to be large commercial farmers and transnational corporations.<sup>372</sup> Indeed, export-oriented production, with its demand for more capital and less labor, is likely to increase rural poverty and inequality by creating incentives for the expansion of large commercial farms at the expense of small farmers and landless laborers.<sup>373</sup> Furthermore, it is important to keep in mind that transnational corporations rather than farmers engage in international trade.<sup>374</sup> Farmers generally sell their output

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(Mar. 2000), available at [http://www.oxfam.org.uk/what\\_we\\_do/issues/trade/downloads/agricultural\\_trade.rtf](http://www.oxfam.org.uk/what_we_do/issues/trade/downloads/agricultural_trade.rtf) (last visited Sept. 29, 2004). Furthermore, as discussed in Part B of this section, even if industrialized country subsidies are removed, transnational corporations may nevertheless use their market power and global reach to flood the developing countries with cheap food produced in other regions of the world. Local smallholders may be unable to compete. See MURPHY, *MANAGING THE INVISIBLE HAND*, *supra* note 82, at 39-40.

<sup>369</sup> See IFPRI, *supra* note 271, at 3 (quantifying the benefits to developing countries of agricultural trade liberalization in industrialized countries).

<sup>370</sup> See OXFAM, *RIGGED RULES AND DOUBLE STANDARDS*, *supra* note 365, at 112-13 (critiquing developed countries' agricultural tariffs and subsidies and discussing the impact of these measures on international trade in agricultural products).

<sup>371</sup> See *id.* at 102-03; Carlson, *supra* note 209, at 1216-17, 1220.

<sup>372</sup> See COOTE, *supra* note 61, at 195.

<sup>373</sup> See SOPHIA MURPHY, *FOOD SECURITY AND THE WTO* (2001), available at <http://www.cidse.org/pubs/tq1posfoodsecwto2001.htm> (last visited Sept. 29, 2002). According to the United Nations Conference on Trade and Development (UNCTAD), local exporting companies, trading companies, and distributors in the developing world have virtually vanished in recent years. They have been replaced by subsidiaries and agents of multinational trading enterprises. *United Nations Conference on Trade and Development, Report of the Secretary-General of the United Nations Conference on Trade and Development on World Commodity Trends and Prospects*, UNCTAD, 57th Sess. at 8, U.N. doc. A/57/381, 8 (Sept. 5, 2002) [hereinafter UNCTAD].

<sup>374</sup> See MURPHY, *MANAGING THE INVISIBLE HAND*, *supra* note 82, at 8-9, (emphasizing that transnational companies' exercise of unregulated market power is detrimental to the average farmers' marketing opportunities). In the agricultural sector, direct foreign investment by transnational corporations has been largely superseded by production contracts and other



to grain dealers and processors or contract with transnational corporations to produce specific crops.<sup>375</sup> Hence, the benefits of greater market access will accrue disproportionately to middlemen and foreign companies rather than developing country farmers.<sup>376</sup> Finally, renewed emphasis on export production is likely to reinforce large-scale industrial farming, thereby degrading the natural resource base necessary for sustainable agricultural production.<sup>377</sup>

*B. Formal Equality in an Unequal World: The Limits of Neoliberalism*

Notwithstanding the benefits to developing countries of greater liberalization in the industrialized world, the neoliberal economic model is inherently biased in favor of transnational agribusiness and fundamentally incompatible with food security and ecological sustainability. Leveling the playing field by applying the same rules to both developed and developing countries will not redress the power imbalances caused by decades of protectionism and centuries of colonialism. On the contrary, neoliberalism, even if applied in an even-handed manner, institutionalizes the economic dominance of transnational agribusiness and limits the ability of developing countries to utilize state intervention to safeguard the interests of the poor, protect the environment, and diversify and industrialize the economy.

1. Institutionalizing the Dominance of Transnational Agribusiness

The neoliberal model attributes distortions in world agricultural markets to government intervention and ignores the market power of transnational agribusiness.<sup>378</sup> This omission is unfortunate in light of the significant consolidation over the last twenty years among agrochemical companies (suppliers of fuel, fertilizer, seeds, and pesticides) and companies that purchase, process, and market agricultural commodities.<sup>379</sup> For example, five agrochemical companies control 65% of the international pesticide market.<sup>380</sup> Five grain trading enterprises control over 75% of the global cereal market.<sup>381</sup> Many of these companies are vertically integrated conglomerates with highly diversified operations.<sup>382</sup> The global reach of these corporations

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mechanisms as the preferred means of controlling the marketing chain and coordinating input suppliers, farmers, processors, and traders. UNCTAD, *supra* note 373, at 8.

<sup>375</sup> See MURPHY, MANAGING THE INVISIBLE HAND, *supra* note 82, at 8-9.

<sup>376</sup> *Id.*

<sup>377</sup> See MURPHY, FOOD SECURITY AND THE WTO, *supra* note 373, at *Issues for Developing Countries*.

<sup>378</sup> See MURPHY, MANAGING THE INVISIBLE HAND, *supra* note 82, at 19.

<sup>379</sup> See *id.* at 21-22.

<sup>380</sup> See Halweil, *supra* note 11, at 68 (tbl. 3-2).

<sup>381</sup> See *id.*

<sup>382</sup> See MURPHY, MANAGING THE INVISIBLE HAND, *supra* note 82, at 28-29. Cargill, for example, is the largest grain exporter in the United States. It operates in over 160 countries, and its multi-

gives them access to valuable market information unattainable to potential competitors, and their wealth and power make them politically and economically influential in both industrialized and developing countries.<sup>383</sup>

As a consequence of the consolidation of transnational agribusiness, farmers in developed and developing countries are increasingly dependent on a handful of transnational corporations for their agricultural inputs and for the marketing and distribution of their output.<sup>384</sup> Indeed, agricultural inputs, transportation, processing, and marketing services now account for 90% of every food dollar, while farming itself accounts for only 10%.<sup>385</sup> As biologist R.C. Lewontin points out, farmers are becoming increasingly proletarianized, as they are transformed from independent commodity producers to mere operatives in a production chain controlled on both ends (input and output) by transnational corporations.<sup>386</sup> The WTO TRIPS Agreement takes this process one step further by protecting corporate ownership of the one resource historically controlled by farmers—seeds.<sup>387</sup>

This domination of agricultural production by a handful of vertically integrated corporations places developing country farmers at an enormous competitive disadvantage and enables transnational agribusiness to drive down prices by purchasing from the lowest cost producer while concentrating value-added processing in the industrialized world.<sup>388</sup> For example, nine transnational corporations control over seventy percent of the world cocoa market.<sup>389</sup> These companies purchase their cocoa beans from millions of suppliers in the developing world (small farmers or local traders and exporters) who are driven into the market by their need for cash and who

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billion dollar operations encompass the salt, cotton, seed, fertilizer, steel, beef, and poultry business as well as worldwide transportation services. *Id.* at 23, 29.

<sup>383</sup> *See id.* at 23-24.

<sup>384</sup> *See id.* at 37.

<sup>385</sup> R.C. Lewontin, *The Maturing of Capitalist Agriculture: Farmer as Proletarian*, in HUNGRY FOR PROFIT, *supra* note 82, at 95.

<sup>386</sup> *Id.* at 97.

<sup>387</sup> *Id.* at 100.

<sup>388</sup> *See* OXFAM, RIGGED RULES AND DOUBLE STANDARDS, *supra* note 365, at 161-63; Philip McMichael, *Global Food Politics*, in HUNGRY FOR PROFIT, *supra* note 82, at 136; IRFAN UL HUQUE, COMMODITIES UNDER NEOLIBERALISM: THE CASE OF COCOA 24 (UNCTAD G-24 Discussion Paper Series, No. 25, Jan. 2004), available at [http://www.unctad.org/en/docs/gdsmdpbg2420041\\_en.pdf](http://www.unctad.org/en/docs/gdsmdpbg2420041_en.pdf) (last visited Nov. 9 2004). Market prices are also depressed by the entrance of new, low-cost producers (such as Indonesia, which expanded cocoa production by twenty percent per year beginning in the 1970s and is now the world's third largest cocoa producer) and by the availability of substitutes in the industrialized world for developing country exports (for example, the substitution of vegetable fats for cocoa butter in chocolate). Furthermore, biotechnology may accelerate the development of substitutes for developing country exports, potentially jeopardizing the livelihoods of millions of farmers. *See* OXFAM, RIGGED RULES AND DOUBLE STANDARDS, *supra* note 365, at 159-60.

<sup>389</sup> *See* OXFAM, RIGGED RULES AND DOUBLE STANDARDS *supra* note 365, at 162.

often lack market information and alternative livelihood options.<sup>390</sup> The power imbalance between a small group of corporate buyers and millions of fragmented suppliers is enormous.<sup>391</sup> Furthermore, because most commodities are exported in unprocessed form, transnational corporations profit handsomely from each stage of processing.<sup>392</sup> As commodity markets suffer the biggest slump in fifty years and wreak havoc on small farmers in the developing world, the price paid by consumers for the final product (such as coffee or chocolate) continues to rise.<sup>393</sup>

By focusing exclusively on market distortions caused by governmental interference, the neoliberal economic model fails to address the monopolization of agricultural production by transnational corporations that undermines the livelihoods of small farmers in the developing world. Farmers are essentially price-takers, caught in the vise of input prices set by a handful of agrochemical companies and output prices determined by a handful of transnational trading and marketing enterprises. Even if agricultural subsidies and import barriers are lifted, developing-country farmers cannot compete effectively with the monopoly power exercised by transnational agribusiness. Furthermore, the neoliberal model precludes developing countries from utilizing the protectionist measures used for decades by the industrialized world to build its corporate behemoths. Structural adjustment and the WTO Agreement on Agriculture, for example, severely constrain developing countries use of subsidies to support agro-export or food processing industries as well as the use of import barriers to protect domestic farmers from foreign competition. By ignoring the market distortions caused by the monopolization of agricultural trade and by depriving developing countries of important tools to mitigate this problem, the neoliberal model institutionalizes the economic dominance of transnational agribusiness at the expense of the poor in the developing world.

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<sup>390</sup> *Id.* at 162-63.

<sup>391</sup> *Id.*

<sup>392</sup> For example, developing countries supply 90% of the world's cocoa beans, but they constitute less than half of cocoa bean production, one third of cocoa powder, and only 4% of chocolate. Cocoa bean exports from developing countries generate annual revenues of \$2 billion, whereas chocolate sales produce in excess of \$60 billion. *Id.* at 161.

<sup>393</sup> *Id.* The monopolistic practices of transnational agribusiness have kept consumer prices high in many sectors despite plummeting commodity prices. For example, between 1975 and 1993, world coffee prices fell by 18% while consumer prices in the United States rose by 240%. Declining commodity prices increased the profit margins of transnational agribusiness rather than being passed on to consumers. See Jean Ziegler, *The Right to Food*, U.N. ESCOR, HUM. RTS. COMM., ¶ 21, at 9, U.N. Doc. E/CN.4/2002/10 (2004), available at [http://www.unhcr.ch/Huridoca/Huridoca.nsf/e06a5300f90fa0238025668700518ca4/34441bf9efe3a9e3c1256e6300510e24/\\$FILE/G0410777.pdf](http://www.unhcr.ch/Huridoca/Huridoca.nsf/e06a5300f90fa0238025668700518ca4/34441bf9efe3a9e3c1256e6300510e24/$FILE/G0410777.pdf) (last visited Sept. 29, 2004). Moreover, the concentration of coffee processing in the industrialized world had the effect of transferring resources from coffee producing countries to coffee consuming countries. Between 1989-1990 and 1994-1995, producers retained only thirteen percent of the total income generated in the coffee production chain. Stefano Ponte, *The "Latte Revolution?" Winners and Losers in the Restructuring of the Global Coffee Marketing Chain*, 14, 14-15 (June 2001), available at [http://www.cdr.dk/working\\_papers/wp-01-3.pdf](http://www.cdr.dk/working_papers/wp-01-3.pdf) (last visited Nov. 9, 2004).

## 2. Institutionalizing Economic Specialization

The neoliberal economic model prevents developing countries from remedying the structural inequities in the global trading system that produce food insecurity. One of the major structural inequities is the dependence of many developing countries on agricultural export revenues to finance the importation of food and manufactured products. This economic specialization diverts prime crop land from food production and subjects developing country export revenues to market instability and to the deteriorating terms of trade for agricultural commodities relative to manufactured goods. The most vulnerable countries are those that rely on a handful of primary agricultural commodities to supply the bulk of export earnings. Diversification and industrialization are critical to the promotion of food security.

The neoliberal economic model perpetuates food insecurity in the developing world by depriving developing countries of the very instruments used by developed countries to diversify and industrialize their economies. Contrary to the free market prescriptions of the IMF, the World Bank, and the WTO, virtually all industrialized countries (including the United States, France, Germany, Japan, and the United Kingdom) actively relied on tariffs, subsidies, and other interventionist measures to industrialize.<sup>394</sup> Many of these countries directly financed and subsidized large-scale and/or risky ventures such as railroads and steel manufacturing.<sup>395</sup> Many also sponsored the acquisition of intellectual property through industrial espionage.<sup>396</sup> Most recently, the so-called NICs (Newly Industrializing Countries)—South Korea, Taiwan, and Singapore—successfully industrialized their economies through a combination of tariffs, subsidies, and regulation of foreign investment, including the imposition of technology transfer requirements and local content requirements.<sup>397</sup>

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<sup>394</sup> HA-JOON CHANG, KICKING AWAY THE LADDER: DEVELOPMENT STRATEGY IN HISTORICAL PERSPECTIVE 19-51, 59-66 (2002); Chang, *The Market, the State and Institutions in Economic Development*, *supra* note 68, at 43. Other interventionist measures include the use of capital and currency controls during the post-World War II reconstruction of Western Europe. Most Western European countries did not achieve currency convertibility until late 1958. Many did not fully eliminate capital controls until the 1990s. These measures enabled Western European countries to achieve a high level of economic development without facing potentially ruinous capital flight or speculative runs on their currency. Nevertheless, at the behest of the very countries that benefited from the use of capital controls, the IMF currently imposes free capital mobility on developing countries as a condition for badly needed financial assistance. See Timothy A. Canova, *Banking and Financial Reform at the Crossroads of the Neoliberal Contagion*, 14 AM. U. INT'L L. REV. 1571, 1612-14, 1639 (1999). Nobel laureate Joseph Stiglitz has described capital market liberalization as the "single most important factor" leading to the global financial crisis that began in East Asia in 1997. See STIGLITZ, *supra* note 256, at 98-104.

<sup>395</sup> See Chang, *The Market, the State and Institutions in Economic Development*, *supra* note 68, at 43.

<sup>396</sup> HA-JOON CHANG, GLOBALIZATION, ECONOMIC DEVELOPMENT AND THE ROLE OF THE STATE 276-77 (2003) [hereinafter CHANG, GLOBALIZATION].

<sup>397</sup> *Id.* at 258-59; Chang, *The East Asian Development Experience*, *supra* note 68, at 111-12, 115.

Having benefited from subsidies, import barriers, and technological theft, industrialized countries now invoke “free trade” to preclude developing countries from utilizing interventionist tools to develop, diversify, and industrialize their economies. Structural adjustment, for example, has thwarted economic diversification and industrialization in many developing countries by reinforcing their “comparative advantage” in raw material and primary product exports.<sup>398</sup> The WTO Agreement on Agriculture hamstrings the ability of developing countries to use tariffs and subsidies to nurture infant agro-export industries. The WTO TRIPS Agreement limits the ability of developing countries to build their technological capacity through imitation and adaptation.<sup>399</sup> It also subjects developing countries to monopoly pricing (in seeds and pharmaceuticals, for example) and potentially onerous royalty payments.<sup>400</sup> The WTO Agreement on Trade-Related Investment Measures (TRIMS) and the 1994 GATT limit the ability of developing countries to impose local content requirements on foreign investors in order to foster dynamic linkages with other sectors of the domestic economy.<sup>401</sup> While a full discussion of this issue is beyond the scope of this article, these examples highlight the ways in which the neoliberal economic model, even if applied prospectively in an even-handed manner, prevents developing countries from replicating the strategies used by industrialized countries to diversify and industrialize their economies. In so doing, the neoliberal economic model institutionalizes the economic specialization that produces poverty and food insecurity in the developing world.<sup>402</sup>

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<sup>398</sup> See Stein, *supra* note 68, at 156 (criticizing the policy prescriptions of the IMF and the World Bank that have limited industrialization in Africa by emphasizing raw material and primary product exports).

<sup>399</sup> See CHANG, GLOBALIZATION, *supra* note 396, at 298.

<sup>400</sup> See *id.* at 297.

<sup>401</sup> See Agreement on Trade-Related Investment Measures, April 15, 1994, WTO Agreement, Annex 1A, art. 2.2 & Illustrative Annex, available at [http://www.wto.org/english/docs\\_e/legal\\_e/18-trims\\_e.htm](http://www.wto.org/english/docs_e/legal_e/18-trims_e.htm) (last visited Nov. 9, 2004) (prohibiting investment measures that require the purchase or use of domestic products known as local content requirements) [hereinafter TRIMS]. The TRIMS Agreement provision is somewhat redundant since it appears to codify GATT jurisprudence concluding that local content requirements violate GATT art. III, § 4. See Kevin C. Kennedy, *A WTO Agreement on Investment: A Solution in Search of a Problem?*, 24 U. PA. J. INT'L ECON. L. 77, 135-39 (2003); see also Paul Civello, *The TRIMS Agreement: A Failed Attempt at Investment Liberalization*, 8 MINN. J. GLOBAL TRADE 97, 113-14 (1999).

<sup>402</sup> As economist Eric Reinert succinctly observes:

The current fashion is to blame the poverty caused by globalization on the lack of openness on the part of industrialized countries towards agricultural imports from the Third World; in other words, the problems are seen as being created by a lack of openness to free trade. In our opinion, the historical record proves these assertions to be wrong. No nation has ever taken the step from being poor to being wealthy by exporting raw material in the absence of a domestic manufacturing sector.

Eric S. Reinert, *Increasing Poverty in a Globalized World: Marshall Plans and Morgenthau Plans as Mechanisms of Polarization of World Incomes*, in RETHINKING DEVELOPMENT ECONOMICS, *supra* note 68, at 470.

### 3. Institutionalizing Industrial Agriculture

Neoliberalism threatens to reinforce industrial agriculture in the developing world and to erode the biological diversity necessary for ecosystem health. Trade liberalization in the United States and the EU is expected to result in increased crop specialization in developing countries in accordance with the dictates of agricultural markets.<sup>403</sup> Crop specialization will erode crop diversity and result in the loss of a wide range of indigenous plants and animals traditionally used for food.<sup>404</sup> The cultivation of export monocultures will result in increased use of pesticides, fertilizers, and irrigation water and will accelerate deforestation and loss of valuable forest species.<sup>405</sup> Increased emphasis on export production will exacerbate food insecurity by undermining local food production and encouraging reliance on imported food.<sup>406</sup> Finally, export production is likely to benefit large commercial farmers at the expense of smallholders, thereby increasing poverty and producing economic dislocation and conflict in many parts of the developing world.<sup>407</sup>

Neoliberalism's subordination of environmental protection to the imperatives of commerce is likely to override any effort by developing countries to ban or restrict the importation of genetically modified organisms. The commercial cultivation of genetically modified crops will exacerbate the socioeconomic and environmental ills of industrial agriculture (such as monocultures, overuse of pesticides and fertilizers, and increasing economic polarization in rural areas) while introducing new risks (such as genetic contamination).

In short, neoliberalism will undermine ecological sustainability in the developing world by eroding agrobiodiversity and encouraging dependence on non-renewable inputs that harm human health and degrade the environment. Neoliberalism will also promote food insecurity by exacerbating poverty and inequality and by depressing domestic food production.

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<sup>403</sup> See ANDREW K. DRAGUN, *Trade Liberalisation, Agriculture and Sustainability*, in SUSTAINABLE AGRICULTURE AND ENVIRONMENT: GLOBALISATION AND THE IMPACT OF TRADE LIBERALISATION 17 (Andrew K. Dragun & Clem Tisdell eds., 1999).

<sup>404</sup> *Id.* at 17-18.

<sup>405</sup> See Kym Anderson, *Effects on the Environment and Welfare of Liberalizing World Trade: The Cases of Coal and Food*, in THE GREENING OF WORLD TRADE ISSUES 152-54 (Kym Anderson & Richard Blackhurst eds., 1992). For example, the explosion of export agriculture in Brazil over the past decade has been accompanied by a surge in the importation of pesticides and fertilizers and by the acceleration of Amazon deforestation due to the expansion of farm lands and grazing lands. Larry Rohter, *South America Seeks to Fill the World's Table*, N.Y. TIMES, Dec. 12, 2004, at A1, A22.

<sup>406</sup> See EINARSSON, *supra* note 47, at 23.

<sup>407</sup> See DRAGUN, *supra* note 403, at 17-18.

## VI. CONCLUSION

This article has argued that the colonial and post-colonial division of labor between “core” and “periphery” introduced patterns of economic specialization in the developing world that promote food insecurity, degrade the environment, and produce rural poverty and inequality. Economic specialization in the cultivation of cash crops diverts land from food production, subjects developing country export earnings to the fluctuating and declining terms of trade for agricultural commodities, and deprives developing countries of the steady and reliable export earnings necessary to finance industrialization and to import the food not produced domestically. Economic specialization in the cultivation of monocultures is also contrary to the biological diversity necessary to promote ecosystem health. In the aftermath of World War II, various development assistance programs (including Public Law No. 480 and the Green Revolution) exacerbated hunger and environmental degradation in the developing world by increasing rural poverty and promoting ecologically harmful monocultural farming techniques. As a consequence of these programs, biodiverse agroecosystems and self-reliant farming practices were replaced with industrial monocultures dependent on uniform seed varieties, chemical fertilizers, synthetic pesticides, and expensive machinery manufactured by transnational corporations headquartered in the industrialized world.

The neoliberal economic reforms of the last two decades reinforced cash crop production at the expense of food production, frustrated economic diversification and industrialization, exacerbated rural poverty, and institutionalized the double standard that permits protectionism in the industrialized world while requiring market openness in the developing world. As explained in Part V, leveling the playing field by eliminating the trade-distorting subsidies and protectionist import barriers of the United States and the EU is necessary but not sufficient to address the problem of hunger and environmental degradation in the developing world. First, trade liberalization in the industrialized world will not address the distortions and inequities caused by the monopolization of agricultural markets by a small number of transnational corporations. Second, trade liberalization, even if applied in an even-handed manner, will reinforce the specialization of many developing countries in agricultural export production by precluding these countries from using the protectionist tools utilized by the United States, Western Europe, Japan, and the NICs of East Asia to industrialize and diversify their economies. Third, the elimination of U.S. and EU subsidies is anticipated to increase crop specialization in the developing world, thereby undermining the biological diversity necessary for healthy agroecosystems.

Cuba is the only country in the western hemisphere that has rejected the neoliberal model and has embarked on a nation-wide experiment in sustainable agriculture. Cuba was able to adopt an autonomous development path only after the collapse of the socialist trading bloc and the tightening of the U.S. embargo. Indeed, Cuba's unique experiment is a product of economic

and political isolation. Once the U.S. economic embargo is lifted, Cuba will be under intense pressure to abandon its autonomous development path and adopt neoliberal reforms. The consequences are likely to be devastating.

There is very little that one country can do to resist the imposition of neoliberal economic reforms. The most promising solution is for Cuba to work collectively with other developing countries in the Doha round of WTO negotiations to transform the rules of the global trade regime. Rather than proposing a detailed blueprint for these negotiations, the remainder of this article highlights several key reforms designed to promote sustainable rural development.

First, trade concerns must be subordinated to food security and ecological sustainability. The right to food is enshrined as a basic human right in the Universal Declaration of Human Rights<sup>408</sup> and in the Covenant on Economic, Social, and Cultural Rights.<sup>409</sup> The Convention on Biological Diversity recognizes the intrinsic value of biological diversity, its critical role in maintaining the life-sustaining systems of the biosphere, and its “importance for meeting food, health, and other needs” of human beings.<sup>410</sup> The global trade rules must be reformed in order to serve as means to these ends rather than functioning as ends in themselves. In particular, the TRIPS Agreement must be reconciled with the Convention on Biological Diversity, and the SPS Agreement must be harmonized with the Cartagena Protocol on Biosafety to the Convention on Biological Diversity. More fundamentally, the WTO Agreement on Agriculture cannot be reconciled with food security or ecological sustainability as long as its single-minded objective is the elimination of trade barriers in order to promote agro-export production.

Second, it is important to recognize that the United States, Western Europe, Japan, and the NICs of East Asia industrialized their economies through tariffs, subsidies, unauthorized appropriation of intellectual property, and regulation of foreign investment. Developing countries must be permitted to diversify and industrialize their economies by utilizing a variety of protectionist policy tools that are currently prohibited by trade agreements and by the conditions attached to assistance from the IMF and the World Bank.

Third, a major step in reforming the international trade regime is to eliminate the double standards that systematically benefit transnational agribusiness at the expense of smallholders in the developing world. The WTO rules must phase out the subsidies and import barriers of the industrialized world. However, formal equality must not be conflated with substantive equality. The historic subordination of developing countries

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<sup>408</sup> *Universal Declaration of Human Rights*, G.A. Res. 217, U.N. GAOR, §III, art. 25 (1948).

<sup>409</sup> *International Covenant on Economic, Social and Cultural Rights*, Dec. 16, 1966, art. 11, 993 U.N.T.S. 3.

<sup>410</sup> *Convention of Biological Diversity*, pmbl., reprinted in 31 I.L.M. 818 (1992).



through trade and investment requires compensatory measures to permit developing countries to promote food security, protect the environment, and diversify and industrialize their economies. Developing countries must be given the flexibility to utilize a wide array of protectionist instruments (including tariffs and subsidies) to nurture infant industries, to promote food security, to protect the environment, and to preserve the livelihoods of small farmers. Developing countries must also be permitted to adopt intellectual property rules suitable to their technological needs and capacities. Finally, developing countries must be given wide latitude to regulate foreign investment through local content rules and other requirements in order to forge dynamic links between foreign investment and the local economy.

Fourth, the global trade regime needs to address the distortions in global agricultural markets produced by transnational corporations. International trade is conducted by corporations, not by farmers or countries. In order to ensure that the global trade regime benefits farmers, consumers, and developing countries, it is imperative to reform the corporate practices that lead to monopolistic abuse.

Transforming the rules that govern global trade will require sustained cooperation and coordination among highly heterogeneous developing countries with conflicting interests and priorities in the face of intense opposition from the United States and the EU. The immense practical difficulty of holding together such a coalition cannot be underestimated. Nevertheless, developing countries asserted their collective power for the first time in September 2003 by walking out of the Fifth Ministerial meeting of the WTO in Cancun, Mexico, to protest the intransigence of the United States and the EU on agricultural subsidies.<sup>411</sup> The WTO negotiations did not resume until the United States and the EU broke the deadlock by agreeing to modest agricultural subsidy reductions.<sup>412</sup> Developing countries have also

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<sup>411</sup> Becker, *Poorer Countries Pull Out*, *supra* note 364, at A1. Opposition to the WTO negotiations had been building in developing countries since the 2001 WTO Ministerial meeting in Doha, Qatar, where developing countries were pressured into adopting a Ministerial Declaration that they had no role in drafting. Only two weeks before the Ministerial meeting in Cancun, Mexico, developed countries hastily sidestepped one of the most contentious WTO issues by agreeing to ease access to cheap generic drugs to poor nations in order to address public health emergencies. With the drug issue off the table, the conflict over agricultural subsidies took center stage. Tensions escalated when the United States and the EU made reductions in agricultural subsidies contingent on developing country concessions in the areas of investment, government procurement, competition policy, and trade facilitation. The Ministerial meeting collapsed as outraged developing countries refused to negotiate these new issues without first resolving the impasse over agricultural subsidies. See BALLVÉ, *supra* note 364, at 16-19.

<sup>412</sup> The United States agreed to reduce agricultural subsidies by twenty percent. The EU announced that it would eliminate export subsidies. In exchange for these concessions, developing countries were asked to reduce tariffs on manufactured goods. While some observers hailed the deal as "the beginning of the end of subsidies," others speculated that the United States and the EU might avail themselves of ambiguities in the agreement to evade their subsidy reduction obligations. See Elizabeth Becker, *Trade Group to Cut Farm Subsidies for Rich Nations*, N.Y. TIMES, Aug. 1, 2004, at 8; Elizabeth Becker, *U.S. Will Cut Farm Subsidies in Trade Deal*, N.Y. TIMES, July 31, 2004, at B1.

been pressing for an exception to the WTO rules for protectionist measures designed to promote food security.<sup>413</sup> Such an exception would provide developing countries with much needed policy flexibility in the area of food security. However, it is important to recognize that a carve-out for food security is a far cry from a re-conceptualization of the WTO Agreement on Agriculture's single-minded promotion of export production.

Finally, modifying the WTO rules to provide developing countries with greater flexibility to promote food security, protect the environment, and diversify their economies does not guarantee that national elites will in fact adopt measures that serve the common good rather than their own narrow self-interest. It is therefore imperative to vindicate the right to food and the emerging right to a healthy environment in both domestic and international tribunals. Human rights law remains an indispensable tool to protect the basic right of all human beings to sufficient, safe, and nutritious food and to advance the procedural and substantive rights essential to the achievement of ecological sustainability.

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<sup>413</sup> These food security and rural development exceptions to the WTO rules have been referred to collectively as the "Development Box" proposal. See SOPHIA MURPHY, IISD, INTRODUCTION TO THE DEVELOPMENT BOX: FINDING SPACE FOR DEVELOPMENT CONCERNS IN THE WTO'S AGRICULTURE NEGOTIATIONS 1, 19 (2003), available at <http://www.iisd.org/publications/publication.asp?pno=533> (last visited Jan. 12, 2005) (describing the origins and elements of the Development Box).