

AGRO-BIODIVERSITY AND FOOD SECURITY:
BIOTECHNOLOGY AND TRADITIONAL
AGRICULTURAL PRACTICES AT THE PERIPHERY
OF INTERNATIONAL INTELLECTUAL PROPERTY
REGIME COMPLEX

*Chidi Oguamanam**

2007 MICH. ST. L. REV. 215

TABLE OF CONTENTS

INTRODUCTION.....	215
I. AGRO-BIODIVERSITY, AGRO-BIOTECHNOLOGY, AND TAPS: OF CONFLICTED EPISTEMOLOGIES AND NARRATIVES OF AGRICULTURE, NATURE, AND THE ENVIRONMENT	220
II. FOOD SECURITY: EXPLORING THE CONCEPT.....	230
III. POLITICAL ECONOMICS OF AGRICULTURE AND FOOD SECURITY	234
IV. INTELLECTUAL PROPERTY RIGHTS AND FOOD SECURITY.....	243
CONCLUSION	254

INTRODUCTION

Following the first decade of the World Trade Organization's (WTO) Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement,¹ scholars and policymakers on the international intellectual property system (IIPS) have been in a stock-taking mode.² From their scrutiny of TRIPS'

* LL.M., Ph.D. (British Columbia), Assistant Professor, Dalhousie Law School, Halifax, Nova Scotia, Canada. Email: Chidi@Dal.Ca. This Article is based on my paper presentation at the Third Annual Michigan State University College of Law Intellectual Property and Communication Law Conference. I thank Professor Peter K. Yu for inviting me to speak at the conference and other seminar participants, especially Professor Doris Estelle Long, who provided valuable feedback that enriched this Article. Thanks also to Mike Paris for great research assistance. Dedication: To John Ekezie Oguamanam, my son, who was born in the summer of 2006 as I was working on an early draft of this Article.

1. Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, Legal Instruments – Results of the Uruguay Round, 33 I.L.M. 1197 (1994) [hereinafter TRIPS Agreement].

2. See, e.g., Laurence R. Helfer, *Regime Shifting: The TRIPs Agreement and New Dynamics of International Intellectual Property Lawmaking*, 29 YALE J. INT'L L. 1 (2004);

impact on the IIPS arises a consensus. Drawing from regime theory,³ analysts seem to agree that the TRIPS Agreement provides a catalyst for counter-regime dynamics in the IIPS.⁴ In the last few years, the regime dis-

see also Marney L. Cheek, *The Limits of Informal Regulatory Cooperation in International Affairs: A Review of the Global Intellectual Property Regime*, 33 GEO. WASH. INT'L L. REV. 277 (2001); Ruth L. Okediji, *The International Relations of Intellectual Property: Narratives of Developing Country Participation in the Global Intellectual Property System*, 7 SING. J. INT'L & COMP. L. 315 (2003) [hereinafter Okediji, *International Relations*]; Ruth L. Okediji, *Back to Bilateralism? Pendulum Swings in International Intellectual Property Protection*, 1 U. OTTAWA L. & TECH. J. 125 (2003-04) [hereinafter Okediji, *Back to Bilateralism*]; Peter K. Yu, *Currents and Crosscurrents in the International Intellectual Property Regime*, 38 LOY. L.A. L. REV. 323 (2004).

3. *See* Helfer, *supra* note 2, at 5 n.17 (noting that the concept of regime transcends singular agreements or processes of an intergovernmental organization but “refers to principles, norms, and rules governing a particular issue area of international relations, and to the formal institutional structures and decision-making procedures through which those principles, norms, and rules are developed”). Essentially, the regime analysis is premised strictly on the regime theory in international relations as a synonym of institutionalism and in reference to “implicit or explicit principles, norms, rules, and decision-making procedures around which actors’ expectations converge in a given area of international relations.” Okediji, *International Relations*, *supra* note 2, at 368 (quoting David Krasner, *Structural Causes and Regime Consequences: Regimes as Intervening Variables*, 36 INT’L ORG. 185, 186 (1982)). Consequently, it does not extend to the phenomenon of intra-regime dynamics within the conventional intellectual property framework itself, as evident in the propositions for *sui generis* protection models in specific areas, such as plant breeders’ rights, which is now an entrenched alternative to conventional intellectual property regimes like patents. *See* Charles Lawson, *Patents and Plant Breeder’s Rights over Plant Genetic Resources for Food and Agriculture*, 32 FED. L. REV. 107 (2004); *see also* Dan Leskien & Michael Flitner, *Intellectual Property Rights and Plant Genetic Resources: Options for a Sui Generis System*, in ISSUES IN GENETIC RESOURCES, at 1, 29-30 (Int’l Plant Genetic Res. Inst., Issues in Genetic Resources No. 6, 1997). Even though the post-TRIPS regime discourse emphasizes the inter-regime regulatory institutional dynamics in the IIPS, intra-regime issues are often implicated in the regime discourse. The two dynamics are inherently related. For example, TRIPS’ neglect of indigenous or traditional knowledge forms is a site of pressure or counter-regime interest in the IIPS for a *sui generis* regime that would accommodate such knowledge forms. This contempt for non-Western knowledge forms exposes the philosophical and ideological weakness of the conventional intellectual property system, which is consolidated for global application via the TRIPS Agreement. Therefore, arguments for the modification of the patent regime or for a new (*sui generis*) rights regime to accommodate local knowledge forms (*see, e.g.*, Ikechi Mgbefi, *Patents and Traditional Knowledge of the Uses of Plants: Is a Communal Patent Regime Part of the Solution to the Scourge of Bio Piracy?*, 9 IND. J. GLOBAL LEGAL STUD. 163 (2001); Peter Drahos, *Indigenous Knowledge, Intellectual Property and Biopiracy: Is a Global Bio-Collecting Society the Answer?*, 22 EUR. INTELL. PROP. REV. 245 (2000)) derive mainly from the deficiency of conventional intellectual property in relation to traditional knowledge. While acknowledging the relationship between the inter-regime and intra-regime dynamics in IIPS, this Article is concerned with the former.

4. *See supra* note 2; *see also* Bradford S. Simon, *Intellectual Property and Traditional Knowledge: A Psychological Approach to Conflicting Claims of Creativity in International Law*, 20 BERKELEY TECH. L.J. 1613 (2005). The regime phenomena are expressed in various terms and perspectives, including “regime shifting,” “counter regime,” and the more fluid concept of “regime complex.” Beyond intellectual property’s relationships with and

course, in a nutshell, explores the ramifications of rapid escalation of intellectual property issues in a number of different international regime arenas and their consequences mostly for developing countries, especially vulnerable indigenous and local communities.⁵

In addition to its interest in exploring intellectual property's relationship with diverse international regimes, the regime debate also examines TRIPS' impact on fostering intra-regime dynamics within the two principal international intellectual property regimes, namely the World Intellectual Property Organization (WIPO) (including its historical transformations) and the TRIPS frameworks.⁶ The regime narrative, in part, underscores how TRIPS escalated inequities, not only in terms of access to benefits of intellectual property, but also in the marginalization of alternative knowledge forms and the appropriation of resources of the developing world's peoples.⁷ Ironically, the disaffection and equity gaps created by the TRIPS Agreement have provided the platform for marginalized stakeholders (mainly indigenous peoples, local communities in developing and developed countries, and their sympathizers around the globe) to challenge not only TRIPS' legitimacy but also to amass counter-regime pressures on the IIPS.⁸ Accord-

complicity in diverse international regimes, "regime complex" addresses intellectual property's role in the multifarious relationships between science, technology, and society. See Peter K. Yu, Opening Address at the Third Annual Michigan State University College of Law Intellectual Property and Communications Law Conference: The International Intellectual Property Regime Complex (Apr. 7, 2006).

5. Before the TRIPS Agreement, intellectual property-related issues in those arenas were perceived as less obvious and of no urgent concern or, at best, fairly mediated by the World Intellectual Property Organization (WIPO) framework. However, Peter Yu argues that the post-TRIPS international intellectual property dynamics is not radically different from the trends in historical evolution of international intellectual property regime. See Yu, *supra* note 2, at 328. According to Professor Yu, it is a trend that "provides opportunities and crises for both developed and less developed countries, as well as for rights holders and individual end users." *Id.* See also Okediji, *Back to Bilateralism*, *supra* note 2; Ruth L. Okediji, *The Institutions of Intellectual Property: New Trends in an Old Debate*, 98 AM. SOC'Y INT'L L. PROC. 219 (2004).

6. See, e.g., Cheek, *supra* note 2; Graeme B. Dinwoodie, *The International Intellectual Property Law System: New Actors, New Institutions, New Sources*, 98 AM. SOC'Y INT'L L. PROC. 213 (2004).

7. See Keith E. Maskus & Jerome H. Reichman, *The Globalization of Private Knowledge Goods and the Privatization of Global Public Goods*, 7 J. INT'L ECON. L. 279 (2004); see also Johanna Gibson, *Intellectual Property Systems, Traditional Knowledge, and the Legal Authority of Community*, 26 EUR. INTELL. PROP. REV. 280 (2004); Chidi Oguamanam, *Localizing Intellectual Property in the Globalization Epoch: The Integration of Indigenous Knowledge*, 11 IND. J. GLOBAL LEGAL STUD. 135 (2004).

8. See Helfer, *supra* note 2; Simon, *supra* note 4; see also Rosemary J. Coombe, *The Recognition of Indigenous Peoples' and Community Traditional Knowledge in International Law*, 14 ST. THOMAS L. REV. 275 (2001). Professor Okediji urges caution on developing countries' use of popular narratives, specifically in the domains of human rights, culture, and welfare-enhancing aspects of intellectual property rights, to challenge or weaken extant

ing to Professor Helfer, since the Doha Declaration⁹ such pressures take the form of “broad-based efforts to revise, reinterpret, or supplement intellectual property protection standards adopted in the WTO and in WIPO.”¹⁰

The principal international regimes and sites of counter-regime movements are those that target post-TRIPS intellectual property-related issues in a number of intersections, including health (especially access to drugs), human rights, culture, indigenous knowledge, and biodiversity.¹¹ There is no doubt that these interrelated regimes are important and merit the prominence they enjoy as frameworks for understanding the contemporary intellectual property regime tension. However, the subjects of agricultural biodiversity (hereinafter “agro-biodiversity”) and food security provide equally important sites for the regime debate. Regrettably, they have either been subsumed into the established frameworks of the regime analysis or have been relegated to the periphery.¹² As a result, their urgency is conspicuously undermined in the entire regime discourse.

This Article focuses on the subjects of agro-biodiversity and food security within the framework of dual epistemic paradigms of agricultural biotechnology (hereinafter “agro-biotechnology”) and traditional agricultural practices (TAPs).¹³ It explores the complicity of the neoliberal¹⁴ eco-

regimes of international intellectual property. See Okediji, *International Relations*, *supra* note 2. Professor Okediji warns that such narratives “may . . . constrain developing countries by implicitly strengthening the presumption of legitimacy that is so powerfully associated with strong intellectual property rights in the developed countries.” *Id.* at 318.

9. World Trade Organization, Declaration on the TRIPS Agreement and Public Health, WT/MIN(01)/DEC/2, 41 I.L.M. 755 (2002).

10. Helfer, *supra* note 2, at 5.

11. This list is not exhaustive. For example, Professor Okediji frames it along the three narratives or countervailing norms of human rights, culture, and welfare-enhancing or core doctrinal features of intellectual property, which are hardly mutually exclusive. See Okediji, *International Relations*, *supra* note 2, at 317-18. However, the list captures key international regimes that are subjects of scholarly and policy interests in the context of the intellectual property regime debate.

12. See generally, for example, literature on the regime discourse, *supra* note 2.

13. Loosely stated, TAPs refer to the diversity and dynamism of agricultural methods and systems deployed by indigenous and local farming communities to fulfill their needs in relation to the cultural, spiritual, epistemological, physical, social, economic, biological, and even political exigencies of their interaction with the agro-ecosystem of which they are part. See Harold Brookfield & Christine Padoch, *Appreciating Agrodiversity: A Look at the Dynamism and Diversity of Indigenous Farming Practices*, ENV'T, June 1994, at 6 (providing a perspective on diversity and dynamism of indigenous or traditional farming practices).

14. Neoliberalism is used here in reference to Western free market ideals, their supporting institutional superstructures, and their general ideological orientation, which is based on the supremacy of self-regulating free market and liberal democratic ideals as the most efficient mediators of social, political, and economic results. See generally KARL POLANYI, *THE GREAT TRANSFORMATION: THE POLITICAL AND ECONOMIC ORIGINS OF OUR TIME* (2d ed. 2001) (1944). See also Brian Tokar, *Introduction: Resisting Biotechnology and*

conomic program in undermining agro-biodiversity, TAPs, and consequently, food security in indigenous and local communities, while highlighting the role of intellectual property in the process. Unlike in other established sites of counter-regime trends in the international intellectual property arena, agro-biodiversity, TAPs, and food security are located on the sidelines of the ongoing scrutiny of the IIPS.¹⁵ This is due to the complex and nuanced nature of intellectual property relationships in the broader neoliberal political and economic forces that are central to agro-biodiversity and food security.

Despite the embedded nature of the complicity of intellectual property rights in the agro-biodiversity crisis and food insecurity in developing countries, intellectual property is vital to the complex political economics of agriculture, which contribute to the escalation of food insecurity, especially in the Third World. The marginal treatment of agro-biodiversity and food insecurity under the post-TRIPS intellectual property regime analyses is a consequence of the interplay of several complex factors underlying the political economics of agriculture. Because of their importance in socio-economic, ecological, and cultural lives and self-determination of indigenous and local communities in developing and developed countries, critically appraised, agro-biodiversity and food security are both deserving of prominent attention like other sites of the post-TRIPS intellectual property regime treatise. In making that case, this Article situates agro-biodiversity and food security within the political economics of agriculture to highlight the complex dynamics that account for their virtual absence in the regime discourse and to underscore the weakness or constraints of the narrow framework of the regime debate.

Global Injustice, in GENE TRADERS: BIOTECHNOLOGY, WORLD TRADE, AND THE GLOBALIZATION OF HUNGER 1 (Brian Tokar ed., 2004) [hereinafter Tokar, *Introduction*].

15. Without doubt, intellectual property rights are critical to the issue of innovation and access in the context of plant genetic resources for food in particular and in the economics of agriculture in general. *See generally* Lawson, *supra* note 3; ORGANISATION FOR ECON. CO-OPERATION & DEV., GENETIC INVENTIONS, INTELLECTUAL PROPERTY RIGHTS AND LICENSING PRACTICES: EVIDENCE AND POLICIES (2002), <http://www.oecd.org/dataoecd/42/21/2491084.pdf>. However, in regard to post-TRIPS intellectual property regime analyses, the connection between intellectual property, agro-biodiversity, and food security takes on a complicated patchwork of a more sophisticated kind that is mainly outside the scope of the dominant literature on the intellectual property regime complex.

I. AGRO-BIODIVERSITY, AGRO-BIOTECHNOLOGY, AND TAPS: OF
CONFLICTED EPISTEMOLOGIES AND NARRATIVES OF AGRICULTURE,
NATURE, AND THE ENVIRONMENT

Agro-biodiversity, a relatively new concept,¹⁶ is a subset of more embracing biodiversity that focuses on biological diversity in the context of agriculture. As will become clearer in the following pages, biodiversity's entrenchment in the intellectual property regime discourse, mainly due to the work of the Convention on Biological Diversity (CBD),¹⁷ is responsible for subsuming the issue of agro-biodiversity and, to a large degree, food security. Despite an erroneous tendency to associate agro-biodiversity with variability of commercially-grown crops,¹⁸ the essence of the concept is in reference to the diverse ways "farmers use the natural diversity of the environment for production, including not only their choice of crops but also their management of land, water, and biota as a whole."¹⁹ According to the Food and Agricultural Organization (FAO), agro-biodiversity "encompasses the variety and variability of animals, plants and micro-organisms which are necessary to sustain *key functions* of the agro-ecosystem, its *structure* and *processes* for, and in support of, food production and *food security*."²⁰ Agro-biodiversity refers to human environmental, ecological, land use, and other resource management practices conducive to sustainable exploitation of the diverse agricultural potentials of our ecosystem.²¹ Inherent in the notion of agro-biodiversity is the sustenance of diversity of an agro-ecosystem and the promotion of food security.

16. See Michael Stocking et al., *Agricultural Biodiversity in East Africa: Introduction and Acknowledgements*, in *AGRICULTURAL BIODIVERSITY IN SMALLHOLDER FARMS OF EAST AFRICA* 3, 4 (Fidelis Kaihura & Michael Stocking eds., 2003) (indicating agro-biodiversity is "a topic that has only within the last decade come to the fore as an issue worthy of special attention, study, and research").

17. See Convention on Biological Diversity, June 5, 1992, 1760 U.N.T.S. 79, available at <http://www.biodiv.org/doc/legal/cbd-en.pdf> [hereinafter CBD].

18. Until not long ago, the popular and controversial free-content Internet encyclopedia Wikipedia makes the following opening entry: "[A]gricultural biodiversity is a subset of general biodiversity involving commercially grown crops." See generally *Agricultural Biodiversity*, http://en.wikipedia.org/wiki/Agricultural_biodiversity.

19. Brookfield & Padoch, *supra* note 13, at 9. See also Stocking et al., *supra* note 16, at 6 (noting that "'agrodiversity' is the broadest of the terms used to capture biological diversity and the diversity of management and organization at a variety of temporal and spatial scales").

20. WINO AARNINK ET AL., FOOD & AGRIC. ORG. OF THE U.N., *Executive Summary to SUSTAINING AGRICULTURAL BIODIVERSITY AND AGRO-ECOSYSTEM FUNCTIONS*, at iii, v (1999), <http://www.biodiv.org/doc/case-studies/agr/cs-agr-1998-12-rpt.pdf> (emphasis added).

21. See generally Stocking et al., *supra* note 16.

The notion of agro-biodiversity implicates the often-contested relationship between agriculture and the environment.²² Attempts to understand this relationship require unmasking the deep ideological and philosophical approaches to the environment and different conceptions of the role of humankind in the competing narratives of the environment and nature. This is so because, as humanity's primordial occupation, agriculture (including aspects of hunting and gathering-related activities) is a fundamental site for human agency. That agency is roundly associated with our contemporary environmental crisis.²³ Besides, agriculture is essentially an environmental enterprise. In general, because of the intrinsic relationship between agriculture and the environment, environmental and agricultural philosophies correlate. Based on their underlying ecological orientations, the environmental impacts of the Western industrial approach to agriculture and indigenous peoples' TAPs are hardly the same. Consequently, the same is true of their respective effects on agro-biodiversity. Accounts of adverse environmental ramifications of agriculture often conflate the two distinct epistemological approaches to agriculture, namely the Western scientific and industrial models and TAPs.²⁴ The latter are frequently subsumed in the dominant narrative's focus on the former.

As a result of historical transitions, today's agricultural practices in the industrialized world have departed from their humble folk origins.²⁵ In the last two hundred years, mechanization, scientific plant breeding, hybridization, and chemicalization, in terms of the use of pesticides, herbicides, and fertilizers,²⁶ have become the key features of agricultural practices in the industrialized world. "The discovery of recombinant DNA in the early

22. See, e.g., STRUCTURAL ADJUSTMENT, THE ENVIRONMENT, AND SUSTAINABLE DEVELOPMENT 25-45 (David Reed ed., 1996) (implicating agriculture in the broader tension between environmental sustainability and economic development) [hereinafter Reed]; Gerald Torres, *Theoretical Problems with the Environmental Regulation of Agriculture*, 8 VA. J. NAT. RESOURCES L. 191 (1989). See generally SHELDON KRIMSKY & ROGER P. WRUBEL, *AGRICULTURAL BIOTECHNOLOGY AND THE ENVIRONMENT: SCIENCE, POLICY, AND SOCIAL ISSUES* (1996) (exploring in part the environmental impacts of agro-biotechnology).

23. See generally Peter H. Raven, *Our Diminishing Tropical Forests*, in BIODIVERSITY 119 (E.O. Wilson ed., 1988); Peter H. Raven & Jeffrey A. McNeely, *Biological Extinction: Its Scope and Meaning for Us*, in PROTECTION OF GLOBAL DIVERSITY: CONVERGING STRATEGIES 13 (Lakshman D. Guruswamy & Jeffrey A. McNeely eds., 1998).

24. See, e.g., Torres, *supra* note 22; see also John D. Copeland, *The Criminalization of Environmental Law: Implications for Agriculture*, 48 OKLA. L. REV. 237 (1995).

25. Modern or formal science is not the pre-historic epistemic base of the West's so-called scientific knowledge of the natural world which originated in the eighteenth to nineteenth centuries' consolidation of pre-existing European folk knowledge. Roy Ellen & Holly Harris, *Introduction to INDIGENOUS ENVIRONMENTAL KNOWLEDGE AND ITS TRANSFORMATIONS: CRITICAL ANTHROPOLOGICAL PERSPECTIVES* 1, 6-11 (Roy Ellen et al. eds., 2000).

26. KRIMSKY & WRUBEL, *supra* note 22, at 9.

1970s rapidly opened new frontiers” in the agricultural revolution.²⁷ Essentially, they involve applications of molecular genetics or biological processes in agriculture through the selection of natural strains (gene splicing) associated with desirable traits and other molecular and scientific devices for the manipulation of plant and animal life forms.²⁸ This scientific phenomenon paved the way for genetic engineering, marking the birth of agricultural biotechnology, a subset of biotechnology steeped in diverse techniques for manipulating genetic materials of living organisms and for exploring and exploiting the complex chemistry of biological systems for food production and other agro-industrial ends.²⁹ The advent of agricultural biotechnology (as an offshoot of biotechnology) shifts agriculture from land-based farming and opens it up to transdisciplinary convergences in therapeutics, pharmaceuticals, chemicals, and marketing in complex industrial and political economics of globalization.³⁰ According to Krinsky and Wrubel, “[a]griculture, once a model of life, has become a mode of production.”³¹

Promoters of agricultural biotechnology insist their processes and products are “based on nature’s own methods.”³² Opponents believe that a system essentially thriving on “gene splicing” or deliberate and artificial incorporation of traits across or within life forms to create non-naturally occurring strangers to the ecosystem is far from being nature’s own methods.³³ Without diverting discussion to the contested ideology of “nature”³⁴ implicated in this snappy sketch, the point is that agricultural biotechnology underscores an ideology of nature, environmental, and ecological ethic that guarantees mankind’s sovereignty over other life forms. In this classical Western Judeo-Christian environmental outlook, humanity is cast in a conflicted relationship with the rest of life’s forces and the environment from which it was alienated and to which it seeks re-entry under assumed license

27. *Id.* See also MARK J. FECENKO, BIOTECHNOLOGY LAW: CORPORATE-COMMERCIAL PRACTICE 6 (2002).

28. Tokar, *Introduction*, *supra* note 14, at 8.

29. See FECENKO, *supra* note 27, at 6-7; see also ALAN T. BULL ET AL., ORGANISATION FOR ECON. CO-OPERATION & DEV., BIOTECHNOLOGY: INTERNATIONAL TRENDS AND PERSPECTIVES 21 (1982), <http://www.oecd.org/dataoecd/34/9/2097562.pdf>.

30. See KRIMSKY & WRUBEL, *supra* note 22, at 227 (observing that there is increasing blurriness in the primordial boundary between agriculture and industry, especially in relation to drug and chemical manufacture); see also ORGANISATION FOR ECON. CO-OPERATION & DEV., BIOTECHNOLOGY AND THE CHANGING ROLE OF GOVERNMENT 12 (1988); Tokar, *Introduction*, *supra* note 14, at 8.

31. See KRIMSKY & WRUBEL, *supra* note 22, at 213.

32. See, e.g., *id.* at 9 (referring to a statement credited to the Monsanto Corporation).

33. *Id.* at 217; see also Tokar, *Introduction*, *supra* note 14, at 8-9 (discussing the unnaturally harmful effects of genetic engineering).

34. For perspectives on the struggle to appropriate the “natural symbol” in agriculture, see KRIMSKY & WRUBEL, *supra* note 22, at 216-17.

to subdue, conquer, and replenish according to its need.³⁵ In its extreme, albeit discredited or misrepresented narrative,³⁶ this theory of the environment and humanity's role provides the fundamental justification for mechanization, scientific plant breeding, hybridization, chemicalization, and other forms of industrial approaches to agriculture that currently climax in the phenomenon of agro-biotechnology.

Agro-biotechnology, as an industrial model, provides unprecedented opportunity and tools for human-entered choice of agricultural crops and livestock. However, this happens within a quite limited range of agricultural and resource management practices that emphasize a quick-fix for ecological challenges through outright elimination of unwanted biota, such as pests and weeds, or engineering of desirable microorganisms or other complex creatures, and instigation of chemical intervention options. Collectively, these processes have incomprehensible implications for our ecosystem. Despite claims of agro-biotechnology's environmental advantages,³⁷ such promises are at best contested or at least do not stand up to any conclusive scientific or empirical scrutiny.³⁸

Thus far, choices regarding agro-biotechnology are driven mainly by political economics of agriculture and market consideration, with little or no regard to environmental accountability.³⁹ For example, fruits and food crops are being genetically engineered to retard the ripening or fermentation process for longer shelf life, and potatoes are genetically engineered to grow to specific sizing to satisfy such mundane considerations as the marketing

35. See Genesis 1:28-30; see also KRIMSKY & WRUBEL, *supra* note 22, at 221.

36. See IKECHI MGBEOJI, GLOBAL BIOPIRACY: PATENTS, PLANTS, AND INDIGENOUS KNOWLEDGE 60 (2006) (arguing that orthodox accounts of "[h]uman domination of nature unbalanced by a sense of duty, trust, and/or stewardship [without corresponding responsibility] is increasingly losing favour and legitimacy in juridical and norm-creating circles").

37. KRIMSKY & WRUBEL, *supra* note 22, at 225. For example, agro-biotechnology makes possible the growing of more food on less land. *Id.* This is an economic efficiency model that frees up land for other uses. *Id.* However, the correlation between lesser diversity in agricultural land and agro-biodiversity in relation to uncultivated fields is not conclusive. *See id.*

38. *See id.* at 5, 216-17; see also Tokar, *Introduction*, *supra* note 14, at 8-9.

39. See generally Brian D. Wright & Philip G. Pardey, *The Evolving Rights to Intellectual Property Protection in the Agricultural Biosciences*, 2 INT'L J. TECH. & GLOBALISATION 12 (2006). Compare, however, Brian Tokar, *The World Bank: Biotechnology and the 'Next Green Revolution'*, in GENE TRADERS: BIOTECHNOLOGY, WORLD TRADE, AND THE GLOBALIZATION OF HUNGER 51-66 (Brian Tokar ed., 2004) [hereinafter Tokar, *The World Bank*], which discusses the World Bank's biotechnology agenda for developing countries and dismisses its ostensible incorporation of environmental component, specifically the biosafety standards of the Cartagena Protocol on Biosafety. Tokar describes the initiative as an attempt to "greenwash" biotechnology for transnational agribusiness interests in order to make way for its acceptance in the developing countries, which results in undermining the integrity of indigenous agricultural practices. *See id.* at 63-66.

needs of fast food chains.⁴⁰ Similarly, cash crops are engineered for shortened life cycle for quicker harvests and return on investment. There are now animal growth hormones, microbially produced, and diverse transgenic animals engineered for target markets and distinct commercial appeals.⁴¹ This list is inexhaustible.⁴²

When considerations other than ecological sustainability become the dominant drivers of agro-biotechnology choices, one of the first casualties is agro-biodiversity. The commercial appeal of agro-biotechnology accounts for its concentration on a few commercially viable agricultural crops and livestock.⁴³ The profit motive also explains the stunted interest of agro-biotechnology promoters in crops and livestock that have no income potential. It is hardly surprising that, despite the huge private sector investment in agro-biotechnology, there is little evidence of a positive improvement on diversity of agricultural crops or agro-biodiversity in general.⁴⁴ There is a clear lack of interest at policy and scientific levels regarding how (if at all) agro-biotechnology can support “*key functions* of the agroecosystem” in their holistic (as opposed to narrow and artificial selective) ramifications for the promotion of food security.

The relationship between agro-biotechnology and agro-biodiversity is conflated in the tendency to equate the one with the other’s role in promoting artificial diversity in commercially grown crops. There is a red herring in associating agro-biotechnology with agro-biodiversity by pointing at “areas of commercial farming and forestry, where [industrial] monocrops and single varieties prevail and single-species stands of trees line up in rows.”⁴⁵ On the contrary, agro-biodiversity involves diverse environmental and resource management practices that promote the carrying capacity of agro-

40. Ironically, after initial patronage of GE food, especially potatoes, in 2000 major U.S. fast food chains decided to turn their back on GE potatoes despite the latter’s market attractions for the fast food industry. See News Release, AG BIOTECH INFONET, Decision by Fast Food Giants to Reject Genetically Engineered Potatoes Sends Strong Message to Farmers, (Apr. 28, 2000) http://www.biotech-info.net/decisions_fastfood.html (last visited May 21, 2007).

41. See KRIMSKY & WRUBEL, *supra* note 22, at 166-211 (discussing animal growth hormones and transgenic animals); see also *infra* note 134.

42. See KRIMSKY & WRUBEL, *supra* note 22, at 214.

43. Soybean, cotton, maize, and canola are major targets of crop biotechnology market and agro-biotechnology activities. See Wright & Pardey, *supra* note 39, at 22; see also VANDANA SHIVA, MONOCULTURES OF THE MIND: PERSPECTIVES ON BIODIVERSITY AND BIOTECHNOLOGY 114 (1993); KRIMSKY & WRUBEL, *supra* note 22, at 239-40.

44. See Wright & Pardey, *supra* note 39, at 22; see also, e.g., CBD, Montreal, Can., Nov. 10-14, 2003, *Report of the Ad Hoc Technical Expert Group Meeting on the Potential Impacts of Genetic Use Restriction Technologies on Smallholder Farmers, Indigenous and Local Communities and Farmers’ Rights*, Annex 1, ¶¶ 7 & 21, UNEP/CBD/SBSTTA/9/INF/6-UNEP/CBD/WG8J/3/INF/2 (Sept. 29, 2003) [hereinafter CBD, *Report of the Ad Hoc Technical Expert Group*].

45. Stocking et al., *supra* note 16, at 5.

ecosystem in a wide range of climatic and habitat conditions, as well as agricultural practices prevailing in centers of biodiversity as mediated by nature's supervised selection process.⁴⁶ The ideological, political, and market economics of agro-biotechnology, which collectively emphasizes its industrial and commercial potential, offers little consideration for agro-biodiversity. A deeper understanding of agro-biodiversity must incorporate plural epistemic approaches to agriculture, including the Western scientific model and TAPs, as well as diverse human natural resource management practices in endemic and variegated ecological settings. Such an understanding must not discount the practice of agriculture as a model of life and a diversity-driven and diversity-sustaining enterprise. Unfortunately, with the advent of agro-biotechnology, this perception of agriculture, which represents perhaps the best approach to food security, is quickly being relegated to mythical status.⁴⁷

Despite the claim by its promoters that agro-biotechnology is a viable alternative to chemicalized agriculture,⁴⁸ the use of chemical inducers to activate desired traits is a feature of agro-biotechnology that dampens the hope of a respite from chemicalized agriculture. Contrary to its promoters' claims, agro-biotechnology is implicated in the increased use of agro-chemicals.⁴⁹ For both proprietary and marketing purposes, crops are engineered to be inherently pest-resistant exclusively for compatible brand name agro-chemicals of seed company stakeholders in an increasingly convergent and oligopolistic corporate arena.⁵⁰ The negative effects of chemicalized agriculture on agro-biodiversity are monumentally affirmed in the failed Green Revolution.⁵¹

46. See Annie Patricia Kameri-Mbote & Philippe Cullet, *Agro-Biodiversity and International Law—A Conceptual Framework*, 11 J. ENVTL. L. 257, 259 (1999).

47. See KRIMSKY & WRUBEL, *supra* note 22, at 213.

48. See *id.* at 28; see also Tokar, *Introduction*, *supra* note 14, at 8 (noting that concerns over chemicalized agriculture led agribusiness executives “to see their possible salvation in the brand new technology of gene splicing, or ‘recombinant DNA’”).

49. See KRIMSKY & WRUBEL, *supra* note 22, at 214; Convention on Biological Diversity, Meeting Documents, <http://www.biodiv.org/doc/meeting.asp?wg=TEGURT-01.html> (last visited May 21, 2007) (posting documents from the ad hoc technical expert group meeting, held in Montreal, Canada in 2003) [hereinafter CBD, Meeting Minutes]; see also Pamela Weintraub, *The Coming of the High-Tech Harvest*, AUDUBON, July-Aug. 1992, at 92, 103.

50. Monsanto Round-Up ready canola, which was at the center of the celebrated Canadian case of *Monsanto Canada Inc. v. Schmeiser*, [2004] 1 S.C.R. 902, is a good example. For a critical review of this case, see Philippe Cullet, *Monsanto v. Schmeiser: A Landmark Decision Concerning Farmer Liability and Transgenic Contamination*, 17 J. ENVTL. L. 83 (2005); see also Peter Straub, *Farmers in the IP Wrench—How Patents on Gene-Modified Crops Violate the Right to Food in Developing Countries*, 29 HASTINGS INT’L & COMP. L. REV. 187, 191 (2006); Wright & Pardey, *supra* note 39, at 22.

51. See, e.g., GORDON CONWAY, *THE DOUBLY GREEN REVOLUTION: FOOD FOR ALL IN THE TWENTY-FIRST CENTURY* (1997); FRANK ELLIS, *AGRICULTURAL POLICIES IN DEVELOPING COUNTRIES* (1992); E.M. YOUNG, *WORLD HUNGER* (1997); see also Carmen G.

The unresolved issue of the environmental impact of agro-biotechnology products in general, including their impact on agro-biodiversity in particular, is an irrefutable and intrinsic aspect of agro-biotechnology risk burden. There is a virtual consensus that “[g]enetic engineering is a new technology whose creations are being released into the environment, where the interactions among organisms and between the biotic and the abiotic world are not fully understood.”⁵² In sum, a Western environmental ideology that underlies modern agro-biotechnology is suspect in regard to fostering agro-biodiversity. Therefore, a narrative of the relationship between the environment and agriculture that focuses on Western industrial agriculture, as opposed to TAPs, does not present a complete picture. For balance, perspectives on TAPs as an alternative epistemic approach to agriculture⁵³ become helpful. In part, this will assist to unmask the ideological undercurrents behind our conflicted ideology or narrative of nature and its influence on agricultural philosophy and implications for food security.

In many indigenous and non-Western societies, humanity’s relationship with nature and life’s forces is theoretically neither conflicted nor alienated. A cardinal ideology of this relationship emphasizes the state of obligated dependence of all life’s forces on one another in an organic and holistic order.⁵⁴ Humankind is cast in a humbler role as an integral part and valuable member of the ecosystem. The sanctity of ecological order and the

Gonzalez, *Trade Liberalization, Food Security, and the Environment: The Neoliberal Threat to Sustainable Rural Development*, 14 *TRANSNAT’L. L. & CONTEMP. PROBS.* 419, 440-50 (2004); Devinder Sharma, *The Great Trade Robbery: World Hunger and the Myths of Industrial Agriculture*, in *GENE TRADERS: BIOTECHNOLOGY, WORLD TRADE, AND THE GLOBALIZATION OF HUNGER* 91 (Brian Tokar ed., 2004). See generally David Pimentel et al., *Environmental and Economic Costs of Pesticide Use*, 42 *BIOSCIENCE* 750 (1992); Ian Scoones, *Agricultural Biotechnology and Food Security: Exploring the Debate* 4 (Inst. of Dev. Studies, Working Paper No. 145, 2002), <http://www.ids.ac.uk/ids/bookshop/wp/wp145.pdf>.

52. KRIMSKY & WRUBEL, *supra* note 22, at 246. See also *id.* at 224-25 (noting the concern that genetically engineered plants “could run amok in the environment and overtake other plant species, particularly those already on the endangered list”). Even though the introduction of new hybridized and classically bred crops, as well as non-indigenous micro-organisms, is generally perceived to have a safe history, the idea of phenotypic combinations is a novel phenomenon (facilitated by genetic engineering) that calls for extra caution. *Id.* at 249.

53. Krimsky and Wrubel hint at what they call alternative or sustainable agriculture as a reference to “a class of techniques that depart from intensive chemical use, animal feedlots, high energy, and high capitalization at the expense of soil sustainability and the overall health of the agro-ecosystem.” *Id.* at 245.

54. See PAUL M. WOOD, *BIODIVERSITY AND DEMOCRACY: RETHINKING SOCIETY AND NATURE* 35-36 (2000); see also James Youngblood Henderson, *Ayukpachi: Empowering Aboriginal Thought*, in *RECLAIMING INDIGENOUS VOICE AND VISION* 248, 259 (Marie Battiste ed., 2000). See generally MARIE BATTISTE & JAMES (SA’KE’I) YOUNGBLOOD HENDERSON, *PROTECTING INDIGENOUS KNOWLEDGE AND HERITAGE: A GLOBAL CHALLENGE* (2000).

interrelationship of life's forces do not permit the claim of absolute sovereignty of one life form over others. Thus, ideally, human environmental agency through agricultural activities happens in a conceptual natural order akin to the biotic balance exemplified in nature's food chain process.

Without doubt, the environmental score sheet of indigenous and local communities is hardly beyond reproach.⁵⁵ However, it is far more tolerable in comparison to industrial or so-called scientific agriculture, which is rationalized by the theory of economic efficiency.⁵⁶ Moreover, historically, indigenous and local communities at the centers of global biodiversity have been hapless and unwilling participants in industrial or foreign modes of natural resources or agricultural exploitation through the colonially imposed international division of labor.⁵⁷ In their intricate linkages, colonialism, market economy, and the neoliberal economic framework, including the extant phenomenon of globalization, account for interminable pressures on third-world indigenous and local communities, upsetting and redefining their agricultural values, practices, and underlying environmental or ecological ideologies.⁵⁸ Despite some slices of romanticism around the classical narratives of indigenous or non-Western peoples' nature and environmental ethic, the significant point is that indigenous epistemic worldviews of the environment and, by extension, their agricultural practices, contrast with the industrial agro-scientific model epitomized by modern agro-biotechnology.

In contrast to agro-biotechnology—a symbol and highpoint of the contemporary agro-scientific revolution which seeks a techno-shortcut or quick-fix to mediate natural ecological challenges for agriculture—TAPs are based on diverse epistemic modules in which agricultural activities are intrinsically linked to a region's endemic genetic resources and ecological offerings in terms of climate, soil texture, and even cultural and belief systems. For convenience, non-Western knowledge forms are contrasted to the monolithic Western science. However, indigenous or non-Western knowl-

55. For example, over-harvesting of natural resources in fishing and hunting activities and other non-sustainable agricultural practices, such as bush burning, are examples of environmentally unfriendly activities of indigenous and local communities. These practices are not, however, limited to indigenous and local communities. In fact, they could happen at a larger scale in the industrial agricultural setting. See OGUAMANAM, *infra* note 86, at 55; see also JEFFREY A. MCNEELY ET AL., *CONSERVING THE WORLD'S BIOLOGICAL DIVERSITY* 38-9 (1990).

56. See George Martin & Saskia Vermeylen, *Intellectual Property, Indigenous Knowledge, and Biodiversity*, *CAPITALISM NATURE SOCIALISM*, Sept. 2005, at 27, 35 (referring to a Lockean preference for the European market economic system and industrial approach to agriculture as the most efficient and productive, over the aboriginal hunting and gathering that operates outside "the system of money and markets").

57. See, e.g., Gonzalez, *supra* note 51, at 433-38.

58. See generally GENE TRADERS: BIOTECHNOLOGY, WORLD TRADE, AND THE GLOBALIZATION OF HUNGER (Brian Tokar ed., 2004); Gonzalez, *supra* note 51.

edge are umbrella epistemic categories encompassing diversities in knowledge systems under generally shared worldviews. In TAPs, there is a coalescing of diversity at multiple fronts, including peoples, cultures, ecologies, genetic resources (biodiversity), human agricultural and environmental management practices, and their underlying complex epistemologies. Not surprisingly, the heartlands of human and cultural diversities are also global mega-biodiversity hotspots.⁵⁹ The diversities prevalent in indigenous and local communities are keys to sustaining the vital *functions* of our agro-ecosystems for food production and *food security* that is the essence of agro-biodiversity.

As their *modus operandi*, TAPs are based on careful reliance on responses to ecological patterns and on painstaking selections from randomly occurring mutations in nature.⁶⁰ Through this process, including its continued refinements and variations under local contextual variables and dynamism of local knowledge, TAPs generate a countless number of landraces or traditional farmer-developed crop varieties and diverse species of livestock, which constitute the genetic resource pool for agro-biotechnology activities.⁶¹ In empirical terms, traditional farmers' fields are akin to laboratories for natural genetic revolutions⁶² of a magnitude that modern agro-biotechnology may not match in our lifetime. The positive association of TAPs with agro-biodiversity, in contrast to agro-biotechnology, is unassailable. Ideally, TAPs do not carry the excess baggage and risk burden of agro-chemicals, nor do they face the environmental dilemma of creating and releasing non-naturally occurring or modified organisms to the environment. Consequently, TAPs do not generally pose as much threat to agro-biodiversity as agro-biotechnology.

TAPs encapsulate an ideology of human agricultural agency that is less radical in upsetting and tinkering with the sanctity of ecological order and other life forces with whom humankind share a near equal partnership in the environmental project in accordance with many indigenous world

59. See BATTISTE & HENDERSON, *supra* note 54, at 41; see also Andrew Gray, *The Impact of Biodiversity Conservation on Indigenous Peoples*, in BIODIVERSITY: SOCIAL AND ECOLOGICAL PERSPECTIVES 59 (Vandana Shiva et al. eds., 1991); Curtis M. Horton, *Protecting Biodiversity and Cultural Diversity Under Intellectual Property Law: Toward a New International System*, 10 J. ENVTL. L. & LITIG. 1 (1995).

60. C.S. Srinivasan & Colin Thirtle, *Impact of Terminator Technologies in Developing Countries: A Framework for Economic Analysis*, in ECONOMIC AND SOCIAL ISSUES IN AGRICULTURAL BIOTECHNOLOGY 159, 161 (R.E. Evenson et al. eds., 2002); Chidi Oguanam, *Genetic Use Restriction (or Terminator) Technologies (GURTS) in Agricultural Biotechnology: The Limits of Technological Alternatives to Intellectual Property*, 4 CAN. J.L. & TECH. 59, 60 (2005).

61. See CBD, *Report of the Ad Hoc Technical Expert Group*, *supra* note 44.

62. See THE CRUCIBLE GROUP, PEOPLE, PLANTS, AND PATENTS: THE IMPACT OF INTELLECTUAL PROPERTY ON BIODIVERSITY, CONSERVATION, TRADE, AND RURAL SOCIETY xviii (1994).

views. As aspects of the non-Western epistemic framework, TAPs reflect a conception of agriculture and natural environment that constitutes sites of epistemological conflict between the indigenous knowledge systems and Western scientific method⁶³ which, in the agricultural context, is symbolized today by agro-biotechnology. This epistemological schism also has its roots partly in the colonizer–colonized relationship of the West and its other.⁶⁴ Despite its contested exclusion from “science,” the *other*, or non-Western knowledge, is theoretically represented as alternative epistemic narrative. In the context of agriculture, it depicts “[a]n alternative vision of the farm is that of an organic and dynamic ecosystem that cannot function under the type of mechanistic control found in industrial manufacture. In [this alternative vision of] the agricultural system humans must still understand their role as one among other species living in balance.”⁶⁵ They must eschew the tendency to eradicate so-called unwanted intruders, such as pests or weeds, which constitute part of a farm’s landscape, or to even selectively introduce desirable but non-naturally occurring strangers to the ecosystem. Farmers’ orientation must shift from artificial tinkering with living organisms or downright eradication of other living stakeholders in the biosphere to management as a means of ensuring a more ecocentric approach to agriculture.⁶⁶

Unlike in the agro-biotechnology context, the choice of farm crops or livestock, including other agricultural management options, is for the most part naturally determined by endemic genetic resources and prevailing ecological conditions.⁶⁷ There is a limited role for the global political economics of agriculture and market consideration in influencing those choices. For this and other reasons, including the self-subsistence nature of TAPs, the spiritual and cultural significance of some crops or livestock, as well as the general communal nature of farming in indigenous and local communities, the latter are able to grow diverse agricultural products that have little, if any, association with commercial viability.⁶⁸ In this way, TAPs are important sources for sustenance of agro-biodiversity.

TAPs represent a vital component of broader indigenous knowledge. In indigenous or non-Western world-views, agriculture is inherently a cultural enterprise involving deep communal, spiritual, and economic ex-

63. For perspectives on this, see Ellen & Harris, *supra* note 25, LORE: CAPTURING TRADITIONAL ENVIRONMENTAL KNOWLEDGE (Martha Johnson ed., 1992), and SCIENCE IN CONTEXT: READINGS IN THE SOCIOLOGY OF SCIENCE (Barry Barnes & David Edge eds., 1982).

64. See Peter Fitzpatrick & Eve Darian-Smith, *Laws of the Postcolonial: An Insistent Introduction*, in LAWS OF THE POSTCOLONIAL 1 (Eve Darian-Smith & Peter Fitzpatrick eds., 1999).

65. KRIMSKY & WRUBEL, *supra* note 22, at 221.

66. *Id.* at 221-22.

67. See generally Stocking et al., *supra* note 16; see also Brookfield & Padoch, *supra* note 13; KRIMSKY & WRUBEL, *supra* note 22.

68. See *id.*

changes.⁶⁹ It is an avenue for the expression and understanding of the primacy of ecological order and the interconnectedness or holistic relationships of life forces and humanity's place in the natural order. Even though the farm as a way of life is fast becoming a myth in the West, it is still a reality in many non-Western cultures, despite external pressures. Given its larger significance for the indigenous epistemic outlook, TAPs and associated knowledge are crucial aspects of indigenous identity, self-determination, and human dignity. Those attributes are vital for food security.

II. FOOD SECURITY: EXPLORING THE CONCEPT

In addition to its underlying epistemic framework and ecological ideology, agro-biotechnology's enigmatic relationship with food security is complicated by other factors within the rubric of political economics of agriculture. These include the colonial division of labor, the neoliberal market economic framework, the IIPS, and extant globalization.⁷⁰ A short sketch of the role of some of these factors and their relationship to food security is reserved to the next section. This Part explores the concept of food security.

Perhaps because of its relative novelty, interdisciplinary appeal, and issues of conceptual vagueness, there has yet to be an authoritative legal articulation of food security. However, dedicated researchers on food security and development studies within the broader social sciences and humanities provide an amazing number of helpful insights. There are over two hundred documented definitions of food security, with each definition emphasizing variegated factors and indices.⁷¹ According to the FAO, food security is a concept in continuing evolution as an operational model in public policy's attempts to grasp the complexities of a wide range of technical and policy issues implicated in the phenomenon.⁷² Nonetheless, the FAO volunteers that food security is attained "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."⁷³

69. See HARRIET V. KUHNLEIN & NANCY J. TURNER, *TRADITIONAL PLANT FOODS OF CANADIAN INDIGENOUS PEOPLES: NUTRITION, BOTANY AND USE* 4, 6 (1991); see also Aziz Choudry, *Biotechnology, Intellectual Property Rights, and the WTO*, in *GENE TRADERS: BIOTECHNOLOGY, WORLD TRADE, AND THE GLOBALIZATION OF HUNGER* 35, 39 (Brian Tokar ed., 2004); Chidi Oguamanam, *Intellectual Property Rights in Plant Genetic Resources: Farmers' Rights and Food Security of Indigenous and Local Communities*, 11 *DRAKE J. AGRIC. L.* 273 (2006).

70. See Oguamanam, *infra* note 86, at 55; see generally Gonzalez, *supra* note 51.

71. Scoones, *supra* note 51, at 3.

72. See U.N. FOOD & AGRIC. ORG., *TRADE REFORMS AND FOOD SECURITY: CONCEPTUALIZING THE LINKAGES* 25-26 (2003).

73. World Food Summit, Nov. 13-17, 1996, *Rome Declaration on World Food Security: World Food Summit Plan of Action*, ¶ 1, WFS 96/REP, available at

Similarly, the Centre for Studies in Food Security at Ryerson University states that the idea of food security is “a condition in which all peoples at all times can acquire safe, nutritionally adequate, and personally acceptable foods that are accessible in a manner that maintains human dignity.”⁷⁴ The University of KwaZulu-Natal complements the multiple conceptions of food security to include “a state of assuring physical availability and economic accessibility to enough food (in an environmentally and socially sustainable manner) in terms of quantity, quality and cultural acceptability for all people at all times for a healthy and active life.”⁷⁵

From its synthesis of food security, the Centre for Studies in Food Security at Ryerson University corroborates other food security and development scholarships in identifying the following five components of the concept:

Availability: sufficient food for all people at all times;

Accessibility: physical and economic access to food for all at all times;

Adequacy: access to food that is nutritious and safe, and produced in environmentally sustainable ways.

Acceptability: access to culturally acceptable food, which is produced and obtained in ways that do not compromise people’s dignity, self-respect or human rights.

Agency: the policies and processes that enable the achievement of food security.⁷⁶

The dichotomy between food security and food production,⁷⁷ as well as the complicity of political, economic, and legal factors in undermining

http://www.fao.org/documents/show_cdr.asp?url_file=/docrep/003/w3613e/w3613e00.htm
(last visited May 21, 2007).

74. Canadian Dietetic Assoc., *Hunger and Food Security in Canada: Official Position of the Canadian Dietetic Association*, 11 AGRIC. & HUM. VALUES 97, 97-98 (1994); see also Centre for Studies in Food Security at Ryerson University, *Food Security Defined*, <http://www.ryerson.ca/foodsecurity/centreFSDefined.html> (last visited May 21, 2007).

75. Food Security Programme at University of KwaZulu-Natal, *Our Definition of Food Security*, <http://www.ukzn.ac.za/foodsecurity/definition.htm> (last visited May 21, 2007). See also CHRISTOPHER STEVENS ET AL., *THE WTO AGREEMENT ON AGRICULTURE AND FOOD SECURITY 2* (2000) (identifying a sufficient amount of food for a healthy life, access to this food, and the guarantee of access to this food as the three elements necessary for food security).

76. Centre for Studies in Food Security at Ryerson University, *Food Security Defined*, *supra* note 74; see also Straub, *supra* note 50, at 188-89 (elaborating further on food security components, in the human rights context, specifically in reference to the right to food); STEVENS ET AL., *supra* note 75.

77. For the proposition on the discrepancy between increased food production and food security, see Ellen Messer, *Food Systems and Dietary Perspective: Are Genetically Modified Organisms the Best Way to Ensure Nutritionally Adequate Food?*, 9 IND. J. GLOBAL LEGAL STUD. 65 (2001). See also AMARTYA SEN, *POVERTY AND FAMINES: AN ESSAY ON ENTITLEMENT AND DEPRIVATION* 7 (1982); Devinder Sharma, *Biotechnology Will Bypass the Hungry*, in *VOICES FROM THE SOUTH: THE THIRD WORLD DEBUNKS CORPORATE MYTHS ON GENETICALLY ENGINEERED CROPS* 21-23 (Ellen Hickey & Anuradha Mittal eds., 2003), <http://www.foodfirst.org/pubs/other/voices/voicesfull.pdf>; Sharma, *supra* note 51.

food security, has received eminent treatment in the work of Nobel Laureate in Economics, Amartya Sen.⁷⁸

Sen associates economic and political determinants of the global food distribution framework with overall food insecurity. He articulates an entitlement-based approach to the concept of food security, which refers to the capacity to control access to food within the framework of intricate “chain of entitlement relations [that] ‘legitimizes’ one set of ownership by reference to another”⁷⁹ by using “those means of commanding food that are legitimized by the legal system in operation in that society.”⁸⁰ As in the domestic household setting, under the entitlement-based model, food security at the national level is a function of any combination of the following three considerations: “(i) production-based entitlements (domestic food production capacity), (ii) trade-based entitlements (ability to earn foreign exchange in order to import food), and (iii) transfer-based entitlements (ability to obtain food as aid).”⁸¹ While the last factor is outside this Article’s scope,⁸² the first two are of interest.

Sen’s entitlement-based approach to food security reinforces the five components or “5As” of food security outlined above. It also affirms an evolving orthodox conception of food security in development studies.⁸³ The ability of a state or its peoples to have firm control of their food production is their best guarantee in regard to availability and accessibility of adequate and culturally acceptable food, procurable in a culturally-sensitive and ecologically-conducive setting. Such a setting not only assures the preservation of human dignity of the peoples, but also minimizes the role of external agents or agencies, such as transnational seed and agro-chemical corporations or other neoliberal international economic institutions that promote indigenous and local community’s dependence on outside forces.

78. See SEN, *supra* note 77.

79. *Id.* at 2. See also Gonzalez, *supra* note 51, at 428-29.

80. SEN, *supra* note 77, at 45.

81. Gonzalez, *supra* note 51, at 430 (citation omitted) (articulating Sen’s entitlement-based approach to food security in reference to a national setting which fits into the conceptual framework of this paper). Indeed, in regard to a domestic household setting, Sen sets out a total of four entitlement relations prevalent in private (or domestic) ownership market economy as the first layer of a more complex analysis. See SEN, *supra* note 77, at 2. They are: 1) trade-based entitlement, 2) production-based entitlement, 3) own-labor entitlement, and 4) inheritance and transfer entitlement. *Id.* On the parallel between food security at domestic and national levels, see STEVENS ET AL., *supra* note 75, at 18.

82. For an article examining this last factor, see Ruosi Zhang, *Food Security: Food Trade Regime and Food Aid Regime*, 7 J. INT’L ECON. L. 565 (2004).

83. See Scoones, *supra* note 51; see also Farhana Yamin, *Intellectual Property Rights, Biotechnology and Food Security* (Inst. of Dev. Studies, IDS Working Paper No. 203, 2003), <http://www.ids.ac.uk/ids/bookshop/wp/wp203.pdf>.

In many developing countries and their component indigenous and local communities, food crops are culturally determined.⁸⁴ TAPs and the entire process of food production are aspects of elaborate cultural rituals, symbolisms, and tendencies that depict peoples' environmental ethic and ecologically-centered holistic world-view, which are key elements of their self-identification, self-determination, and human dignity.⁸⁵ Partly for this reason, notwithstanding the endemic poverty in developing countries and the attractions of agro-biotechnology foods, indigenous and local communities are critical of the epistemic order that distorts their cultural conceptions of ecological relationships and sanctity of life forms through genetic modification and practices that threaten agricultural and human diversity.⁸⁶

Like his production-based entitlement to food security, Sen's trade-based entitlement also resonates with the "5As" of food security and the dynamics of TAPs in indigenous and local communities. The trade-based approach speaks to the ability of a developing country and its indigenous and local communities to earn foreign exchange to support food import at all times,⁸⁷ especially in times of need. Developing countries can achieve trade-based entitlement to food security in the context of economic or export diversification.⁸⁸ In addition to multifarious agro-resource management practices of third-world indigenous and local communities, there is also an amazing reserve of agro-crop, livestock, and biological diversity in those places. As already noted, the prevailing agro-biodiversity and rich genetic diversities in these regions correspond to their human, cultural, and even linguistic diversities.⁸⁹ The ability of developing countries to harness their diverse agro-resources will promote their agro-biodiversity and agro-export base and, by extension, guarantee sustainable agriculture. A diverse agro-export base is key to economic strength and a stronger balance of payments, which assures the competitive earning power needed for food import under

84. See KUHLEIN & TURNER, *supra* note 69, at 1; see also Oguamanam, *supra* note 69, at 298 n.113.

85. This claim is essentially based on my research findings and personal experience. However, it is affirmed in the writings of BATTISTE & HENDERSON, *supra* note 54.

86. See, e.g., First International Conference on the Cultural and Intellectual Property Rights of Indigenous Peoples, Whakatane, New Zealand, June 12-18, 1993, The Mataatua Declaration on Cultural and Intellectual Property Rights of Indigenous Peoples, U.N. Doc E/CN.4/Sub.2/AC.4/1993/CRP.5; Coordinating Body for the Indigenous Organizations of the Amazon Basin (COICA), 1994 COICA Statement, available at COICA Statement, AUSTRAL. INDIGENOUS L. REP., Jan. 2001, at 107; Mwananyanda Mbikusita Lewanika, *GMOS and the Food Crisis in Zambia*, in GENE TRADERS: BIOTECHNOLOGY, WORLD TRADE, AND THE GLOBALIZATION OF HUNGER 86-90 (Brian Tokar ed., 2004); see also CHIDI OGUAMANAM, INTERNATIONAL LAW AND INDIGENOUS KNOWLEDGE: INTELLECTUAL PROPERTY RIGHTS, PLANT BIODIVERSITY, AND TRADITIONAL MEDICINE 87 (2006).

87. Gonzalez, *supra* note 51, at 430.

88. *Id.*

89. See BATTISTE & HENDERSON, *supra* note 54, at 41.

trade-based entitlement to food security. Moreover, when a country adequately exploits its agro-diverse resources, it is in a position to satisfy the five components of food security.

Despite the strong agro-diverse and rich genetic resource base of many developing countries, they are trapped in the web of monoculturism. For the most part, this is due to a combination of a colonial division of labor, the political economics of agriculture, neoliberal economic structures,⁹⁰ and to some extent, the globalization phenomenon. Essentially, monoculturism is justified by the economic efficiency associated with comparative advantage inherent in a country's ability to invest only in agricultural endeavors to which it is best suited by reason of several factors.⁹¹ As a result of the historical experience of colonialism, such choices were imposed on developing countries by the colonial powers, mostly on the basis of colonial needs.⁹² With its emphasis on cash crops, colonialism was central in the distortion of the TAPs in developing countries. In the postcolonial era, that status quo has only deepened.⁹³ Many of these countries are mainly food-insecure, partly because of their reliance on a handful of agricultural exports to finance food import.⁹⁴ While acknowledging the complex ramifications of the political economics of agriculture for food security in indigenous and local communities, the next Part identifies and outlines key factors in that dynamic as a foreground to focus discussion on intellectual property rights in Part IV.

III. POLITICAL ECONOMICS OF AGRICULTURE AND FOOD SECURITY

Many developing countries and their indigenous and local communities are not able to deploy their genetic, cultural, human, and ecological diversities, and the inherent advantages of their agro-resource base to promote agro-biodiversity and food security. Ironically, citizens of these countries constitute more than eighty percent of the global population plagued by food insecurity.⁹⁵ Unsustainable forms of industrial agriculture are quickly displacing TAPs and underlying epistemic and ecological world-views of indigenous and local communities in both developed and developing coun-

90. See generally Gonzalez, *supra* note 51.

91. See *id.* at 435, 489-92; see also YOUNG, *supra* note 51, at 41.

92. See YOUNG, *supra* note 51, at 41.

93. See generally GLOBALISATION AND THE THIRD WORLD (Ray Kiely & Phil Marfleet eds., 1998); see also Maskus & Reichman, *supra* note 7.

94. Gonzalez, *supra* note 51, at 422.

95. Straub, *supra* note 50, at 192; see also *GMOS: The Wrong Answer to the Wrong Problem*, in VOICES FROM THE SOUTH: THE THIRD WORLD DEBUNKS CORPORATE MYTHS ON GENETICALLY ENGINEERED CROPS 6-7 (Ellen Hickey & Anuradha Mittal eds., 2003), available at <http://www.foodfirst.org/pubs/other/voices/voicesfull.pdf> (interview with Rafael Mariano, head of the Peasant Movement of the Philippines).

tries.⁹⁶ As regards the latter, this agro-epistemic and cultural erosion is part of the unfortunate consequences of their incorporation into the political and market economics of agriculture.

A fundamental aspect of the political economics of agriculture is the colonially imposed international division of labor, through which one region (the colonized South) is the supplier of agricultural and industrial raw materials for the Northern colonizing and industrial powers. As noted elsewhere, “[f]rom five hundred years of colonialism to contemporary globalism, the transfer of natural resources to the centres of global financial capital remains an uninterrupted trend” in shaping the framework of our market and political economy.⁹⁷ The colonial division of labor is a foremost strategy in undermining the food security potentials of developing countries. These countries were targeted as sources of specific raw materials for the colonial powers through the principle of economic specialization.⁹⁸ Under this self-serving colonial approach, developing countries *specialized* in the production of a handful of cash crops for export at the expense of harnessing and developing their agro-diverse resources for enhanced food crop production.⁹⁹ Not only were those countries subjected to the vagaries of the world commodity markets, 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.”¹⁰⁰

The advent of “chemicalized agriculture” at the intersection of colonial and post-colonial transitions following the end of World War II marked yet another highpoint in the erosion of TAPs and the food security potential of developing countries.¹⁰¹ The launching of the Green Revolution as a salvage strategy for addressing post-war global hunger and rural poverty marked an entry point for the introduction of chemicalized agriculture into indigenous and local communities.¹⁰² In addition to the conflicted epistemic and ecological ramification of chemicalized agriculture in relation to TAPs

96. Chidi Oguamanam, *Tension on the Farm Fields: The Death of Traditional Agriculture?*, BULL. SCI. TECH. & SOC’Y (2007).

97. OGUAMANAM, *supra* note 86, at 55.

98. See, e.g., Carmen G. Gonzalez, *Markets, Monocultures, and Malnutrition: Agricultural Trade Policy Through an Environmental Justice Lens*, 14 MICH. ST. J. INT’L L. 345, 357-58 (2006).

99. See Okediji, *International Relations*, *supra* note 2, at 321 (pointing out that trade in agricultural commodities that emphasized growth and export of cash crops, which fueled the industrial revolution, defined colonial interactions, especially in Africa); see also JOSEPH E. INIKORI, *AFRICANS AND THE INDUSTRIAL REVOLUTION IN ENGLAND: A STUDY IN INTERNATIONAL TRADE AND ECONOMIC DEVELOPMENT* (2002); see generally Sharma, *supra* note 51.

100. Gonzalez, *supra* note 51, at 423.

101. *Id.*

102. *Id.*

and their supporting ecological ethic, the Green Revolution made food crops targets of monocultural production techniques.¹⁰³ Previously, monoculturism was already entrenched in cash crops under the colonial division of labor.¹⁰⁴ With its emphasis on High Yielding Varieties (HYVs), the Green Revolution diverted rural agricultural practices from their agro-diverse base to growing uniform seed and other monocultural practices.¹⁰⁵ It also distorted cultivation techniques and agro-resource management practices through the introduction of chemical fertilizers, pesticides, and herbicides.¹⁰⁶ These agro-inputs, which were supplied by multinational corporations, not only increased the cost of farming but were also factors in the displacement of poor and subsistence rural farmers who could not afford them.¹⁰⁷ Also, the market for agro-chemicals was vital in facilitating the powerful role of transnational corporations in global agriculture. In all, the Green Revolution's chemical agriculture yielded unintended consequences by undermining food security in developing countries¹⁰⁸ while also providing transnational agribusiness a foothold in those countries—a strategic development in the neoliberal economic agenda.

Initiated to address the 1980s debt crisis of the developing countries, the neoliberal economic program significantly escalated the food security and agro-biodiversity crisis in developing countries. A key aspect of this model is the World Bank and IMF's structural adjustment program (SAP) for developing countries.¹⁰⁹ The SAP was designed to assist in debt restructuring and to facilitate successful negotiation of fresh loans; its trademark prescription package included shrinking public sector spending, increasing privatization of public utilities, trade liberalization initiatives, and perhaps most important for our purpose, increasing export for the generation of revenue to fix foreign debts.¹¹⁰ The trade liberalization component of the neoliberal economic platform is captured in the WTO Agreements, espe-

103. *Id.* at 423-24; JACK RALPH KLOPPENBURG, JR., *FIRST THE SEED: THE POLITICAL ECONOMY OF PLANT BIOTECHNOLOGY, 1492-2000* (1988).

104. Gonzalez, *supra* note 51, at 423; *see also* Okediji, *International Relations*, *supra* note 2, at 321.

105. *See generally* sources cited *supra* note 51. *See also* VANDANA SHIVA, *THE VIOLENCE OF THE GREEN REVOLUTION: THIRD WORLD AGRICULTURE, ECOLOGY AND POLITICS* (1991).

106. *See generally* SHIVA, *supra* note 105; Pimentel et al., *supra* note 51.

107. *See* Gonzalez, *supra* note 51, at 441-50; *see also* CONWAY, *supra* note 51, at 44-45; SHIVA, *supra* note 105, at 45; *see generally* Pimentel et al., *supra* note 51.

108. Gonzalez, *supra* note 51, at 423-24, 443-44; *see generally* Reed, *supra* note 22.

109. *See* Reed, *supra* note 22; *see also* GILES MOHAN ET AL., *STRUCTURAL ADJUSTMENT: THEORY, PRACTICE AND IMPACTS* (2000); DAVID E. SAHN ET AL., *STRUCTURAL ADJUSTMENT RECONSIDERED: ECONOMIC POLICY AND POVERTY IN AFRICA* (1997).

110. Tokar, *The World Bank*, *supra* note 39, at 53.

cially the Agreement on Agriculture (AoA).¹¹¹ Ironically, in theory, the AoA was designed to address the existing historic imbalances or distortions in global agricultural trade,¹¹² an aspiration that largely remains rhetorical.¹¹³

As part of the trade liberalization initiative, developing countries are pressured to increase their agricultural exports. This neoliberal prescription builds upon the subsisting structure of colonial division of labor and economic specialization in relation to cash crop exports. As a clear consolidation of those two phenomena, the neoliberal model ultimately buoys up harmful monocultural practices. In many developing countries, including Cameroon, Brazil, Pakistan, and India, expansion of agricultural exports is a leading cause of decline in habitat and species, and by extension, decline in agro-biodiversity and food security.¹¹⁴ These neoliberal economic pressures have succeeded in the eradication of agricultural subsidies, export barriers, and other bottlenecks in developing countries.¹¹⁵ However, there is hardly a fair exchange of value between developing countries' agricultural exports and imported finished products from the industrialized world.¹¹⁶ Indeed, industrialized countries' lack of commitment to trade liberalization in the agricultural context is evident in their reluctance to eliminate agricultural

111. Agreement on Agriculture, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, Legal Instruments – Results of the Uruguay Round, 1867 U.N.T.S. 410 (1994) [hereinafter AoA]. For a thorough insight on this agreement and its implication for food security, see STEVENS ET AL., *supra* note 75.

112. Choudry, *supra* note 69, at 46; *see generally* Gonzalez, *supra* note 51.

113. The preambular paragraphs to the AoA refer to parties' commitment to "correcting and preventing restrictions and distortions in world agricultural markets," and to the need for market access and export competition. AoA preamble, *supra* note 111. Those imbalances, which are in favor of developed countries, were carry-overs from the colonial legacy, including the so-called international division of labor, and the pre-WTO GATT regime. *See generally supra* note 72 and accompanying text. Developed countries' reluctance to decisively tackle the issue of domestic agricultural subsidy and market access to the third world give lie to their stated commitment in the AoA. The issue of agricultural subsidy remains one of the key stumbling blocks to progress in multilateral trade negotiations at the WTO. For instance, on July 23, 2006, global trade talks under the Doha Development Agenda were stalemated following accusations and counter-accusations between the U.S. and E.U. representatives in the G6 (comprised of the U.S., the E.U., Australia, Brazil, India, and Japan) Trade Negotiations Committee for lack of flexibility on the issue farm subsidies. Press Release, World Trade Org., *Talks Suspended. 'Today There are Only Losers'* (July 24, 2006), available at http://www.wto.org/english/news_e/news06_e/mod06_summary_24july_e.htm (last visited May 21, 2007). This development led to subsequent and indefinite suspension of further negotiation by the G6, and consequently in all negotiation groups at the WTO. *Id.* The WTO Director General, Pascal Lamy, described this as a missed opportunity to demonstrate the feasibility of multilateralism. *Id.* Perhaps the most significant consequence of this failure is its potential to empower regional and bilateral trade pacts that undermine developing countries' aspirations, especially in regard to market access and domestic support.

114. THE ROOT CAUSES OF BIODIVERSITY LOSS 66 (Alexander Wood et al. eds., 2000).

115. *Id.*

116. *Id.*

subsidies and their willingness to create and exploit loopholes in the WTO's AoA.¹¹⁷ Thus, the developed countries' approach to that agreement is characterized as a double standard, which institutionalizes "inequities by requiring market openness [or access] in developing countries while permitting protectionist policies in the industrialized world."¹¹⁸ It is tempting to draw the conclusion that under the political economics of agriculture, developed countries have a conceited and vested interest in the food insecurity situation in developing countries.¹¹⁹ This is symbolically illustrated by developed countries' support for extreme biotechnology measures that threaten both to supplant (or tighten) the conventional intellectual property regime and to undermine food security in indigenous and local communities of the third world as exemplified in the genetic use restriction technologies (GURTs) phenomenon, popularly known as terminator technology.¹²⁰

Essentially, terminator technology is a genetic engineering method that achieves the suppression of genetic copy propagation by rendering seeds sterile so that farmers will not utilize them for subsequent planting.¹²¹ It is akin to a technological alternative to intellectual property rights, specifically a form of self-enforcing patents devoid of social interest mediations and responsibilities incidental to orthodox intellectual property rights.¹²² The United States, Canada, and Argentina are staunch supporters of terminator technologies, and have continued to press for commercial exploitation of GURTs.¹²³ This is so despite serious concerns by the CBD and a majority of the international community over the potential impact of ter-

117. See Claire Godfrey, *Stop the Dumping! How EU Agriculture Subsidies Are Damaging Livelihoods in the Developing World* (Oxfam Briefing Paper No. 31, 2002), <http://www.globalpolicy.org/socecon/trade/subsidies/2002/10stopdumping.pdf>. Cf. Marcela Valente, *End to Subsidies Would Not End Rural Poverty*, INTER PRESS SERV., Dec. 2, 2005, available at <http://www.globalpolicy.org/socecon/trade/subsidies/2005/1202rural.htm> (last visited May 21, 2007) (arguing that an open European and American agriculture market would be exploited by a handful of mega agribusiness corporations and not benefit small third world farmers); see also *supra* note 116 and accompanying text.

118. Gonzalez, *supra* note 51, at 460.

119. See Choudry, *supra* note 69, at 48.

120. See generally Srinivasan & Thirtle, *supra* note 60.

121. Oguamanam, *supra* note 62, at 64 (pointing out that GURTs transcends suppression of propagating capacity of seeds (V-GURTs) and includes trait suppression and selection and management (T-GURTs)).

122. See *id.* at 70-71. Examples of such social interest considerations include the fair use exemption (mainly for copyright), research and experimental use exemptions, compulsory licensing, and statutory term limits. Okediji, *International Relations*, *supra* note 2, at 363; see also CBD, *Report of the Ad Hoc Technical Expert Group*, *supra* note 44.

123. Other countries that actively support the technology include Australia and New Zealand. See AG BIOTECH INFONET, Biodiversity Convention's Terminator Decision Fails Biodiversity and Fails Farmers (June 28, 1999), available at http://www.biotech-info.net/failing_farmers.html (last visited May 21, 2007); see also TRUTHOUT.ORG, <http://www.truthout.org/cgi-bin/artman/exec/view.cgi/59/18825> (last visited May 21, 2007).

minator technology on agricultural livelihoods of indigenous and local communities.¹²⁴

Terminator technology perhaps typifies the climax of contemporary revolution in intellectual property jurisprudence through progressive extension of proprietary claims over life forms, especially plant germplasm, to various forms of technology control and enforcement mechanisms. The push for an extremist technology-cum-intellectual-property model such as the terminator is indicative of the insensitivity of neoliberal trade considerations to the vulnerabilities of indigenous and local community populations in both developed and developing countries, especially in the area of food security. Jointly, the trio of the United States, Canada, and Argentina grow eighty percent of the world's genetically engineered crops.¹²⁵ While presently there is a temporary inclination to heed developing countries' reservations over GURTs through a subsisting United Nations moratorium, this is not the case with GMOs in general.¹²⁶ Regulatory and policy issues around the GMO phenomenon have continued to fuel direct regime clash between the CBD as a symbol of the environmental regime and the neoliberal WTO.¹²⁷ This is evident in some WTO Panel rulings, particularly the recent one on approval and marketing of biotechnology products in the European Communities that came on the heels of a U.S.-Canadian victory on the famous beef hormone decision.¹²⁸ That latter decision has been described as

124. See CBD, *Report of the Ad Hoc Technical Expert Group*, *supra* note 44.

125. JORGE FERNANDEZ-CORNEJO & MARGRIET CASWELL, THE FIRST DECADE OF GENETICALLY ENGINEERED CROPS IN THE UNITED STATES 7 (2006), available at <http://www.ers.usda.gov/publications/EIB11/> (last visited May, 21, 2007).

126. While there is a UN officially imposed moratorium on GURTs, contestment of other products of agricultural biotechnology among states is being resolved as a matter of free trade under the the WTO dispute resolution framework. See, e.g., *infra* note 128 and accompanying text.

127. For example, the moratorium on terminator technology was accomplished at the initiative of the CBD process whilst the WTO dispute resolution process provides the impetus for the continuing commercial opening up of GE food and products.

128. In 1996, the U.S. requested consultations with the EC, seeking to challenge the EC ban on the import of meat and meat products treated with any of the listed six growth hormones pursuant to the SPS Agreement. See Request for Consultations by the United States, *European Communities—Measures Concerning Meat and Meat Products (Hormones)*, WT/DS26/1 (Jan. 31, 1996). Canada, Australia, New Zealand, and Norway joined the complaint as third parties. World Trade Organization, *European Communities – Measures Concerning Meat and Meat Product Hormones*, http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds26_e.htm (last visited May 21, 2007). Both the Panel and Appellate Body found for the complainants. See Panel Report, *EC Measures Concerning Meat and Meat Products (Hormones)*, WT/DS26/R/USA (Aug. 18, 1997); Appellate Body Report, *EC Measures Concerning Mean and Meat Products (Hormones)*, WT/DS26/AB/R (Jan. 16, 1998). Upon the EC failure to meet an arbitrated deadline to implement the decision, a subsequent arbitration proceeding awarded \$116.8 million and \$11.3 million against the EC as the level of nullification suffered by the two countries respectively. Choudry, *supra* note 69, at 48-49. Canada's active participation

“a precedent for using the WTO to attack all kinds of domestic regulations based on health concerns, which are viewed as barriers to trade.”¹²⁹

The 2006 WTO Panel decision on the U.S., Canada, and Argentina challenge to Europe’s de facto five-year freeze on approvals for GM crop varieties¹³⁰ is a significant indication of regime clash between WTO and the CBD. European regulatory rigor on GMOs may be justifiable under the precautionary approach of international environmental law, which is reaffirmed by CBD’s supplementary document—the 2000 Cartagena Protocol on Biosafety.¹³¹ The Protocol chiefly “seeks to protect biological diversity from the potential risks posed by living modified organisms [LMOs] resulting from modern biotechnology.”¹³² It sets up a system of an advance informed mechanism to enable importing countries to have access to adequate information in order to make informed decisions regarding LMOs.¹³³ In the March 2006 decision, the WTO Panel sided with the U.S., Canada, and Argentina, holding that Europe’s moratorium on GMOs and Europe’s delayed approval of some twenty-four specific GMO crop varieties violated that organization’s neoliberal free trade regime, specifically the WTO Agreement on the Application of Sanitary and Phytosanitary Measures (SPS Agreement).¹³⁴

For the most part, this case revolved around article 2 of the SPS agreement, which requires WTO member countries’ decisions to adopt sanitary and phytosanitary measures that are capable of interfering with free trade to be based on “sufficient scientific evidence.”¹³⁵ However, under the Cartagena Protocol on Biosafety and in accordance with the precautionary approach, “where there are threats of serious irreversible damage,” *full scientific certainty is not* required as a condition precedent to take or impose a

turned on arguments for suspension of trade concessions to the EC as a result of the latter’s failure to implement the beef hormone decision within the time set by arbitration. *See id.*

129. Choudry, *supra* note 69, at 48.

130. *See* Panel Report, *European Communities – Measures Affecting the Approval and Marketing of Biotech Products*, WT/DS291/R, WT/DS292/R, WT/DS293/R (Sept. 29, 2006). Other countries joined the U.S. in this complaint, including Australia, Brazil, Chile, Columbia, India, Mexico, New Zealand, and Peru. Choudry, *supra* note 69, at 48. For more insight into this case and the beef hormone decision, see Choudry, *supra* note 69, at 47-49.

131. Cartagena Protocol on Biosafety to the Convention on Biological Diversity, Jan. 29, 2000, 39 I.L.M. 1027 (2000), available at <http://www.biodiv.org/biosafety/protocol.shtml> (last visited May 21, 2007) [hereinafter Cartagena Protocol].

132. Cartagena Protocol on Biosafety: Background, available at <http://www.biodiv.org/biosafety/background2.aspx> (last visited May 21, 2007).

133. *Id.*

134. Agreement on the Application of Sanitary and Phytosanitary Measures, Apr. 4, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1A, Legal Instruments – Results of the Uruguay Round of Multilateral Trade Negotiations, 1867 U.N.T.S. 493 (1995).

135. *See id.* art 2(2).

remedial action.¹³⁶ In this case, European Communities' prudent (albeit politically motivated) disposition toward GMOs, which is in conformity with the Biosafety Protocol and the precautionary approach, appears to have been undermined by North America's more liberal trade-driven approach to biotechnology.

Despite the industry-driven low precautionary threshold of subjecting GMOs to "sufficient scientific evidence" under the business oriented SPS, transnational agribusinesses are even determined to settle for the lowest denominator.¹³⁷ Indeed, current WTO food safety standards are based on the Codex Alimentarius Commission model.¹³⁸ Codex Alimentarius¹³⁹ was jointly established and is co-administered by the FAO and the WHO. The Codex model, which has found favor with U.S. agribusiness and agro-biotechnology policy circles, is premised on the narrow concept of food safety, and gives no regard to environmental risk issues.¹⁴⁰ This approach is a clear demonstration of the triumph of the WTO neoliberal free trade regime over the CBD's precautionary principle and general concerns over environmental sustainability and other risk factors in agro-biotechnology. Since GMOs became a trade and public policy issue in the WTO and individual member countries, Europe championed a precautionary approach while the United States, Canada, and a few others insist upon the preeminence of neoliberal or free trade ideals over other considerations.¹⁴¹

136. This is pursuant to principle fifteen of the Rio Declaration on Environment and Development. See Conference on Environment and Development, Rio de Janeiro, Braz., June 3-14, 1992, *Rio Declaration on Environment and Development*, princ. 15, U.N. Doc. A/Conf.151/26/Rev.1 (June 13, 1992), 31 I.L.M. 874, 879 (1992) (stating that "[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation"). This principle is roundly reflected in the Cartagena Protocol. See, e.g., Cartagena Protocol, *supra* note 131, pmb.; see also *id.* art. 1, 39 I.L.M. at 1027; *id.* art. 10(6), 39 I.L.M. at 1031; art. 11(8), 39 I.L.M. at 1032.

137. See Choudry, *supra* note 69, at 49.

138. *Id.*

139. According to its official website, Codex was established in 1963 by FAO and WHO to develop food standards, "ensur[e] fair trade practices in the food trade, and promot[e] coordination of all food standards work undertaken by international governmental and non-governmental organizations." Codex Alimentarius, http://www.codexalimentarius.net/web/index_en.jsp (last visited May 21, 2007).

140. Choudry, *supra* note 69, at 49-50; see also CODEX ALIMENTARIUS COMM'N, PRINCIPLES FOR THE RISK ANALYSIS OF FOODS DERIVED FROM MODERN BIOTECHNOLOGY, CAC/GL 44-2003 (2003), www.codexalimentarius.net/download/standards/10007/CXG_044e.pdf.

141. See Tokar, *WTO vs Europe on GMOs*, *infra* note 146.

Europe has a prudent and sophisticated regulatory regime on GM crops.¹⁴² Nonetheless, it still imports GM crops but is opposed to the crops being forced down European throats. For example, Europe imports a significant quantity of soybeans from the United States and Brazil even though it is determined to restrict them to animal consumption—a yet unpopular and controversial decision in Europe.¹⁴³ Also, the increasing commercial prospects for biofuel make Europe a profitable destination for U.S. and Canadian GM crops.¹⁴⁴ Generally, the European Community is open to free trade in GMOs under the rules.¹⁴⁵ But the contentious issues are how the rules are interpreted, especially in light of the regime conflict between the WTO and the CBD, specifically the Biosafety Protocol. Consequently, the long-term impact of the WTO Panel decision transcends Europe, and its significance should be seen outside the present ostensible transatlantic muscle flexing on the subject of GMOs.

Indeed, for developing countries and indigenous and local communities, commentators have noted that the decision is a “violation of people’s right to make appropriate choices about their food and how it is grown,”¹⁴⁶ and the decision’s “main impact would be on other countries still struggling to address the implications of this technology,”¹⁴⁷ especially as they relate to food security. Similarly, in alliance with other U.S. NGOs, the Organic Consumers Association noted that “[s]ince the United States has no real hope of boosting sales of [genetically engineered] foods to unwilling Europeans, the WTO suit is clearly an effort to chill other nations from pursuing any regulations on [genetically engineered] foods.”¹⁴⁸ African and Asian countries have been identified as “by far the most conspicuous targets.”¹⁴⁹

142. For instance, unlike in Canada and the United States, in Europe ingredients that are more than 0.9 percent genetically engineered must be labeled. See Tokar, *WTO vs Europe on GMOs*, *infra* note 146.

143. *Id.*

144. *Id.* However, the recent move by the U.S. government to cut a deal with Brazil for the supply of ethanol is indicative of a potential supply crisis as biofuel increasingly becomes a reality. See Peter Baker, *U.S., Brazil Team up to Promote Ethanol*, WASH. POST, Mar. 10, 2007, A12.

145. See Tokar, *WTO vs Europe on GMOs*, *infra* note 146.

146. Brian Tokar, *WTO vs Europe on GMOs*, SPECTREZINE, Mar. 20, 2006, <http://www.spectrezine.org/environment/GMO4.htm> (last visited May 21, 2007) [hereinafter Tokar, *WTO vs Europe on GMOs*].

147. *Id.*

148. Organic Consumers Association, *OCA & Other NGOs: Gene-Altered Foods Will Remain a Losing Proposition for U.S. Farmers - Despite WTO Decision*, <http://www.organicconsumers.org/ge/GMO020606.cfm> (last visited May 21, 2007).

149. Tokar, *WTO vs Europe on GMOs*, *supra* note 146.

IV. INTELLECTUAL PROPERTY RIGHTS AND FOOD SECURITY

On its own, agro-science in the forms of chemicalized agriculture, scientific plant breeding techniques, hybridization, or genetic engineering/agro-biotechnology may have limited influence in upsetting the alternative agricultural episteme represented in TAPs. Practically, agro-science's ability to displace or distort TAPs can be realized only when agro-scientific processes and products are competitive and profitable by way of private appropriation and commercial exploitation. Conventional wisdom locates the key to profitable agro-science in intellectual property or its technological substitutes, like GURTs.¹⁵⁰ Intellectual property is the orthodox Western mechanism for the establishment of proprietary claims and for the allocation of rights and rewards over knowledge and its products.¹⁵¹ Even though intellectual property is not *directly* implicated in the food security and agro-biodiversity equation, as a trade-related instrument, TRIPS is a critical and embedded factor in the political economics of agriculture, and consequently quite significant for the food security question in developing countries.¹⁵² As already noted, the AoA is part of a neoliberal economic model with direct implication for food security. In relation to intellectual property, the main WTO regime is the TRIPS Agreement. The agreement is a principal document in regard to the IIPS. Even though TRIPS is not an agricultural instrument and has no direct provision on food security, it needs to be examined to the extent it incorporates agro-science and TAPs—two epistemic approaches to agriculture—in order to understand its implication for food security.

Besides the TRIPS Agreement, there are other important treaties relevant to the international intellectual property regime complex, such as the WIPO-administered treaties.¹⁵³ Those are outside the scope of the present

150. A major theoretical justification for intellectual property is that it provides both incentive and reward mechanism for research, development, and profitability of inventions by securing for inventors and investors alike exclusive proprietary monopoly rights to inventions over a limited period. Unlike conventional intellectual property, potentially, GURTs are not constrained by the customary term limits and so they are technologies of choice for inventors seeking to maximize the profitability of their innovation in the agro-biotechnology arena.

151. David R. Downes, *How Intellectual Property Could Be a Tool to Protect Traditional Knowledge*, 25 COLUM. J. ENVTL. L. 253, 256 (2000).

152. There is, however, no dearth of literature on the intersection of intellectual property and agriculture. See, e.g., CARY FOWLER & PAT MOONEY, *SHATTERING: FOOD, POLITICS, AND THE LOSS OF GENETIC DIVERSITY* (1990); KLOPPENBURG, JR., *supra* note 103; MGBEON, *supra* note 36; Bongo Adi, *Intellectual Property Rights in Biotechnology and the Fate of Poor Farmers' Agriculture*, 9 J. WORLD INTELL. PROP. 91 (2006); Lawson, *supra* note 3; Martin & Vermeylen, *supra* note 56; Oguamanam, *supra* note 69; Straub, *supra* note 50.

153. To date, there are twenty-four WIPO-administered treaties. See WIPO, *Treaties and Contracting Parties*, <http://www.wipo.int/treaties/en/> (last visited May 21, 2007).

analysis. However, the International Union for the Protection of New Varieties of Plants (UPOV)¹⁵⁴—a non-WIPO instrument—which establishes a common plant variety protection (PVP) framework known as Breeders' Rights (PBRs) regime for UPOV member states, is crucial to the subject of food security in indigenous and local communities.¹⁵⁵ The agreement was originally struck by a group of major industrialized countries with a head start in plant breeding and agricultural biotechnology in order to secure profitable seed trade in proprietary varieties.¹⁵⁶ The UPOV's legitimization of private ownership of and proprietary interest in plant varieties is part of radical transitions in the intellectual property jurisprudence from the original reluctance¹⁵⁷ to extend intellectual property or private ownership rights to plants and life forms in general.¹⁵⁸ This transition was decisive in boosting private sector investment in agro-science research, especially the plant-breeding sector.¹⁵⁹ Also, it was crucial in paving the way for the influential roles of transnational agribusiness, chemical, and seed corporations in the political economics of agriculture.¹⁶⁰

Understandably, third-world indigenous and local communities were opposed to PBRs and the notion of private rights over agro-life forms, mainly because of the phenomena's conflict with indigenous agro-ecological ethics and world-views and the phenomena's tendency to privatize communal and public domain knowledge.¹⁶¹ Despite their opposition,

154. See UPOV – Welcome to the International Union for the Protection of New Varieties of Plants, <http://www.upov.int/index.html> (last visited May 21, 2007). To view texts of the various Acts of the UPOV Conventions, see UPOV Acts: 1961, 1972, 1978, 1991, <http://www.upov.int/en/publications/conventions/index.html> (last visited May 21, 2007).

155. See *Adi*, *supra* note 152, at 104-07; see also Wright & Pardey, *supra* note 39, at 15-16. See generally Claudio Chiarolla, *Commodifying Agricultural Biodiversity and Development-Related Issues*, 9 J. WORLD INTELL. PROP. 25 (2006).

156. See generally FOWLER & MOONEY, *supra* note 152 (discussing historical accounts of America's head start in plant breeding and its leading role in the global "politics of genetic resource control" through intellectual property rights); KLOPPENBURG, JR., *supra* note 103.

157. For example, historically, patents conferred rights only to industrial or technical innovations. See STUDY OF THE SUBCOMMITTEE ON PATENTS, TRADEMARKS, AND COPYRIGHTS OF THE SENATE COMMITTEE ON THE JUDICIARY, 85TH CONG., AN ECONOMIC REVIEW OF THE PATENT SYSTEM (Comm. Print 1958); see also Wright & Pardey, *supra* note 39, at 14.

158. For insights on the U.S.-led progressive judicial and historical reconceptualization and extensions of intellectual property rights to the realm of life forms, see *Diamond v. Chakrabarty*, 447 U.S. 303 (1980). See also MGBEOJI, *supra* note 36, at 122-26; Oguamanam, *supra* note 60, at 61-62; Wright & Pardey, *supra* note 39, at 14.

159. See Oguamanam, *supra* note 60, at 61-62 (arguing that increased private sector participation in plant breeding is responsible for increased PVP legislation in Europe and North America); Srinivasan & Thirtle, *supra* note 60, at 159.

160. See generally Srinivasan & Thirtle, *supra* note 60.

161. See *supra* note 86 and accompanying text.

progressive revisions of the UPOV treaty gradually choked up crucial TAPs, such as the culture of seed saving, while entrenching traditional farmers' dependence on external proprietary rights holders for seeds and plant varieties.¹⁶² PBRs are used by industrialized countries and mega seed corporations to marginalize TAPs and traditional farmers and consequently to undermine food security in indigenous and local communities.¹⁶³

Not surprisingly, as a form of intellectual property, PBRs provide a site for understanding intellectual property's role in the intersection between the international agriculture regime, TAPs, and food security. In this regard, since the 1980s, the FAO has been involved in the juridical evolution of the concept of "farmers' rights" as a counterbalance to PBRs.¹⁶⁴ Provided for under the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA),¹⁶⁵ farmers' rights are integral to a regime of open access to genetic resources in *ex situ* seed banks of the International Agricultural Research Centers (IARCs)¹⁶⁶ and other public seed banks.¹⁶⁷ The

162. Since the first text of the UPOV in 1961, the instrument has undergone revisions in 1972, 1978, and 1991. The latest revisions radically roll back exemptions or concessions granted to farmers over breeders (farmers' privilege) while they extend breeders' rights to virtually all circumstances for reproduction of seeds of protected varieties, including harvested materials. See International Convention for the Protection of New Varieties of Plants of Dec. 2, 1961, as Revised at Geneva on Nov. 10, 1972, on Oct. 23, 1978, and on Mar. 19, 1991, art. 14(2), <http://www.upov.int/en/publications/conventions/1991/pdf/act1991.pdf>; see also Chiarolla, *supra* 155, at 29-33; Srinivasan & Thirtle, *supra* note 60, at 163-64; Oguamanam, *supra* note 60, at 62.

163. The UPOV claims that its mission is "[t]o provide and promote an effective system of plant variety protection with the aim of encouraging the development of new varieties of plants for the benefit of society." Welcome to the International Union for the Protection of New Varieties of Plants, <http://www.upov.int/> (last visited May 21, 2007).

164. For detailed discussion of farmers' rights and its relationship to intellectual property rights, see Oguamanam, *supra* note 69. See also Laurence R. Helfer, *Intellectual Property Rights in Plant Varieties: An Overview with Options for National Governments*, (FAO Legal Papers Online, No. 31, 2002), <http://www.fao.org/Legal/Prs-OL/lpo31.pdf>.

165. International Treaty on Plant Genetic Resources for Food and Agriculture, Nov. 3, 2001, available at <ftp://ftp.fao.org/ag/cgrfa/it/ITPGRRe.pdf> [hereinafter ITPGRFA].

166. There are an estimated 1,200 documented collections of plant germplasm worldwide, held in 160 countries and territories; of these collections, governments hold 83 percent, IARCs hold 11 percent, and the private sector holds 1.27 percent. MGBEOJI, *supra* note 36, at 107; see also KLOPPENBURG, JR., *supra* note 103, at 159-66. Apart from the IARCs, there was also the Consultative Group on International Agricultural Research (CGIAR), an integrative body created in 1971 by a joint public (FAO-UNDP) and private (four privately funded agricultural research centers in the Philippines, Mexico, Kenya, and Colombia) sector initiative with the backing of the Ford and Rockefeller Foundations. Tokar, *The World Bank*, *supra* note 39, at 60. The CGIAR was pivotal to the Green Revolution. KLOPPENBURG, JR., *supra* note 103, at 160. It has sixteen agro-research centers under its current umbrella. Tokar, *The World Bank*, *supra* note 39, at 60.

167. See ITPGRFA, *supra* note 165, art. 9; see also International Undertaking on Plant Genetic Resources, Nov. 23, 1983, U.N. Doc. C/83/Rep, available at

IARCs and other *ex situ* public seed banks were conceptually designed to preserve the world's precious genetic resources for food and agriculture; the target being those originating from centers of biodiversity.¹⁶⁸ Ostensibly, this was with a view towards, among other things, enhancing research in agricultural crops and improving the yield of those valued genetic materials.

Unfortunately, over time the management of these resources and their association with global neoliberal economic bodies, especially the Bretton Woods institutions,¹⁶⁹ has created a crisis of confidence in North-South relations, especially in regard to access to the genetic resources from the putative common pool. Some in the South believe that IARCs were preemptory initiatives by industrialized countries in the wake of a dying empire to guarantee continued South-to-North funneling of genetic resources.¹⁷⁰ By means of patents and PBRs, Western multinational seed corporations have remained the beneficiaries of the genetic resources in IARCs¹⁷¹ common pool to the exclusion of indigenous and local community suppliers of those resources. Hence, the idea of farmers' rights is designed to subject genetic resources in *ex situ* seed banks to the CBD-like principles of equitable access and benefits sharing, and to place them outside the realm of intellectual property claims.¹⁷²

Farmers' rights encompass TAPs relevant to plant genetic resources for food and agriculture, including the right to sale or exchange farm-saved seeds, the right to participate in equitable sharing of benefits, and decision making regarding conservation and sustainable use of plant genetic resources for food and agriculture.¹⁷³ The main objective of farmers' rights under the treaty is to reward the

<http://www.fao.org/ag/cgrfa/IU.htm> (last visited May 21, 2007); FAO Res. 8/83, UN Doc. C/83/REP (Nov. 23, 1983); FAO Res. 5/89, U.N. Doc. C/89/24 (Nov. 29, 1989).

168. KLOPPENBURG, JR., *supra* note 103, at 158-66.

169. See Tokar, *Introduction*, *supra* note 14, at 12-13; see also Tokar, *The World Bank*, *supra* note 39, at 60-63.

170. See MGBEOJI, *supra* note 36, at 106 (noting that the Rockefeller-Ford initiative on the Mexican agricultural program—a precursor to the establishment of IARCs in the South—was a disguise of some sort to ensure continued transfer of vital Southern germ plasm at the end of colonial rule when colonizing powers lacked the raw and direct military “presence and legal authority to compel sovereign nations to yield valuable germ plasm”) (quoting WILLIAM LESSER, SUSTAINABLE USE OF GENETIC RESOURCES UNDER THE CONVENTION ON BIOLOGICAL DIVERSITY: EXPLORING ACCESS AND BENEFIT-SHARING ISSUES 14 (1997)).

171. This was contrary to the founding objectives of these international crop-breeding institutions between the 1940s and 1960s, which was essentially to improve the yield potential of basic food crops. See Gonzalez, *supra* note 51, at 440; see also MGBEOJI, *supra* note 36, at 106-18; FOWLER & MOONEY, *supra* note 152, at 56.

172. See ITPGRFA, *supra* note 165, art. 1.1; see also Lawson, *supra* note 3, at 111-12. See generally Helfer, *supra* note 164.

173. See ITPGRFA, *supra* note 165, art. 9.2(a)-(c).

enormous contribution that the local and indigenous communities and farmers of all regions of the world, particularly those in the centres of origin and crop diversity, have made and will continue to make for the conservation and development of plant genetic resources which constitute the basis of food and agriculture production throughout the world.¹⁷⁴

Unfortunately, because farmers' rights are subject to pre-existing national laws and treaty obligations of states, which for the most part includes PBRs and patents both under the UPOV and the TRIPS standards,¹⁷⁵ the ability of farmers' rights to serve as an effective counterbalancing regime to PBRs in particular and intellectual property rights in general is seriously in doubt.¹⁷⁶ The PBRs and farmers' rights intersection represents a direct illustration of the intellectual property regime discourse in the agricultural and food security contexts.

Plant-breeding is essentially a monocultural endeavor that selectively targets commercially exploitable characteristics of a few varieties of plants. PBRs stifle or distort indigenous interests in exploring their agrobiodiversity potentials and consequently their food security aspirations. Although originally UPOV members were developed countries, in the last decade or so, many developing countries have subtly been coerced into the treaty's expanding membership, mainly through the TRIPS-plus agreements.¹⁷⁷ Perhaps more important, in addition to opening up conventional

174. *Id.* art. 9.1.

175. *See id.* art. 9.3 (providing that farmers' rights to deal with farm saved seeds is subject to applicable national law); *see also* Agreed Interpretation of the International Undertaking FAO Res. 4/89, U.N. Doc. C/89/24 (Nov. 29, 1989), <ftp://ftp.fao.org/ag/cgrfa/Res/C4-89E.pdf> (stating that UPV PBRs regime is not incompatible with the International Undertaking).

176. *See* MGBEOJI, *supra* note 36, at 118 (arguing that article 12(3)(d) of the ITPGRFA, which exempts plant genetic resources obtained from the multilateral system from intellectual property only if they are in the original forms received from donors, undermines the attempt to curtail the role of intellectual property in genetic resources of indigenous or third world origins and defeats an important purpose of the treaty); Oguamanam, *supra* note 69; *see also* Helfer, *supra* note 164; Lawson, *supra* note 3, at 111.

177. Conceptually, the TRIPS Agreement is a multilateral instrument that establishes a compulsory minimum statutory benchmark for intellectual property protection among WTO member states. Choudry, *supra* note 69, at 44. However, states are at liberty to commit to higher intellectual property protection beyond the TRIPS Agreement's minimum. Through a series of bilateral Free Trade Agreements (FTA), developed countries, especially the U.S., have lured many developing countries to commit to stronger intellectual property regimes. This practice is commonly referred to as TRIPS-plus agreements. A regular trend in such agreements is that they are backdoors through which many developing countries now commit to UPOV PBRs regime. *Id.* at 44. For perspectives on TRIPS-plus agreements, *see Id.* at 43-44, Sisule F. Musungu & Graham Dutfield, *Multilateral Agreements and a TRIPS-plus World: The World Intellectual Property Organisation (WIPO)* (Quaker United Nations Office & Quaker Int'l Affairs Program, TRIPS Issues Papers No. 3, 2003); Pedro Roffe, *Bilateral Agreements and a TRIPS-plus World: The Chile-USA Free Trade Agreement* (Quaker Int'l Affairs Program, TRIPS Issues Papers No. 4, 2004); David Vivas-Eugui, *Re-*

intellectual property rights to life forms, the TRIPS Agreement specifically endorses the notion of intellectual property in PGRs to be potentially applicable beyond the geographical scope afforded by the UPOV bloc to the larger WTO memberships.¹⁷⁸ Thus, PGRs are now clearly within the domain of private ownership or intellectual property claims.

In some ways, the TRIPS Agreement is an international consolidation of national trends, especially in industrialized countries, toward the extension of intellectual property (without limitation) to all fields of technology, including those dealing with life forms such as agro-biotechnology.¹⁷⁹ TRIPS directly recognizes forms of innovation that satisfy the orthodox tests of inventiveness, namely newness, inventive step or non-obviousness, and industrial applicability or utility.¹⁸⁰ These tenets are biased in favor of Western scientific epistemic narratives and are hardly reconcilable with an incremental process in the evolution of traditional knowledge.¹⁸¹ TRIPS specifically brings animals, plants, and plant varieties within the scope of patentable protection, subject however, to the individual member's ultimate choice.¹⁸² In relation to plant varieties, it offers members the option to choose modes of protection between "patents or . . . effective *sui generis* system or . . . any combination thereof."¹⁸³

The above references are to the provisions of article 27 of the TRIPS Agreement. That article has generated robust commentaries and elaborate jurisprudence on TRIPS, and by extension, the IIPS.¹⁸⁴ In relation to our subject, the following four salient points can be extrapolated. First, the

gional and Bilateral Agreements in a TRIPS-plus World: The Free Trade Area of the Americas (FTAA) (Quaker United Nations Office & Quaker Int'l Affairs Program, TRIPS Issues Papers No. 1, 2003); Wright & Pardey, *supra* note 39, at 19.

178. The TRIPS Agreement does not directly adopt the UPOV model of PBR, even though industrialized countries prefer such model under the TRIPS-plus agreements. See Susan K. Sell, *Post-TRIPS Developments: The Tension Between Commercial and Social Agendas in the Context of Intellectual Property*, 14 FLA. J. INT'L L. 193, 205 (2002).

179. TRIPS Agreement, *supra* note 1, art. 27. With the enactment of the Plant Patent Act of 1930 and the Plant Variety Protection Act of 1970, the U.S. exerted progressive legislative and judicial efforts toward the extension of intellectual property to life forms, a development that radically revolutionized intellectual property jurisprudence globally. See Plant Patent Act of 1930, Pub. L. No. 71-245, 46 Stat. 376; Plant Variety Protection Act of 1970, Pub. L. No. 91-577, 84 Stat. 1542 (codified as amended at 7 U.S.C. §§ 2321 to 2582 (2000)).

180. TRIPS Agreement, *supra* note 1, art. 27; see also MGBEOJI, *supra* note 36, at 130-41; Martin & Vermeulen, *supra* note 56, at 30-31.

181. See generally Christine Haight Farley, *Protecting Folklore of Indigenous Peoples: Is Intellectual Property the Answer?*, 30 CONN. L. REV. 1 (1997); Oguamanam, *supra* note 7.

182. TRIPS Agreement, *supra* note 1, art. 27.3(b).

183. *Id.*

184. See, e.g., MGBEOJI, *supra* note 36, at 127; Leskien & Flitner, *supra* note 3.

TRIPS Agreement is based on mainstream Western intellectual property,¹⁸⁵ in this case the patent regime, which legitimizes only the Western scientific epistemic account. Second, TRIPS' silence in regard to local or alternative knowledge forms, which includes TAPs, represents a major crisis of legitimacy in the IIPS. Third, because TRIPS is an instrument integral to the WTO, it consolidates and extends intellectual property rights over PGRs, including the PBRs regime, to broader international jurisdiction beyond UPOV scope. Theoretically, developed country membership in UPOV is a voluntary decision. However, in regard to being state parties to TRIPS, their options are clearly constrained given that TRIPS is a component of the larger and more embracing WTO framework, which is an aggregation of twenty-eight other agreements. As a result, TRIPS provides in part the platform for the realization of a neoliberal economic program in agriculture in a manner that complements the trends in the AoA.

Developing and developed countries' attitudes to the revision of TRIPS since 1999 reflects some degree of motion, but no notable movement on any substantive issues.¹⁸⁶ The politics of TRIPS' revision, especially as it concerns article 27 provisions, reflects similar inclination on the part of developed countries to stay the status quo and to stretch loopholes in the WTO agreement in their favor. One inescapable conclusion is that, even though the TRIPS Agreement has no direct provision on food security, it legitimizes orthodox Western intellectual property, especially the patent regime and the *sui generis* PBRs, for the empowerment of agro-science in its major genres: scientific plant breeding, chemicalized agriculture, and agro-biotechnology. TRIPS' silence on traditional knowledge forms, which includes TAPs, significantly implicates intellectual property in undermining the food security and other concomitant imperatives in indigenous and local communities.¹⁸⁷ The significance of TRIPS' negligence of alternative epis-

185. See DANIEL J. GERVAIS, *THE TRIPS AGREEMENT: DRAFTING HISTORY AND ANALYSIS* (2d ed. 2003).

186. See CARLOS CORREA, *Review of the TRIPS Agreement: Fostering the Transfer of Technology to Developing Countries* (2001), available at <http://www.twinside.org.sg/title/foster.htm> (last visited May 21, 2007) (noting that so far developing countries have adopted a prudent approach that seeks a balance between promotion of intellectual property and their development objectives, while emphasizing how to operationalize the objectives and principles outlined under articles 7 and 8 of the TRIPS Agreement; developed countries, on the other hand, seek modest expansion of intellectual property rights, especially in regard to copyrights, which are outside the in-built areas for review); see also GRAIN, *FOR A FULL REVIEW OF TRIPS 27.3(B)* (2000), http://www.grain.org/briefings_files/tripsfeb00.pdf.

187. It can be argued that the reference to an "effective *sui generis* system" in article 27 of the TRIPS Agreement provides a window for national governments to creatively evolve suitable forms of knowledge protection, including indigenous knowledge. See TRIPS Agreement, *supra* note 1, art. 27. In this case, it may be inaccurate to contend that TRIPS does not provide for indigenous knowledge forms.

temic forms, which are more conveniently expressed as traditional knowledge, is evident in the eminent status that traditional knowledge has assumed as a major site of regime debate or counter narrative on the IIPS.

Traditional knowledge, biodiversity, health, human rights, and culture are principal and interrelated sites of the IIPS regime discourse post-TRIPS. Even though traditional knowledge is a cross-cutting subject in relation to these enumerated sites, its relationship with biodiversity appears to enjoy prominence.¹⁸⁸ Indeed, it is possible to argue that the intrinsic relationship or association of traditional knowledge with biodiversity accounts for the latter's importance in the international intellectual property regime discourse. The traditional knowledge-biodiversity intersection is facilitated mainly through the CBD.

The CBD is neither an intellectual property nor a traditional knowledge regime. At best, it is an environmental regime that seeks to exploit the role of traditional knowledge and intellectual property in the promotion of its principal objectives, which include sustainable biodiversity conservation and equitable deployment of benefits resulting from utilization of genetic resources.¹⁸⁹ To date, the CBD is perhaps "the most authoritative international instrument yet that recognizes the traditional knowledge of indigenous and local communities."¹⁹⁰ In a way, the CBD fans the embers of traditional knowledge, boosting it against TRIPS' attempt to confine it to oblivion. CBD's commitment to local knowledge is epitomized in article 8(j) and the Convention's ongoing programs of work centered on the realization of that article's provisions.¹⁹¹ Article 8(j) requires parties to "respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles . . . [a]nd promote their wider application with the approval and involvement of holders of such knowledge."¹⁹² The CBD also endorses the role of patents and other intellectual property rights in so far as they "are supportive of and do not run counter to its objectives."¹⁹³

CBD's qualification of intellectual property rights suggests that it is mindful of the limitations of the orthodox intellectual property system and its inherent crisis of legitimacy in relation to local knowledge, especially in regard to biodiversity conservation. However, the author is mindful of some of the criticisms of the CBD notably, for example, regarding its com-

188. See, e.g., CBD, *supra* note 17, art. 8(j).

189. See CBD, *supra* note 17, art. 1.

190. OGUAMANAM, *supra* note 86, at 5.

191. See Convention on Biological Diversity, Article 8(j): Traditional Knowledge, Innovations and Practices Introduction, <http://www.biodiv.org/programmes/socio-eco/traditional/default.asp> (last visited May 21, 2007) [hereinafter CBD Article 8(j)].

192. CBD, *supra* note 17, art. 8(j).

193. See *id.* art. 16(5).

plicity in the sheer privatization and proprietary control of biogenetic resources.¹⁹⁴ Elaborating on those criticisms is outside the scope of this Article. From the general language of the CBD, there is discernible openness to promote the protection of local knowledge forms beyond the conventional intellectual property system.¹⁹⁵ This is a remarkable shift from the TRIPS jurisprudence. As noted, TRIPS is part of the neoliberal political economics of agriculture, which empowers the epistemic narratives of Western agro-science while ignoring alternative knowledge forms embedded in TAPs.

For its over ten years of existence, the CBD framework and programs of work have provided the impetus for developing countries inclined to foster both the legal recognition of traditional knowledge practices and to renegotiate the concomitant issues of equity, especially through the phenomenon of benefit sharing in natural resource exploitation.¹⁹⁶ This is evident in the number of CBD-friendly local knowledge protection statutes at regional and national levels.¹⁹⁷ Collectively, those statutes are clear evidence of a counter-regime movement in the IIPS post-TRIPS. Exploring knowledge protection outside conventional frameworks and the recognition of alternative epistemic narratives to formal Western science are necessary to empower TAPs. Clearly, TAPs are indispensable to food security given their embodiment of indigenous agro-ecological world-views and indigenous dealings with their local agro-diversity. In sum, the CBD is largely responsible for the central place of traditional knowledge in the post-TRIPS re-

194. As a regime aimed at conservation of biological diversity, the CBD is said to be complicit in facilitating its exploitation, even commercialization. See SHIVA, *supra* note 43, at 153; see also Martin & Vermeylen, *supra* note 56, at 37 (arguing that CBD, like TRIPS, is part of a neoliberal approach to resource exploitation, the only significant difference being the former's egalitarian provisions on benefit sharing).

195. For perspectives on cross-cultural trends to intellectual property rights and the role of the CBD and WIPO, see Chidi Oguamanam, *The Protection of Traditional Knowledge: Towards a Cross Cultural Dialogue on Intellectual Property Rights*, 15 AUSTL. INTELL. PROP. J. 34 (2004).

196. Some regional initiatives include the Organization of African Unity's African Model Legislation for the Protection of the Rights of Local Communities, Farmers, and Breeders, and for the Regulation of Access to Biological Resources (2000), http://www.grain.org/brl_files/oau-model-law-en.pdf; and the Andean Community's Decision 391 on the Common Regime on Access to Genetic Resources, <http://www.comunidadandina.org/INGLES/normativa/D391e.htm> (last visited May 21, 2007); and Decision 486 on the Common Intellectual Property Regime, <http://www.comunidadandina.org/INGLES/normativa/D486e.htm> (last visited May 21, 2007). For detailed appraisal of CBD-friendly legislative trends in developing countries in regard to patents, *sui generis* PVP, biodiversity, traditional knowledge, and other alternative legislative initiatives, see GRAIN, Biodiversity Rights Legislation (BRL), <http://www.grain.org/brl/> (last visited May 21, 2007).

197. See, e.g., Genetic Resources Action International (GRAIN)'s global list of Biodiversity Resource's Legislation, available at <http://www.grain.org/brl/> (last visited May 21, 2007).

gime shifting in the IIPs. If fully exploited by developing countries, the Convention's favorable disposition toward traditional knowledge, which includes TAPs, will have positive implications for food security. The extent to which this proposition is realizable is largely dependent on how stakeholders in the international process resolve the inherent conflict between the CBD and the WTO-TRIPS, which occasionally arises as symbolic flash-points of the impact of neoliberal economic reforms on developing countries and custodians of local knowledge globally.

For the most part, the CBD focuses on traditional knowledge in general, while emphasizing those forms of traditional knowledge relevant to biodiversity conservation. For this reason, CBD's relevance to TAPs and the latter's bearing on food security is oblique and can only be explored by a stretched analysis. Consequently, the subject of food security is not recognized as a direct site of the post-TRIPS regime discourse.¹⁹⁸ Nonetheless, in pursuit of its general objectives, CBD has elaborate work programs on agriculture and agro-biodiversity, which are both vital to the food security question. For reasons of scope, the present discussion is restricted to the agro-biodiversity work program.

In 1996, the CBD established a multi-year program on agro-biodiversity.¹⁹⁹ This initiative adopts cross-sectoral approaches to the subject, often in coordination with the FAO, while it also gives regard to the provisions of the ITPGRFA and other relevant initiatives under that work program.²⁰⁰ The agro-biodiversity program focuses on assessment and surveillance of status and trends on global agro-biodiversity; adaptive agro-biodiversity management practices, including local management and technological systems as well as on agro-biodiversity capacity building; and integrated national and global agro-biodiversity policies.²⁰¹ Perhaps most important, it recognized that "[a]gricultural biodiversity is managed by farmers; many components of agricultural biodiversity depend on this human influence; indigenous knowledge and culture are integral parts of the management of agricultural biodiversity."²⁰²

The CBD's agro-biodiversity work program commissions case studies on agro-biodiversity, as well as collates agro-biodiversity-related sections of

198. See the list of literature on the Post-TRIPS regime debate, *supra* note 2.

199. CBD, Agricultural Biodiversity, Work Programme, <http://www.biodiv.org/programmes/areas/agro/programme.asp> (last visited May 21, 2007).

200. See, e.g., CBD, Agricultural Biodiversity, International Initiative for the Conservation and Sustainable Use of Pollinators, <http://www.biodiv.org/programmes/areas/agro/pollinators.aspx> (last visited May 21, 2007); FAO/AGL, Soil Biodiversity and Agricultural Context, <http://www.fao.org/ag/AGL/agll/soilbiod/fao.stm> (last visited May 21, 2007).

201. CBD, Agricultural Biodiversity, Work Programme, *supra* note 199.

202. CBD, Agricultural Biodiversity, Dimensions of Agricultural Biodiversity, <http://www.biodiv.org/programmes/areas/agro/dimensions.aspx> (last visited May 21, 2007).

national reports on biological diversity.²⁰³ Also, it occasionally convenes ad hoc technical expert working groups to examine diverse technical aspects of new technologies and their implications for agro-biodiversity. In recent times, the environmental impacts of GMOs and the effects of biotechnologies in general are of interest to the CBD.²⁰⁴ Specifically, the CBD targets the potential impacts of GURTs on biodiversity, agro-biodiversity, conservation, small-holder farmers, and indigenous and local communities.²⁰⁵

From the results of its examination of GURTs, CBD uncovered potential damning effects of the technologies on biodiversity, biosecurity, farming, food security, the environment, and the socio-cultural lives of indigenous and local communities.²⁰⁶ This resulted in a UN-imposed moratorium on commercial exploitation of the technology.²⁰⁷ According to the CBD report, GURTs have the potential to undermine TAPs and innovations, especially the culture of unhindered exchange or saving of seeds.²⁰⁸ Also, GURTs have the capacity to generally undermine article 8(j) of the CBD, as well as the farmers' rights provision of the ITPGRFA.²⁰⁹ Perhaps more important is that, as technologically disguised forms of intellectual property, GURTs can potentially foster "increase[d] opportunities for appropriation of genetic resources by the developers and owners of the technology, beyond the possibility of hybridisation, outside of the bounds of patents, other intellectual property rights and regulatory systems."²¹⁰ Also, GURTs undercut some public policy-induced practices under conventional intellectual property regimes, such as term limits, farmers', researchers', and breeders' exemptions, and compulsory licensing.²¹¹

In addition to biotechnology or GURTs, CBD's agro-biodiversity program also examines the impacts of the neoliberal trade liberalization agenda on agro-biodiversity. The program has significantly helped to galvanize

203. See CBD, Agricultural Biodiversity, Sections in National Reports on Agricultural Biodiversity, <http://www.biodiv.org/programmes/areas/agro/reports.aspx> (posting national reports submitted to CBD) (last visited May 21, 2007).

204. See CBD, Agricultural Biodiversity, Genetic Use Restriction Technologies (GURTs), <http://www.biodiv.org/programmes/areas/agro/gurts.aspx> (last visited May 21, 2007).

205. See *id.*

206. See CBD, Meeting Minutes, *supra* note 49.

207. See Draft Decisions for the Eighth Meeting of the Conference of Parties to the Convention on Biological Diversity, Curitiba, Braz., Mar. 20-31, 2006, UNEP/CBD/COP/8/1/Add.2 (Mar. 1, 2006), <http://www.biodiv.org/doc/meetings/cop/cop-08/official/cop-08-01-add2-en.pdf>; see also CBD, Decisions From Meetings of the Conference of the Parties, Decision V/5, <http://www.biodiv.org/decisions/default.aspx?m=COP-05&d=05> (last visited May 21, 2007).

208. See CBD, *Report of the Ad Hoc Technical Expert Group*, *supra* note 44.

209. *Id.*

210. See *id.* ¶ 21.

211. See *id.* ¶ 13(b).

public interest and ongoing scrutiny regarding the potential and real impact of biotechnologies and trade liberalization on agro-biodiversity and their implication on food security for indigenous and local communities. Despite pressure from the United States, Canada, and their transnational agribusiness to lift the moratorium on field-testing or commercial exploitation of GURTs, the CBD's platform was vital to sustaining the moratorium imposed in 2000.

In sum, intellectual property's relationship with agro-biodiversity and food security is for the most part oblique. A more nuanced scrutiny of both the PBRs regime and TRIPS' conceptual thrust that endorses only conventional patent criteria and contempt for traditional knowledge uncovers intellectual property's bias for agro-science, and logically, agro-biotechnology. This bias is at the expense of alternative epistemic and philosophical approaches to agriculture. As shown, such approaches are represented in TAPs. The latter provide the best guarantee for agro-biodiversity and food security, especially in indigenous and local communities.

CONCLUSION

The post-TRIPS regime analyses of the IIPS focus on intellectual property's relationship with a number of external regimes, especially health, human rights, culture, biodiversity, and indigenous knowledge. Agro-biodiversity and food security are hardly sites of the regime discourse. However, given the intrinsic relationship between TAPs, agro-biodiversity, and food security in indigenous and local communities demonstrated in this Article, TRIPS' contempt for local knowledge forms provides perhaps an indirect basis for understanding the complicity of intellectual property in the food security question. Because of the CBD, traditional knowledge is a firmly established site of the intellectual property regime discourse. But the all-embracing nature of traditional knowledge has not permitted a thorough inquiry into the ramification of TRIPS' disdain for such knowledge forms and its impact specifically on TAPs, and by extension, agro-biodiversity and food security. In addition, the evolving jurisprudence on farmers' rights as a counter-regime measure to PBRs has yet to engineer any significant change in the status quo from the existing international intellectual property outlook.

Further, given the complex nature of several forces behind the political economics of agriculture, intellectual property is perhaps a less visible or less obvious factor implicated in the agro-biodiversity and food security crisis, especially in comparison to its role in undermining access to drugs and the escalation of a third-world health crisis. Nonetheless, transitions in agro-science and the advent of agro-biotechnology coupled with progressive expansions of intellectual property to all technological spheres compels a

close look at the complicity of intellectual property in the agro-biodiversity and food security crisis.

Without doubt, the TRIPS Agreement is a factor in facilitating the transitions in agro-science and expansion of intellectual property in virtually all spheres of human endeavor. The failure of post TRIPS intellectual property regime analyses to directly co-opt agro-biodiversity and food security demonstrates both the parochial nature of the regime discourse as well as the complex nature of several other factors, including the broader political economics of agriculture, implicated in the agro-biodiversity and food security question. Since recent progress in agro-science, especially agro-biotechnology, and rapid extension of intellectual property rights to the life sciences arena do not result in improvement in the agro-biodiversity and food security situation in indigenous and local communities,²¹² diverse efforts by these communities and the rest of developing countries to protest and resist the marriage of agro-biotechnology and intellectual property warrant a careful audit. Indeed, such efforts ought to constitute a legitimate interest for the post-TRIPS intellectual property regime analyses. Agro-biodiversity and food insecurity raise a crisis of equal proportion to the TRIPS-orchestrated access freeze to essential drugs and the general health care crisis in developing countries.

212. See generally Sharma, *supra* note 51.