Chicago-Kent Journal of Intellectual Property

Volume 13 | Issue 1 Article 2

9-1-2013

Open Innovation in Plant Genetic Resources for Food and Agriculture

Chidi Oguamanam

OPEN INNOVATION IN PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

Chidi Oguamanam[*]

ABSTRACT

Contemporary global order for the promotion of innovation exaggerates the role of intellectual property (IP) as a closed proprietary model of knowledge production and protection. Partly as a boomerang effect of that order and/or partly as a coincidence of the phenomenal rise in the information and communication technologies, there has been increased gravitation toward open, collaborative, shared, communal, and interdependent models of innovation. This trend is typified by the rise of open software movement and cognate endeavors. This Article attempts to transpose the open innovation dynamic to the context of plant genetic resources for food and agriculture (PGRFA); and draws attention to the customary seed sharing and exchange as the centerpiece of the inherent open nature of innovation in agriculture, especially in indigenous and local communities. Focusing on the emergent institutional and legal frameworks for the governance of PGRFA, this Article finds that they reflect pragmatic attempts at melding both the IP-driven closed model and the accommodation of open- or public-goods approach toward the promotion of access and overall management of innovation in PGRFA. It concludes that IP is not necessarily antithetical to open innovation, but could be calibrated to advance it.

INTRODUCTION

Since the last quarter of the twentieth century, the triumph of market fundamentalism has expanded the scope and tightened the protection of intellectual property (IP) rights. Recent changes to IP regimes are rooted in the successful linking of IP with international trade.[1] Through the World Trade Organization's (WTO) agreement on Trade-Related Aspects of Intellectual

---

 LL.B, LL.M, Ph.D. Associate Professor, Faculty of Law, University of Ottawa (Common Law Section) and Faculty at the Centre for Law, Technology and Society. Thanks to Attila H. Rezaie for dedicated research assistance, and to the reviewers of this Article and the editorial team for their extremely helpful interventions.

[1] *See generally* GLOBAL INTELLECTUAL PROPERTY RIGHTS: KNOWLEDGE ACCESS AND DEVELOPMENT (Peter Drahos & Ruth Mayne eds., 2002); PETER DRAHOS WITH JOHN BRAITHWAITE, INFORMATION FEUDALISM: WHO OWNS THE KNOWLEDGE ECONOMY (Oxford Univ. Press 2003).

Property Rights (TRIPs),[2] IP has been promoted as the magic wand for optimal generation and exploitation of innovation, particularly in technological and commercial arenas. Enduring criticisms of the new global IP order revolve around the marginalization of social concerns and public interest impact of innovation.[3] The WTO system in general and the TRIPs global IP regime in particular, are said to have placed too much emphasis on the exclusionary, proprietary control of innovation, resulting in sub-optimal outcomes. Critics charge that the post-TRIPs IP mandate gives little, if any, regard to the dynamic nature of social exchange and the public interest dimensions of innovation and knowledge production.[4] Critics argue that TRIPs' vision of IP rarely accommodates non-proprietary, inclusive and diverse alternative schemes for incentivization of innovation, which are critical for optimal exploitation of innovation in society.

Spurred by information and communication technologies (ICTs), the unyielding pace of socio-cultural and economic transformations has drawn attention to different sets of innovation dynamics.[5] For the most part, these undercurrents coalesce and become discernable through various open-ended internet-driven platforms. Contrary to the thinking that strong private rights-driven and exclusionary IP is the *sine qua non* for vibrant innovation, new realities point toward more open, collaborative, shared and non-proprietary essentials, which have been marginalized under the TRIPs agreement.[6] In essence, digital technology-driven innovation and the overall internet culture unravel the complementary, collaborative, and interoperability of knowledge generation. The result is a convergence in which the producers and users of knowledge participate in a revolving role exchange as mutually-reinforcing stakeholders.

---

[2] Agreement on Trade-Related Aspects of Intellectual Property Rights, Apr. 15, 1994, Marrakesh Agreement Establishing the World Trade Organization, Annex 1C, 1869 U.N.T.S. 299, 33 I.L.M. 1197 (1994), *available at* http://www.wto.org/english/docs_e/legal_e/27-trips.pdf [hereinafter TRIPs].

[3] *See generally* INTELLECTUAL PROPERTY AND HUMAN DEVELOPMENT: CURRENT TRENDS AND FUTURE SCENARIOS (Tzen Wong & Graham Dutfield eds., 2010); SUSAN K. SELL, PRIVATE POWER, PUBLIC LAW: THE GLOBALIZATION OF INTELLECTUAL PROPERTY RIGHTS (2003).

[4] *See generally* INTERNATIONAL PUBLIC GOODS AND TRANSFER OF TECHNOLOGY UNDER A GLOBALIZED INTELLECTUAL PROPERTY REGIME (Keith E. Maskus & Jerome H. Reichman eds., 2005).

[5] *See generally* OPEN DEVELOPMENT: NETWORKED INNOVATION IN INTERNATIONAL DEVELOPMENT (Matthew L. Smith & Katherine M. A. Reilly eds., 2014).

[6] *See generally* YOCHAI BENKLER, THE WEALTH OF NETWORKS: HOW SOCIAL PRODUCTION TRANSFORMS MARKETS AND FREEDOM (2006); HENRY CHESBROUGH, OPEN INNOVATION: THE NEW IMPERATIVE FOR CREATING AND PROFITING FROM TECHNOLOGY (2003); Yochai Benkler, *Sharing Nicely: On Sharable Goods and the Emergence of Sharing as a Modality of Economic Production*, 114 YALE L.J. 273, 273–80 (2004).

In the new innovation paradigm, it is quite tempting to conceive of openness and inclusiveness as counterpoints to IP, as symbolized in the association of the patent system with the tragedy of the anti-commons.[7] This Article does not deny the value of IP as an incentive for knowledge or innovation; however, experience from TRIPs demonstrates that not only is IP the most hyperbolized form of incentive for innovation, its unbalanced application has the potential to muzzle creativity and yield sub-optimal outcomes.[8] As an aggregation of closed and essentially proprietary frameworks for the exploitation of innovation, IP has differing degrees of suitability for different industrial sectors.[9]

Depending on the contingencies of a given sector, the optimal exploitation of innovation would require a deliberate calibration of both exclusive and open models. An IP system that is too strong undermines economic development and public objectives, which are (or ought to be) at the core of both IP and innovation systems in general. By contrast, an unfettered openness could chill the entrepreneurial investment that is necessary to convert invention into innovation for the common good of society.

This Article seeks to transpose the concept of open innovation associated with ICTs to the realm of plant genetic resources for food and agriculture (PGRFA). Focusing on the new institutional governance regimes under the auspices of the International Treaty on Plant Genetic Resources for Food and Agriculture (the Treaty)[10] and the Consultative Group on International

---

[7] Activities of corporations engaged in buying of patents and aggregation into large portfolios with a view to licensing them to third parties (so-called patent trolls) are fingered as serious threats to innovation as they put opportunistic barriers to effective use of knowledge and are counterproductive to the essence of the IP system. For example, while uncritical extension of patents to life forms results in the use of patent claims to circumscribe access to platform science and information (such as those relating to genes), patent pools also represent creative application of the patent system to stimulate R&D and knowledge transmission in critical areas. *See generally* John L. Turner, Patent Thickets, Trolls and Unproductive Entrepreneurship (May 1, 2013) (unpublished manuscript), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1916798. See Michael A. Heller & Rebecca S. Eisenberg, *Can Patents Deter Innovation? The Anticommons in Biomedical Research*, 280 SCIENCE 698, 698–701 (1998), for a discussion on patents and anticommons.

[8] *See* Heller & Eisenberg, *supra* note 7, at 698–701.

[9] For example, analysts agree that the pharmaceutical sector is the most successful and effective sector for the application of patents. *See* MEIR PEREZ PUGATCH, THE INTERNATIONAL POLITICAL ECONOMY OF INTELLECTUAL PROPERTY RIGHTS 76–100 (2004); Chidi Oguamanam, *Patents and Pharmaceutical R&D: Consolidating Private-Public Partnership Approach to Global Public Goods Crises*, 13 J. WORLD INTELL. PROP. 556, 556–80 (2010).

[10] International Treaty on Plant Genetic Resources for Food and Agriculture, Nov. 3, 2001, *available at* ftp://ftp.fao.org/docrep/fao/011/i0510e/i0510e.pdf [hereinafter Treaty].

Agricultural Research (CGIAR),[11] this Article examines the emerging potential for open and closed innovation models to co-exist in the agricultural arena. It reflects on the ramifications of new dynamics developed in ICTs for collaborative sourcing of innovation in agriculture across diverse epistemic realms. Finally, this Article considers how pragmatic approaches to open and closed models predispose society for optimal uptake of the benefits of innovation in agricultural bio-technology in general, and with special application to the world's poor.

I. OPEN INNOVATION, IP, AND DEVELOPMENT

The concept of *openness* in the discourses of innovation, IP, and development is fairly new.[12] According to Jeremy de Beer et al.:

> Potential confusion around the concept stems from the elusiveness of agreement about what *openness* is. Whether a system can be considered open or not depends on a variety of factors including, significantly, the degree to which people are free, or even empowered, to universally access a system and to participate, collaborate and share within that system.[13]

The application of the concept of openness in the contexts of innovation, IP, and development, is currently in a state of evolution.

In a simplified way, openness—in relation to the study of innovation, IP, and development—is concerned with the various and complex systemic dynamics affecting inclusive generation, access, or distribution of knowledge and information. The goal of openness is to encourage optimal translation of benefits toward the advancement of developmental goals. The specter of openness hovers across various sites of innovation: technological inventions, commercial exploitations, and omnibus socio-cultural dynamics in which stakeholders deal with innovation. According to one analyst, "[s]ocial

---

[11] *See* CGIAR, http://www.cgiar.org/ (last visited Jan. 10, 2014).

[12] *See generally* CHESBROUGH, *supra* note 6; OPEN INNOVATION: RESEARCHING A NEW PARADIGM 1–2 (Henry Chesbrough, Wim Vanhaverbeke & Joel West eds., 2006); Organisation for Economic Co-Operation and Development, *Open Innovation in Global Networks* (Nov. 2008), *available at* http://www.oecd.org/sti/inno/41721342.pdf. See JOSEPH A SCHUMPETER, THE THEORY OF ECONOMIC DEVELOPMENT: AN INQUIRY INTO PROFITS, CAPITAL, CREDIT, INTEREST AND THE BUSINESS CYCLE 3–75 (Redvers Opie trans., Harvard Univ. Press 1934) and JOSEPH A SCHUMPETER, 1 BUSINESS CYCLES: A THEORETICAL, HISTORICAL, AND STATISTICAL ANALYSIS OF THE CAPITALIST PROCESS 84–86 (McGraw-Hill 1939), for earlier foundation on theorization of open and social innovation.

[13] Jeremy de Beer, Chidi Oguamanam & Tobias Schonwetter, *Innovation, Intellectual Property and Development Narratives in Africa, in* INNOVATION & INTELLECTUAL PROPERTY: COLLABORATIVE DYNAMICS IN AFRICA 8 (Jeremy de Beer et al. eds., 2013); *see* OPEN DEVELOPMENT: NETWORKED INNOVATION IN INTERNATIONAL DEVELOPMENT, *supra* note 5, at 3–5, 30.

innovation is understood as a broad term that contains multiple dimensions [including] behavioural, cultural, organizational, structural, institutional, political and regulatory innovation."[14] Social renditions of innovation are intricately tied to all aspects of innovation in symbiotic relationships as sites for the bridging, translating, and harnessing of technological and commercial innovation. While technological innovations have significant impact on social innovation (consider, for example, the manner in which the internet has transformed traditional work ethic and overall social relations globally), it is also critical in supervising the impact of technological and commercial innovations on society.

In a similar vein, as a key mechanism for the overall governance and rewarding of various renditions of innovation and creativity, IP is an important factor in determining and influencing the uptake efficiency of innovation. Consequently, it has an optimal or suboptimal impact on society. IP is not inherently allergic to the promotion of social innovation and the accommodation of its social interest considerations.[15] Rather, the lack of balance in its application continues to create doubts over the instrumentality of IP in promoting social innovation and broader developmental objectives. After all, IP and open innovation are hardly ends in themselves. Consequently, fairly recent attempts at mapping the intersection of open innovation and IP within interdisciplinary inquiries focus, on how best the concepts could interact and contribute to development. As an outcome, such interaction has potential to address global inequity, democratize creative processes, extend the benefits of innovation, uplift the quality of human life, and advance the optimal realization of human potential, especially among the most vulnerable members of the human family.[16] At this juncture, a rough sketch of elements of open innovation is helpful.

---

[14] Sa Yu, Innovation as Capability and Freedom: Charting a Course of TRIPS Patent Protection in a Fair and Balanced Global Innovation System 27 (2013) (unpublished LL.D. dissertation, University of Ottawa), *available at* http://www.ruor.uottawa.ca/en/bitstream/handle/10393/24357/Yu_Sa_2013_thesis.pdf?sequence=1.

[15] Indeed, whether in its statutory or common law renditions, intellectual property has built-in mechanisms for balancing private and public interests.

[16] *See* INNOVATION & INTELLECTUAL PROPERTY: COLLABORATIVE DYNAMICS IN AFRICA 1–12 (Jeremy de Beer et al. eds., 2013); *see generally* INDIGENOUS PEOPLES' INNOVATION: INTELLECTUAL PROPERTY PATHWAYS TO DEVELOPMENT (Peter Drahos & Susy Frankel eds., 2012); INTELLECTUAL PROPERTY AND HUMAN DEVELOPMENT: CURRENT TRENDS AND FUTURE SCENARIOS, *supra* note 3.

Applications of digital technology have put a spotlight on open innovation.[17] The Internet provides a foundational example of the limitless possibilities for information aggregation, dissemination, and democratization through open innovation. Arguably, though, the concept of open innovation is hardly novel. Innovation is inherently open to the extent that openness characterizes or depicts, in an ex post facto sense, universally-shared impressions on the nature of the innovation process as one that "rests on a public domain of ideas."[18] However, the uniqueness of open innovation arises when openness is a referential or comparative designation in relation to alternatives, especially the closed models that are usually (though, less accurately) associated with IP. Rarely is any innovation system completely closed or completely open. Everything is a matter of degree. Comparatively, open innovation emphasizes or depicts the flexibility in the generation, transition, translation, and transformation of information or knowledge across internal and external stakeholders in the innovation process. It captures the conduct of innovation in the framework of collaboration, collectivity, and community by promoting network-building, sharing and democratic participation. It also capitalizes on the incremental nature of innovation, the interdependence of knowledge systems, and all the actors in the innovation process—not the least of which are generators and users of innovation. Rather than latch onto any perceived demarcation between these two categories, the open innovation paradigm recognizes the interaction between them as a healthy extension of the innovation process.

II. FRAMEWORK FOR INNOVATION IN PLANT GENETIC RESOURCES

The governance of innovation in the realm of PGRFA implicates complex institutional, regimented and plural epistemic dynamics. Detailed explorations of these dynamics abound in literature.[19] However, a brief review of the three pivotal regimes relevant to proprietary control of innovation in agricultural production—TRIPs, the International Undertaking on Plant Genetic Resources

---

[17] *See generally* OPEN DEVELOPMENT: NETWORKED INNOVATION IN INTERNATIONAL DEVELOPMENT, *supra* note 5, at 3; MANUEL CASTELLS, THE RISE OF THE NETWORKED SOCIETY (2d ed., Wiley-Blackwell 2000); *see also* CHIDI OGUAMANAM, INTELLECTUAL PROPERTY IN GLOBAL GOVERNANCE: A DEVELOPMENT QUESTION (2012).

[18] Hassan Masum et al., *Open Source Biotechnology Platforms for Global Health and Development: Two Case Studies*, *in* OPEN DEVELOPMENT: NETWORKED INNOVATION IN INTERNATIONAL DEVELOPMENT, *supra* note 5, at 114.

[19] *See generally* AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, SEEDS AND SOVEREIGNTY: DEBATE OVER THE USE AND CONTROL OF PLANT GENETIC RESOURCES (Jack R. Kloppenburg Jr. ed., 1988); IKECHI MGBEOJI, GLOBAL BIOPIRACY: PATENTS, PLANTS AND INDIGENOUS KNOWLEDGE (2006); JACK RALPH KLOPPENBURG JR., FIRST THE SEED: THE POLITICAL ECONOMY OF PLANT BIOTECHNOLOGY (2d ed., University of Wisconsin Press 2004).

for Food and Agriculture, and the International Union for the Protection of New Varieties of Plants—is necessary. PGRFA is an expression most popularized by the work of the United Nations Food and Agricultural Organization (FAO).[20] The phrase recognizes the multiple purposes and applications of plant genetic resources, such as in medicine, forestry, and broader plant ecological diversity. However, despite the interconnectedness of biotic elements, including plant and animal genetic resources as an ecological whole, the focus of PGRFA is on the jurisdictional mandate of the FAO.[21] Even though it conveniently helps in navigating the inherent regime overlap between diverse institutions and international instruments, PGRFA is hardly an ideal demarcation.

The governance of PGRFA has been a historically contentious subject matter for a number of reasons.[22] First, PGRFA constitutes a crucial part of global biological resources.[23] They are at the core of global biological diversity. Second, global biological resources and biodiversity are predominately concentrated in the global south, or so-called Vavilov's centers of diversity.[24] Home to most of the world's indigenous and local communities, this region constitutes the original sources of the world's most important food crops, as well

---

[20] This is especially due to the work of the FAO Commission on Genetic Resources for Food and Agriculture, which was originally charged by the FAO to address issues relating to PGRFA—a mandate that has since been broadened. *History*, Commission on Genetic Resources for Food and Agriculture, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, http://www.fao.org/nr/cgrfa/cgrfa-about/cgrfa-history/en/ (last visited Jan. 12, 2014).

[21] The jurisdictional mandate is in relation to FAO's commitment to improve agricultural productivity and hunger eradication. *See About FAO: What We Do*, FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS, http://www.fao.org/about/what-we-do/en/ (last visited Jan. 13, 2014). The role of plant genetic resources in agricultural production remains central to the realization of the FAO mandate. For example, FAO supervises two important international treaties on plants, namely the 1951 International Plant Protection Convention and the 2001 International Treaty on Plant Genetic Resources for Food and Agriculture. *See The International Plant Protection Convention (IPPC)*, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, http://www.fao.org/docrep/003/x6730e/x6730e09.htm (last visited Jan. 13, 2014); THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE, http://www.planttreaty.org/ (last visited Jan. 13, 2014).

[22] *See generally* MGBEOJI, *supra* note 19; KLOPPENBURG, *supra* note 19.

[23] The link between biodiversity and PGRFA explains the reason for the expansion of the mandate of the Commission on Plant Genetic Resources for Food and Agriculture in 1995 to include "all components of biodiversity of relevance to food and agriculture." *See History*, *supra* note 20.

[24] These are areas associated with the highest degree of genetic diversity and the geographical locations linked with the evolution of agriculture based on insight from the works of Russian and U.S. scientists Nikolai Vavilov and Jack Harlan. *See generally* W. B. Turrill, *Studies on the Origin of Cultivated Plants*, 118 NATURE 392 (1926).

as key industrialized plant products.[25] Third, given the well-recognized dependence between overall health of global biodiversity and global food supply, the former has been approached as a common concern of humankind.[26] Recent international legal developments, especially those pursuant to the Convention on Biological Diversity (CBD),[27] help to clarify the status of biological resources, including PGRFA, as national patrimony of the states in which they are located.[28] Fourth, despite the concentration of PGRFA in centers of diversity, recent transitions in agricultural production, especially in regard to agricultural biotechnology, reflect an unprecedented exploitation of PGRFA outside the centers of diversity by industrialized countries.[29] This exploitation via the deployment of technological superiority is enhanced by the expansion of the scope of IP under the TRIPs agreement to the realm of plant genetic resources in general.[30] Fifth, because plant genetic resources—which, for all practical purposes, refer to seeds and other propagating materials of plant origin—constitute critical raw materials at the center of informal and formal agricultural production, innovation, and global food security, the control of seeds is subject to the political economics of agriculture and international trade.[31] In this political-economic matrix, the expanded scope of IP under TRIPs has increased tension in the debate between stakeholders in the centers of diversity and their industrialized counterparts on how best to ensure sustainability for equitable access to PGRFA and the benefits arising from associated innovations.

The legal options for alleviating this tension appear as a hydra-headed interplay of open and closed approaches to innovation in the realm of PGRFA. One of the earliest attempts to broach the idea of equitable access and sharing of benefits of innovation associated with the use of PGRFA is colloquially known

---

[25] *Id*.

[26] *See* Chidi Oguamanam, *Biological Diversity*, *in* ROUTLEDGE HANDBOOK OF INTERNATIONAL ENVIRONMENTAL LAW 209–18 (Shawkat Alam et al. eds., 2012).

[27] Convention on Biological Diversity, June 5, 1992, 1760 U.N.T.S. 79, 31 I.L.M. 818, *available at* http://www.cbd.int/doc/legal/cbd-en.pdf [hereinafter CBD].

[28] *Id.* arts. 3, 15(1).

[29] 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, 275 (2006).

[30] TRIPs, *supra* note 2, art. 27.

[31] *See generally* MGBEOJI, *supra* note 19; KLOPPENBURG, *supra* note 19; GENE TRADERS: BIOTECHNOLOGY, WORLD TRADE, AND THE GLOBALIZATION OF HUNGER (Brian Tokar ed., 2004).

as the idea of a "doomsday vault."[32] In 1983, the FAO Conference adopted via Resolution 8/83 the International Undertaking on Plant Genetic Resources for Food and Agriculture (the Undertaking).[33] This non-binding instrument was supervised by the FAO's Commission on Genetic Resources for Food and Agriculture (CGRFA)[34] and aimed at promoting "international harmony in matters regarding access to plant genetic resources for food and agriculture [and to] ensure that plant genetic resources of economic and/or social interest, particularly for agriculture, will be explored, preserved, evaluated and made available for plant breeding and scientific purposes."[35] Pursuant to the idea of genetic resources as common concern of mankind, the Undertaking articulated the framework for access and use of key plant germplasm sourced mainly from centers of diversity which were stored in ex situ global seed banks, identified as the International Agricultural Research Centers (IARCs).[36] In the conduct of their research and development (R&D), these centers maintained loose federating relations with the CGIAR within a framework of public-private partnerships.

Pursuant to a 1994 CGIAR-IARCs agreement with FAO,[37] the IARCs ex situ seed banks held the designated germplasm in trust and were required to ensure that dealings thereto did not undermine the interest of stakeholders,

---

[32] In 2010, Norway inaugurated The Svalbard Global Seed Vault to serve as a backup to the world's 1,400 other seed banks. *See* F. William Engdahl, *"Doomsday Seed Vault" in the Arctic – Bill Gates, Rockefeller and the GMO Giants Know Something We Don't*, GLOBAL RESEARCH (Dec. 4, 2007), http://www.globalresearch.ca/doomsday-seed-vault-in-the-arctic-2/23503. This frozen vault is expected to store an estimated 4.5 million seed samples sourced from around the globe and to shield them from known and unknown threats including climate change, war, natural disasters, pests and ecological negative uncertainties. *See CGN Seeds in the Svalbard Global Seed Vault: FAQ's*, WAGENINGEN UR, http://www.wageningenur.nl/en/show/CGN-seeds-in-the-Svalbard-Global-Seed-Vault-FAQs.htm (last visited Jan. 19, 2014).

[33] International Undertaking on Plant Genetic Resources, FAO Resolution 8/83, *in* Report of the Conference of FAO, Food and Agriculture Organization of the United Nations, 22d Sess., P285, U.N. Doc 83/REP (1983), *available at* http://apps3.fao.org/wiews/docs/Resolution_8_83.pdf [hereinafter Undertaking].

[34] *International Undertaking on Plant Genetic Resources for Food and Agriculture*, Commission on Genetic Resources for Food and Agriculture, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, http://www.fao.org/ag//CGRFA/iu.htm (last visited Jan. 12, 2014).

[35] *See id.*

[36] *See History*, *supra* note 20.

[37] CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH, *Agreement with FAO to Place CGIAR Center In-Trust Collections of Plant Genetic Resources Under the Auspices of the FAO* (May 9, 1994), *available at* http://library.cgiar.org/bitstream/handle/10947/149/cg9405c.pdf?sequence=1.

especially farmers in the source countries.[38] Specifically, article 3(a) and (b) of the agreement provides as follows:

> (a) The Center shall hold the designated germplasm in trust for the benefit of the international community, in particular the developing countries in accordance with the International Undertaking on Plant Genetic Resources and the terms and conditions set out in this Agreement.
>
> (b) The Center shall not claim legal ownership over the designated germplasm, nor shall it seek any intellectual property over that germplasm or related information.[39]

Notwithstanding the 1994 agreement, dealings in designated germplasm by the IARCs and their partners lacked transparency and accountability.[40] There was no enthusiasm amongst developed countries and private sector actors to develop a juridical framework to support the spirit, let alone the letter, of the Undertaking. Rather, developed countries insisted upon interpretative curtailment of the Undertaking to avoid interference with their commitment to a special form of IP, namely plant breeders' rights.[41] This lukewarm attitude was hardly surprising for two major and interrelated reasons. The first is the expansion of the scope of IP protection in the agricultural sector. The second is the nature of technological or innovative transitions in agricultural production, especially since the middle of twentieth century, and the re-configuration of actors and stakeholders.[42]

Regarding these two reasons, "the discovery of recombinant DNA technology in the 1970s and the gradual uptake of insights thereof in the realm of agricultural genomics and broader biotechnologies resulted in greater private sector interest in agriculture."[43] Modern ag-biotechnology involves the applications of molecular genetics or biological processes in agriculture via the identification and direct selection of natural strains associated with functional or desirable traits for the manipulation of plant and animal forms for food and

---

[38] *Id.* Annex 1, arts. 2, 3.

[39] *Id.* Annex 1, art. 3.

[40] *See generally* MGBEOJI, *supra* note 19.

[41] Oguamanam, *supra* note 29, at 285.

[42] This transition is evident in the emergence of allied mega agro-biotech and chemical corporations and the quickened pace of R&D in agricultural biotechnology, especially genetic modification since the last quarter of the twentieth century.

[43] Chidi Oguamanam, *Implementing the International Treaty on Plant Genetic Resources for Food and Agriculture – Regulatory and Intellectual Property Outlook*, *in* INNOVATION IN AGRICULTURAL GENOMICS: OVERCOMING COMPLEXITIES IN THE INTELLECTUAL PROPERTY–REGULATORY COMPLEX (Emily Marden & Nelson Godfrey eds., forthcoming 2014) (on file with the author).

nutrition.[44] As part of modern biotechnology, ag-biotechnology involves limitless innovation possibilities and strategies mainly based on cell fusion/injection through vitro nucleic acid strategy, with which it is possible to innovate across taxonomic boundaries.[45] It represents an effective and attractive alternative to conventional breeding and selection. In addition to being a radical model of innovation in agricultural production, ag-biotechnology is also a site for the advancement of technology and proprietary control of the inherent propagating character of seeds or genetic resources, as evident in the so-called "terminator"[46] and other technology control measures.

Ag-biotechnology is a resource- and R&D-intensive endeavor. On that basis, the argument for strong IP protection finds easy traction as a pre-condition for private sector investments in the field.[47] Upon the heels of post-cold war market economic fundamentalism and shrinking of public investment and R&D in agriculture and other endeavors, the TRIPs agreement symbolized a radical shift away from the historical reluctance of IP jurisprudence to extend IP protection to life forms. Through its article 27—the so-called "biotechnology clause"—TRIPs extends patent protection, with subtle and minimal exception, to inventions in all fields of technology.[48] Specifically, in article 27(3)(b), it provides that parties "shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof."[49] This provision is significant mainly because, before TRIPs, developing countries had no obligation in international law to extend any form of IP protection to innovation in plant genetic resources or agriculture. In practice, many of those countries did not extend IP protection to pharmaceutical and agricultural innovations, an approach dictated by their national interests in ensuring easy access to food and medicines by their impoverished populations.[50]

---

[44] Chidi Oguamanam, *Agro-Biodiversity and Food Security: Biotechnology and Traditional Agricultural Practices at the Periphery of International Intellectual Property Regime Complex*, 2007 MICH. ST. L. REV. 215, 222 (2007).

[45] The Cartagena Protocol on Biosafety to the Convention on Biological Diversity art. 3(i), Jan. 29, 2000, 2226 U.N.T.S. 208, 39 I.L.M. 1027.

[46] *See* Thom Van Dooren, *Terminated Seed: Death, Proprietary Kinship and the Production of (Bio)Wealth*, 16 SCIENCE AS CULTURE 71, 71 (2007).

[47] *See* PAUL W. HEISEY, C.S. SRINIVASAN, & COLIN THIRTLE, U.S. DEP'T OF AGRIC., AGRIC. INFO. BULL. NO. 772, PUBLIC SECTOR PLANT BREEDING IN A PRIVATIZING WORLD (2001); *see also* ECONOMIC AND SOCIAL ISSUES IN AGRICULTURAL BIOTECHNOLOGY 18–20 (R. E. Evenson, V. Santaniello & D. Zilberman eds., 2002).

[48] TRIPs, *supra* note 2, art. 27.

[49] *Id.* art. 27(3)(b).

[50] This was consistent with the flexibility enjoyed by member states to the Paris Convention for the Protection of Industrial Property. Paris Convention for the Protection of Industrial Property, Mar. 20, 1883, 21 U.S.T. 1583, 828 U.N.T.S. 305.

In contrast, IP protection for innovation around plant genetic resources was embraced mainly by industrialized countries well before TRIPs.[51] Even then, it was limited for the most part to a sui generis form of protection, namely plant breeders' rights.[52] Plant breeders' rights are a quasi-IP form below patent standard, and they are directly amenable to the science and technology of plant breeding. The use of plant breeders' rights found favor especially in countries outside the centers of origin and crop diversity.[53] The technological sophistication of industrialized countries, their head-start in plant breeding, and medium scale private sector activism in that sector made the idea of plant breeders' rights attractive.[54] Beyond having plant breeders' rights in their national statutes, these countries belonged to an elite organization for the multilateral promotion of plant breeders' rights under the umbrella of the International Union for the Protection of New Varieties of Plants (UPOV).[55] As Graham Dutfield rightly noted, despite various revisions of the original text of the UPOV, its central mission is to privilege and promote the interests of plant breeders through the facilitation of the exchange of protected or proprietary seed varieties among them, while restricting access to plant-breeders'-rights-protected farm-saved seeds or propagating materials against indigenous and local community (ILC) farmers.[56] The UPOV and the plant breeders' rights systems created a hurtful dichotomization of breeders and farmers.[57] This artificial division is non-existent in the agricultural traditions of many ILCs where breeding is an integral aspect of farming and traditional agriculture practices. Overall, the UPOV and plant breeders' rights subject the "rights" of traditional farmers to those of more organized plant breeders.

The above review of the three pivotal regimes relevant to proprietary control of innovation in agricultural production unveils a dynamic correlation of actors and power relations in the control of seed. First, the Undertaking foreshadows the struggle of ILCs in the centers of origin to promote farmers' rights, which is explored later. Second, the UPOV represents the stakes of sub-sectoral stakeholders in the metamorphosis of agricultural innovation, namely the breeders. Historically, breeders are mainly family-based enterprises, research

---

[51] Oguamanam, *supra* note 29, at 280–81.

[52] *Id*. at 279.

[53] *Id*. at 282.

[54] For a historical perspective on intellectual property in agriculture in industrialized countries see Graham Dutfield, *Turning Plant Variety into Intellectual Property: The UPOV Convention*, *in* THE FUTURE CONTROL OF FOOD: A GUIDE TO INTERNATIONAL NEGOTIATIONS AND RULES ON INTELLECTUAL PROPERTY, BIODIVERSITY AND FOOD SECURITY 27–47 (Geoff Tansey & Tasmin Rajotte eds., 2008).

[55] INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS, http://www.upov.int/portal/index.html.en (last visited Jan. 13, 2014).

[56] *See* Dutfield, *supra* note 54.

[57] *Id*.

institutions, or medium-level industrial actors.[58] Third, while making no reference to indigenous knowledge or farmers' rights, TRIPs' extension of double-layered IP protection (i.e., patents and plant breeders' rights) represents an accommodation of the interest of large-scale transnational ag-biotechnology companies. While farmers' rights remain inchoate in regard to their practical and jurisprudential ramifications, membership of UPOV is voluntary, and its obligations and rights apply only to union members. On the other hand, obligations under TRIPs extend to all member countries of the WTO. Under that framework, those obligations are strongly enforced by trade sanctions pursuant to TRIPs' dispute resolution mechanism.[59]

In sum, these core instruments depict the continual legal responses to knowledge progression and transitions in agriculture. Also, they illustrate the dynamic nature of power relations and struggle amongst undergirding actors. Traditional farming communities' open culture of seed exchange and sharing is muzzled by self-serving plant breeders' rights sponsored by plant breeders. Plant breeders' rights maintain outwardly closed (against farmers and non-plant breeders) but inwardly open innovation (among its members) models in plant breeding. Lastly, TRIPs' induction of patents into the agricultural innovation area compels compliance with the more strict conventional standards of patentability (novelty,[60] usefulness,[61] and nonobviousness[62]). These sets of standards are best suited for high-tech agricultural endeavors through various aggregations of ag-biotechnology. However, as the science of plant breeding continues to advance in the light of progression in agricultural genomics, the idea of a sub-patent standard for plant breeders' rights may no longer be a viable proposition in law. The practical melding of the standards of innovation in seed-breeding and agricultural biotechnology signals an uncertain future for seed breeders as actors in the agriculture sector. Moreover, frequent cross-sectoral convergences and corporate acquisitions by ag-biotechnology corporations reinforce the idea of seed breeders as potential targets of acquisition and strategic displacement.[63]

---

[58] *Id.*

[59] *See* TRIPs, *supra* note 2, arts. 63, 64.

[60] 35 U.S.C. § 102 (2006).

[61] *Id.* § 101.

[62] *Id.* § 102.

[63] Global Industry Analysts, Inc., AGRICULTURAL BIOTECHNOLOGY – A GLOBAL STRATEGIC BUSINESS REPORT (Oct. 2012) (Key global players in ag-biotech and allied technologies such as Bayer CropScience Ag, Dow AgroSciences, Mycogen Seeds, Emerald BioAgriculture Corporation, Monsanto Corporation, Pioneer Hi-Bred International Inc., Syngenta Ag, Dupont, etc. progressively engage in strategic acquisitions of small and medium scale seed industries thereby supervising the obliteration of the latter through this form of strategic convergence.).

III. OPEN INNOVATION IN THE CONTEXT OF ILCS' AGRICULTURAL PRACTICES

What do the indigenous and local community farmers have in common with the processes of innovation in ag-biotechnology and in ICTs? First, the actors in all three sectors are innovators. Second, as the mainstay of their endeavors in innovation, they are all involved in the process of knowledge generation and management. Third, they are all involved in continual nurturing of an evolving and responsive culture of innovation. Perhaps more importantly, they share in the commonality of the constitutive elements of that culture on diverse scales. As indicated earlier, that culture is constituted, to a varying degree, by collaboration, networking, and democratic participation.

ILC farmers, especially those in the centers of diversity and crop origin are custodians of crucial PGRFA. Their millennial stewardship of these resources has been successful, for the most part, through the communal and shared systems of knowledge production as typified by the sacrosanct culture of seed sharing and exchange. Across most cultures in ILCs, seed is a sacred symbol of fertility, propagation, and trans-generational sustainability.[64] For example, historically, most agrarian communities in Africa practice careful selection of premium seeds of endemic stable crops and breeds of domestic farm animals. Aside from social and economic prestige that accompany these traditionally-recognized wealth portfolios, their value lies also in cultural and social propagation via marriage protocols.[65] These agricultural resource capitals are often gifted or bequeathed to new couples as part of traditional marriage ritual. The gifts represent both practical and symbolic capital with which the newly married are expected to start their traditional agrarian life. As a socially-negotiated splinter unit of their families, the status of new couples correlates, in a way, to that of the bequeathed genetic resources. Collectively, the couple and the genetic resource capital represent symbols both for and of selective continuity of desirable progeny of human and plant/animal genetic stock. The couple and the resources embody a networked, collaborative, and intergenerational continuity of open and shared agricultural production, innovation, and sustainability.

---

[64] Naomi Roht-Arriaza, *Of Seeds and Shamans: The Appropriation of the Scientific and Technical Knowledge of Indigenous and Local Communities*, 17 MICH. J. INT'L L. 919, 956 (1996); *see also* VANDANA SHIVA, STOLEN HARVEST: THE HIJACKING OF THE GLOBAL FOOD SUPPLY 7–8 (2000) (arguing that food security of indigenous and local communities is in the 'seed', the first link in the food chain).

[65] Among the Igbo of Southern Nigeria, marriage protocols and rituals are associated with agriculture and farming, and they are officiated most often by references to agrarian analogies and symbolisms. *See, e.g.*, UCHE LYNN-TERESA UGWUEZE, AFRICAN CULTURE, IDENTITY AND AESTHETICS: THE IGBO EXAMPLE 39–43 (2011).

In many indigenous and local farming communities, genetic revolutions happen in farmers' fields through careful observations of accidentally-occurring genetic mutations in nature and through targeted selections of desirable traits and strategic elimination of undesirable ones.[66] In these regions generously endowed with genetic diversity, such selections account for the sustainable demarcation of domestic and wild relatives of traditional landraces through the healthy accommodation of a rich genetic reservoir, in contrast to the monocultural thrust of industrial agricultural production. Selections by indigenous farmers reflect even the most sophisticated subtleties. Weather dynamics such as drought, frost, pest resistance, and other vagaries are often computed into equally sophisticated and scientific meteorological insights.[67] In contrast to modern biotechnology, this form of innovation is essentially incremental. On the surface, it appears not to reflect the hallmarks of frontier or radical innovation. However, modern biotechnology is inescapably dependent on the knowledge systems that have historically sustained the global stock of genetic diversity. Without biodiversity, there would be little, if any, biotechnology.

Although outside the scope of this Article, it is worth noting that the process of agricultural production and innovation in many indigenous and local farming communities is weaved around complex communal processes of cultural production. Farming is essentially a cultural process and a way of life, implicating all units of the social structure, from individuals and families to ethnic, kinship, or tribal platforms.[68] Also, it implicates power and gender dynamics, especially in regard to gender roles and land ownership structure.[69] The reification of "the culture in agriculture"[70] in ILCs is the cooperative and

---

[66] Chidi Oguamanam, *Tension on the Farm Fields: The Death of Traditional Agriculture?*, 27 BULL. SCI. TECH. & SOC. 260 (2007).

[67] *See, e.g.*, A. L. Kijazi, L. B. Chang'a, E. T. Liwenga, A. Kanemba, & S.J. Nindi, *The Use of Indigenous Knowledge in Weather and Climate Prediction in Mahenge and Ismani Wards, Tanzania*, 6 J. GEOGRAPHY & REG'L PLANNING 274, 274–79 (2013).

[68] OGUAMANAM, *supra* note 17, at 106.

[69] *See* SOFTA TEAM & CHERYL DOSS, THE FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS, AGRICULTURAL DEVELOPMENT ECONOMICS DIVISION, THE ROLE OF WOMEN IN AGRICULTURE 20 (2011), *available at* http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=books&cd=1&ved=0CDAQFjAA&url=http%3A%2F%2Fwww.fao.org%2Fdocrep%2F013%2Fam307e%2Fam307e00.pdf&ei=uW7VUv24G5OrqQGi2oGIAg&usg=AFQjCNG9BTwU3cG_--_UXXOl5xJI8oXz4A&sig2=c13iJYh7OTWbgSkNxyFCRQ; *see also Research on Gender and Agriculture*, CGIAR, http://www.cgiar.org/our-research/research-on-gender-and-agriculture/ (last visited Jan. 14, 2014).

[70] *See* SHELDON KRIMSKI & ROGER WRUBEL, AGRICULTURAL BIOTECHNOLOGY AND THE ENVIRONMENT: SCIENCE, POLICY AND SOCIAL ISSUES 213 (University of Illinois Press 1996) (Agriculture is a cultural process and a way of life, as opposed to merely a model of production depicted by agricultural biotechnology and its industrial and corporate support systems.).

collaborative system of sourcing farm labor and farm resources such as seeds or other genetic materials through a trans-generational, networked process of open knowledge exchange.

But it is hardly as if the system of agricultural innovation in ILCs is totally open. It, too, adapts to complexly layered forms of individual, communal, or collective credit or reward for contributions to knowledge and innovation. That said, unlike the conventional IP system where exclusionism and proprietary control dominate, here we see consideration of openness, interdependence, and sustainability as pillars of knowledge production. Thus, before openness was fashionable it was of obligate first nature in agricultural traditions and overall knowledge production in ILCs.

IV. MODELING OPEN INNOVATION IN PGRFA

Legal control of innovation in PGRFA remains relatively unexamined from the perspective of open innovation.[71] From that vantage, however, one can trace the pathways for modeling open innovation in PGRFA to specific and general developments in international law-making and policy. On the one hand, the 1983 Undertaking and its incarnation in the 2001 Treaty symbolize the specific context for the recognition and advancement of an open approach to innovation in PGRFA. On the other hand, the more general and contemporaneous context for the elaboration of the concept of access- and benefit-sharing (ABS) under the framework of the CBD and its various work programs represent a broad context for open innovation in PGRFA.

The CBD framework involves a wider scope and incorporates genetic resources relevant to biodiversity conservation, which includes plant, forest, and aspects of marine and other forms of biodiversity.[72] The CBD and the Rio Declaration on Environment and Development[73] are part of the 1992 United Nations Conference on Environment and Sustainable Development. Along with other instruments resulting from that summit,[74] it builds upon the 1972 United

---

[71] *See* Masum et al., *supra* note 18, at 113–28 (For discussion of technology driven form of openness with a focus on global health and peripheral treatment of agriculture). *But see* Ademola A. Adenle et al., *Analysis of Open Source Biotechnology in Developing Countries: An Emerging Framework for Sustainable Agriculture* 34 TECH. IN SOC'Y 256, 259–60 (2012).

[72] *See* Oguamanam, *supra* note 26 (on the jurisdictional scope of the CBD).

[73] Rio Declaration on Environment and Development, United Nations Conference on Environment and Development, U.N. Doc. A/CONF.151/26/Rev.1 (Vol. 1) (1992), reprinted in 31 I.L.M. 874.

[74] *See, e.g.*, *The History of Farmers' Rights in the FAO: CBD and Agenda 21 on Farmers' Rights – and the Response of the FAO*, FARMERS' RIGHTS, http://www.farmersrights.org/about/fr_history_part5.html (last visited Jan. 24, 2014) (1992 U.N. action plan on sustainable development agreed to at the 1992 U.N. Conference of Environment and Development).

Nations Declaration on Human Environment,[75] wherein the role of ILCs and their knowledge system is recognized as one of the fundamental pillars of modern international environmental law.[76] At the heart of the CBD is the commitment of parties in article 8(j) to:

> respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices.[77]

Through its various work programs, the CBD became the catalyst for elaborating the principles of ABS. In 2000, its secretariat issued the Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising Out of their Utilization.[78] From 2000 to 2010, the Guidelines provided the framework for national, regional and international entrenchment of key ABS principles, notably: use of Material Transfer Agreements (MTAs); negotiation of Mutually Agreed Terms (MATs); and securing Prior Informed Consent (PIC) of resource providers and accommodation of monetary and non-monetary aspects of ABS.[79] The 2010 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity[80] marked the consolidation of the Bonn Guidelines into a binding legal instrument pursuant to a resolution of the 2002 Johannesburg World Summit on Sustainable Development.[81] The Nagoya Protocol has yet to come into force.

In addition to promoting ABS and biodiversity conservation, the flurry of activities in the CBD provided the impetus for advancing international

---

[75] Gunther Handl, *Declaration of the United Nations Conference on the Human Environment (Stockholm Declaration), 1972 and the Rio Declaration on Environment and Development, 1992* 7 (2012), *available at* http://legal.un.org/avl/pdf/ha/dunche/dunche_e.pdf.

[76] *See* Oguamanam, *supra* note 17, at 300; *see generally* Oguamanam, *supra* note 26.

[77] CBD, *supra* note 27, art. 8(j).

[78] Stephen Tully, *The Bonn Guidelines on Access to Genetic Resources and Benefit Sharing*, 12 REV. EUR. CMTY. & INT'L ENVTL. L. 84 (2003).

[79] *Id*. at 88–92.

[80] Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from Their Utilization to the Convention on Diversity, Oct. 29, 2010, *available at* http://www.cbd.int/abs/text/default.shtml [hereinafter Nagoya Protocol].

[81] *Johannesburg Declaration on Sustainable Development*, UN Doc. A/CONF.199/20 (Sept. 4, 2002), *available at* http://www.unescap.org/esd/environment/rio20/pages/Download/johannesburgdeclaration.pdf.

protection of indigenous knowledge and hastening its implementation. Such development is evident in the passing of the United Nations Declaration of the Rights of Indigenous Peoples (UNDRIPS).[82] The pathways to UNDRIPS go back to the 1970s.[83] But the first official draft was issued in 1993.[84] Yet the declaration remained in limbo until 2007 when it was passed as a declaration of the United Nations General Assembly.[85] A combination of issues, including the tightening of global IP order via TRIPS, the latter's silence on the protection of indigenous knowledge, advancements in biotechnology, and the exacerbation of the phenomena of bio-piracy (using patent systems to appropriate traditional knowledge of genetic resources), pushed many developing countries to seek a more friendly regime for the protection of their interests in genetic resources and associated traditional knowledge.[86]

Because of its traditional knowledge-friendly disposition and its malleable approach to IP,[87] the CBD became the regime of choice for developing countries and ILC stakeholders. In the initial regime-shifting, developed states resisted opening up the traditional knowledge debate in the

---

[82] United Nations, *United Nations Declaration on the Rights of Indigenous Peoples*, UN Doc A/RES/61/295 (Sept. 17, 2007), *available at* http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&ved=0CC0QFjAA&url=http%3A%2F%2Fwww.un.org%2Fesa%2Fsocdev%2Funpfii%2Fdocuments%2FDRIPS_en.pdf&ei=P7LWUr6zKOX4yQGRm4CwCQ&usg=AFQjCNFsAoTgiIMEVUHfEXbBn_03AJhJTg&sig2=D_rdf79S5kngJCZWWPO-fA.

[83] Aileen Moreton-Robinson, *Virtuous Racial States: The Possessive Logic of Patriarchal White Sovereignty and the United Nations Declaration on the Rights of Indigenous Peoples*, 20 GRIFFITH L. REV. 641, 642 (2011).

[84] *Historical Overview*, United Nations Permanent Forum on Indigenous Issues, UNITED NATIONS DEPARTMENT OF ECONOMIC AND SOCIAL AFFAIRS, http://undesadspd.org/IndigenousPeoples/DeclarationontheRightsofIndigenousPeoples/HistoricalOverview.aspx (last visited Jan. 19, 2014) ("The study outlined the oppression, marginalization and exploitation suffered by indigenous peoples. WGIP submitted a first draft declaration on the rights of indigenous peoples to the Sub-Commission on the Prevention of Discrimination and Protection of Minorities, which was later approved in 1994.").

[85] *Declaration on the Rights of Indigenous Peoples*, OFFICE OF THE UNITED NATIONS HIGH COMMISSIONER FOR HUMAN RIGHTS, http://www2.ohchr.org/english/issues/indigenous/declaration.htm (last visited Jan. 19, 2014).

[86] *See* Laurence R. Helfer, *Regime Shifting: The TRIPs Agreement and New Dynamics of International Intellectual Property Law Making*, 29 YALE J. OF INT'L L. 1, 49 (2004). (A sense of these tensions can be gleaned from the discussion of factors that account for regime shifting in global IP order.).

[87] *Article 16 Access to and Transfer of Technology*, CONVENTION ON BIOLOGICAL DIVERSITY, http://www.cbd.int/convention/articles/default.shtml?a=cbd-16 (last visited Jan. 14, 2014).

WTO system through further negotiations of the TRIPS agreement.[88] This stance resulted in the confinement of traditional knowledge discourse to another forum, namely the World Intellectual Property Organization (WIPO), specifically pursuant to the 2000 work of the WIPO-IGC.[89] After nearly fifteen years of deliberations, that forum is expected to birth comprehensive international legal instrument(s) on various aspects of indigenous knowledge.[90] The work of the WIPO-IGC is deeply influenced by the CBD as the subject of ABS, and advances its centrality to emergent jurisprudence on indigenous knowledge.[91]

In regard to PGRFA, the Treaty represents an attempt to translate the CBD's ABS principles into the context of PGRFA.[92] The influence of the CBD on the Treaty is unmistakable. Article 1 of the treaty provides:

> 1.1 The objectives of this Treaty are the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the Convention on Biological Diversity, for sustainable agriculture and food security.
>
> 1.2 These objectives will be attained by closely linking this Treaty to the Food and Agriculture Organization of the United Nations and to the Convention on Biological Diversity.[93]

The convergence of multiple instruments and processes under the auspices of the CBD (and its constitutive work programs, guidelines and protocol), the WIPO-IGC, the Treaty and the UNDRIPS signify the link

---

[88] *See* Graham Dutfield, *Protecting Traditional Knowledge: Pathways to the Future* 11–14, ICTSD Programme on IPRs and Sustainable Development, Issue Paper No. 16 (June 2006) (This disposition facilitated the WIPO stewardship of further negotiations on traditional knowledge through the IGC.); Daniel Gervais, *TRIPS, Doha and Traditional Knowledge*, 6 J. WORLD INTELL. PROP. 403, 408–09 (2003) (regarding the jurisdictional and juridical dilemma over traditional knowledge).

[89] *See Intergovernmental Committee (IGC)*, WORLD INTELLECTUAL PROPERTY ORGANIZATION, http://www.wipo.int/tk/en/igc/ (last visited Jan. 14, 2014).

[90] *Id.* ("The WIPO Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore is, in accordance with its mandate, undertaking text-based negotiations with the objective of reaching agreement on a text(s) of an international legal instrument(s), which will ensure the effective protection of traditional knowledge (TK), traditional cultural expressions (TCEs) and genetic resources (GRs).").

[91] *See* Chidi Oguamanam, *IP in Global Governance: A Venture in Critical Reflection*, (2011) 2 W.I.P.O.J. 196, 205.

[92] *See generally* Shakeel Bhatti, Secretary of the International Treaty, Presentation at the Joint Briefing for Second Committee Mandated by UNGA Resolution 67/212: The International Treaty on Plant Genetic Resource for Food and Agriculture (Oct. 30, 2013), *available at* www.un.org/en/ga/second/68/itpgrfapresentation.pdf.

[93] Treaty, *supra* note 10, art. 1.

between indigenous knowledge, including those relevant to PGRFA, conservation of biodiversity, and ABS. All of these instruments have a common commitment to the promotion of the ABS principles as a framework for equitable and sustainable innovations incidental to utilization of genetic resources, which includes those happening in the context of both indigenous knowledge and biotechnology. Focusing on the Treaty, I will examine its strategy for modeling open innovation in PGRFA.

A key to implementation of the objectives of the Treaty is the promotion of the concept of farmers' rights, which was first broached in the Treaty's 1983 precursor, the Undertaking.[94] Without offering a juridical definition of farmers' rights, article 9.1 of the Treaty articulates the *raison d'être* for the rights and identifies the rights' beneficiaries.[95] Accordingly, farmers' rights aim to:

> [R]ecognize the 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.[96]

Article 9 identifies elements of farmers' rights by associating them with traditional knowledge and ensures that measures for the protection of farmers' rights should include those for the "protection of traditional knowledge relevant to plant genetic resources for food and agriculture."[97] Other features of farmers' rights under the Treaty include rights of equitable participation in sharing the benefits deriving from the utilization of plant genetic resources, and the rights of farmers to democratically participate in decision making on matters relevant to sustainable use of PGRFA.[98] Article 9 concludes with a proviso, stating, "Nothing in this Article shall be interpreted to limit any rights that farmers have to save, use, exchange and sell farm-saved seed/propagating material, subject to national law and as appropriate."[99]

The ultimate objective of the Treaty is sustainable agriculture and food security.[100] The Treaty's undergirding presumption is that the conservation of PGRFA is critical to the realization of Treaty's core objectives.[101] Additionally, an inherent logic of the Treaty is that "fair and equitable share of benefits" arising out of the utilization of PGRFA is a strategic incentive for conservation,

---

[94] Undertaking, *supra* note 33, art. 9.
[95] Treaty, *supra* note 10, art. 9.1.
[96] *Id.*
[97] *Id.* art. 9.2.
[98] *Id.*
[99] *Id.*
[100] *Id.* art. 1.1.
[101] *Id.*

and by extension, sustainable agriculture and food security.[102] By identifying ILC farmers as global agents for conservation of PGRFA, it is very clear that farmers' rights and their practical implementation are instrumental to the realization of the core objectives of the Treaty.

A combined reading of articles 1 and 9 of the Treaty affirms the recognition of multiple epistemic approaches to agricultural production and innovation. This recognition runs through the text of the Treaty. It is captured directly by the omnibus reference to the enormous contributions of ILC farmers to conservation and development of plant genetic resources as well as the reference to utilization of genetic resources.[103] "Utilization"[104] encompasses all epistemic deployment of plant genetic resources, including through traditional knowledge and various forms of R&D as well as innovative end-products of agricultural genomics, ag-biotechnology and even wide-ranging dealings in plant genetic resources through biotechnology in general.

In addition to the recognition of diverse epistemic approaches to agricultural production and innovation, the Treaty endorses an open and collaborative model of innovation. For example, its elaboration of farmers' rights is far from a being a close or proprietary concept akin to IP. Farmers' rights are loosely expressed as a concept for recognition of contributions of farmers.[105] It is not constrained by wonted jurisprudential limits of conventional rights analysis.[106] Clearly, textual elements of farmers' rights underscore equitable sharing of benefits, democratic participation of farmers in policy making over plant genetic resources for food and agriculture, and the principle of free exchange and dealings with farm-saved seeds by farmers. The next Part explores how the emerging Treaty implementation relates to the conversion of farmers' rights via the ABS framework within both open and closed models of innovation.

V. THE TREATY'S MECHANISM FOR OPEN INNOVATION IN PGRFA

The Treaty builds upon the 1983 Undertaking in three ways: it seeks effective and practical implementation of farmers' rights; it strengthens accountability and transparency over dealings with in-trust germplasm held by the CGIAR-IARCs; and it promotes practical implementation of the ABS

---

[102] *Id*.

[103] *See generally* Treaty, *supra* note 10.

[104] Nagoya Protocol, *supra* note 80, art. 2(c) (defines utilization as the "conduct [of] research and development on the genetic and/or biochemical composition of genetic resources, including through the application of biotechnology").

[105] Lauren Winter, *Cultivating Farmers' Rights: Reconciling Food Security, Indigenous Agriculture, and TRIPs*, 43 VAND. J. TRANSNAT'L L. 223, 235–36.

[106] *See* 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, 289–92 (2006) (discussing the distinction between farmers' rights and IP).

process in the context of PGRFA.[107] To this end, the governing body of the Treaty assumes jurisdiction over in-trust plant genetic resources held under the CGIAR-IARCs, hitherto administered pursuant to the 1994 agreement between FAO and CGIAR-IARCs.[108] In addition, the Treaty proactively encourages all holders of annexed plant genetic resources (e.g., national seed banks, public and private sectors, individuals, and ILC farmers) to contribute plant genetic resources with a view to expanding the global stock.[109] The Treaty system has since streamlined the details of dealings in the so-called annexed and non-annexed plant genetic resources through the instrumentality of a common Standard Material Transfer Agreement (SMTA)[110] in accordance with ABS principles.[111]

The SMTA constitutes a pivotal framework under a multilateral system (MLS) of ABS of annexed genetic resources, pursuant to article 10 of the Treaty.[112] Article 10 describes the MLS as "[an] efficient, effective, and transparent [mechanism], both to facilitate access to plant genetic resources for food and agriculture, and to share, in a fair and equitable way, the benefits arising from the utilization of these resources, on a complementary and mutually reinforcing basis."[113] In addition to entrenching standard ABS protocols as the operational framework for dealing in plant genetic resources under the MLS, the Treaty provides for a collaboratively-shared global information system on PGRFA.[114] The objectives of this system are threefold: to facilitate the free exchange of relevant information and knowledge to enhance ABS; to identify threats or hazards; and to gauge the state and sustainability of global PGRFA.[115]

The idea of a global information system on plant genetic resources underlines the Treaty's support for an open approach to innovation in PGRFA.

---

[107] *See* Treaty, *supra* note 10, at Preamble, arts. 1.1, 4–6, 9, 10–13.

[108] Susan H. Bragdon, *Recent Intellectual Property Rights Controversies and Issues at the CGIAR*, *in* AGRICULTURE AND INTELLECTUAL PROPERTY RIGHTS: ECONOMIC, INSTITUTIONAL AND IMPLEMENTATION ISSUES IN BIOTECHNOLOGY 77, 89 (V. Santaniello et al. eds., 2000).

[109] Treaty, *supra* note 10, art. 11.2.

[110] STANDARD MATERIAL TRANSFER AGREEMENT, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (June 16, 2006), *available at* ftp://ftp.fao.org/ag/agp/planttreaty/agreements/smta/SMTAe.pdf [hereinafter SMTA].

[111] *Id.* art. 15.1(b) ("Plant genetic resources for food and agriculture other than those listed in Annex I of this Treaty and collected before its entry into force that are held by IARCs shall be made available in accordance with the provisions of the MTA currently in use pursuant to agreements between the IARCs and the FAO. This MTA shall be amended by the Governing Body . . . in consultation with the IARCs, in accordance with the relevant provisions of this Treaty . . . .").

[112] *Id.* art. 10.

[113] *Id.* art. 10.2.

[114] *Id.* art. 17.

[115] *Id.*

Information exchange, access to and transfer of technology, and capacity building (targeting especially developing countries and countries with economies in transition) are constitutive elements of the system, as elaborated in article 13 on technology transfer.[116] Information exchange (or sharing) is quite distinct from mere reference to "free information" in open innovation discourse. Free information (or the more familiar refrain in ICT, free content) may bridge access gaps, sometimes in order to temporarily fix inequity, but it does not guarantee systemic change or capacity building and socialization of knowledge for the benefit of recipients. More often, the innovation in question is usually a product of centralized or hierarchical order. Information exchange, however, reflects the essence of openness. Information exchange or openness is not an end. It is innately functional because of its ability to develop capacity or promote empowerment, and it is essentially democratic in its ability to fuel optimal epistemic traffic across diverse competences in society in a horizontal chain of interaction. Rather than serve as a one-directional hand-out meant for consumption or absorption, creating a producer/consumer dichotomy, openness supports "social, [or socialized] information-network-based, models of sharing [and exchange], participation, and collaboration."[117]

In addition to the global information system, elaborate provisions regarding access to genetic resources held under the MLS indicate the Treaty's commitment to the advancement of open innovation in plant genetic resources for three reasons. First, parties have the unequivocal obligation to facilitate access to plant genetic resources under the MLS to legal and natural persons so long as those stakeholders will continue to sustain the exchange relationship by making new accessions to the MLS.[118] Access is essentially free. It must be accompanied by relevant information such as passport data and other non-confidential information in order to serve objectives relating to utilization and conservation of PGRFA for research, breeding and training.[119] Second, access must be subject to the SMTA approved by the governing body of the Treaty (already signed by 11 IARCs), which specifies the details of ABS.[120] Lastly, the regime provides for expedited access to designated plant genetic resources in emergency or disaster situations to mitigate disruptions to agricultural systems and to relieve food crisis situations.[121]

Regarding IP, the Treaty is consistent with the Undertaking. Despite problematic qualifications, the Treaty provision sustains the spirit of openness in

---

[116] *Id.* art. 13.

[117] *See* Katherine M. A. Reilly & Matthew L. Smith, *The Emergence of Open Development in a Network Society*, *in* OPEN DEVELOPMENT: NETWORKED INNOVATION IN INTERNATIONAL DEVELOPMENT, *supra* note 5, at 30.

[118] Treaty, *supra* note 10, art. 12.2.

[119] *Id.* art. 12.3(c).

[120] *Id.* art. 12.4.

[121] *Id.* art. 12.6.

article 12(3)(d) to the effect that "Recipients [of genetic resources] shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System."[122] In a pragmatic way, the Treaty does not completely foreclose commercialization or, by implication, claims of IP over plant genetic resources obtained from the MLS. In article 13(2)(d)(ii), it provides that the SMTA under the Treaty "shall include a requirement that a recipient who commercializes a product that is a plant genetic resource for food and agriculture and that incorporates material accessed from the Multilateral System," shall pay to the Treaty's financial mechanism "an equitable share of the benefits arising from the commercialization of that product, except whenever such a product is available without restriction to others for further research and breeding, in which case the recipient who commercializes shall be encouraged to make such payment."[123] Evidently, while elaborating on open and collaborative approaches to innovation, the Treaty contemplates the co-existence of that approach with the IP system in creative ways that advance openness.

Funding is a key aspect of the MLS and of the implementation of Treaty objectives. The objective of the funding strategy is to "enhance the availability, transparency, efficiency, and effectiveness of the provision of financial resources to implement activities under this Treaty."[124] In addition to giving the governing body carte blanche to adopt creative fund-sourcing strategies to finance the Treaty programs, the Treaty specifies direct sources of funding, such as voluntary contributions from contracting parties, the private sector, non-governmental organizations and miscellaneous sources.[125] More importantly, the Treaty provides for a mandatory contribution which, as the case may be, could be a percentage of patent royalty by recipients who prefer to patent and commercialize genetic resources from the MLS as opposed to embracing the shared and open approach.[126] The treaty clearly identifies the prime target and beneficiaries of its activities and programs as "farmers in all countries, especially in developing countries, and countries with economies in transition, who conserve and sustainably utilize plant genetic resources for food and agriculture."[127] Throughout the treaty, there is a general emphasis on technology transfer to developing countries and countries with economies in transition.[128]

The mandatory and voluntary funds are deposited into a collective trust account, called the benefit-sharing fund, which is established pursuant to article

---

[122] *Id.* art. 12.3(d).
[123] *Id.* art. 13.2(d)(ii).
[124] *Id.* art. 18.2.
[125] *Id.* art. 18.4(f).
[126] *See id.* arts. 18.4(e), 13.2(d).
[127] *Id.* art. 13.3.
[128] *E.g., id.* art. 18.3.

19(3)(f).[129] So far, the governing body of the Treaty is still developing an expertise in fund sourcing; but a few developed countries and a few developing countries have made modest contributions to the benefit-sharing fund.[130] The Treaty recognizes that effective commitment of developed countries to allocate funds to the benefit-sharing fund is the key to which the obligations of developing countries and, by extension, the overall objectives of the Treaty could be attained.[131] This is important, especially because earlier attempts at voluntary funding under the 1983 Undertaking did not succeed, in part, because of the lack of commitment by developed countries.[132]

Since establishing effective governance of annexed and some non-annexed plant genetic resources under the new IT framework (through the MLS), the governing body of the Treaty has deployed the benefit-sharing fund to sponsor R&D in high-impact projects under collaborative innovation frameworks and partnerships.[133] Collaborative frameworks include various and diverse stakeholders such as research institutions, plant breeders, and civil societies.[134] Overall, this process of exchanging technologies and information symbolizes important ways to bridge knowledge gaps in ag-biotechnology in relation to the localization, or adaptation, of such knowledge for both capacity building and for meeting contemporary demands for sustainability and food

---

[129] *Id.* art. 19.3(f).

[130] The following countries have made contributions to the benefit-sharing fund: Norway, Italy, Switzerland, Canada, Australia, Spain, Norway, Ireland, and Indonesia. *See* Shakeel Bhatti, Secretary of the International Treaty, Presentation at the FAO International Technical Conference on Agricultural Biotechnologies in Developing Countries: Technology Transfer Aspects of the Multilateral System of the ITPGRFA (Mar. 3, 2009), *available at* http://goo.gl/6CzuF. For the period 2009–2014, the governing body targets to raise $116 million under the benefit-sharing fund scheme. *See* CLAUDIO CHIAROLLA & STEFAN JUNGCURT, OUTSTANDING ISSUES ON ACCESS AND BENEFIT SHARING UNDER THE MULTILATERAL SYSTEM OF THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE: BACKGROUND STUDY PAPER, BERNE DECLARATION 38 (Mar. 2011), *available at* http://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCkQFjAA&url=http%3A%2F%2Fwww.evb.ch%2Fcm_data%2FITPGR_ABS_Study_1.pdf&ei=qhbjUsucAufuyAGlv4D4DA&usg=AFQjCNEpp3z0EzF_G3LeG7N7NEjyg0SiSg&sig2=ashJP2vqMpdoWH74QdVMAA.

[131] Treaty, *supra* note 10, art. 18.4(b).

[132] *See* Keith Aoki & Kennedy Luvai, *Reclaiming "Common Heritage" Treatment in the International Plant Genetic Resources Regime Complex*, 2007 MICH. ST. L. REV. 35, 52–53 (2007).

[133] *The Benefit-Sharing Fund in Brief*, THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE, http://www.planttreaty.org/node/3072 (last visited Jan. 14, 2014).

[134] *See* FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, REPORT ON THE FIRST ROUND OF THE PROJECT CYCLE OF THE BENEFIT-SHARING FUND 37–39 (2013), *available at* http://www.planttreaty.org/sites/default/files/Report_BSF.pdf.

security.[135] As the first major initiative for effective implementation of ABS, the benefit-sharing fund has so far funded a number of projects aimed at influencing collaborative integration of ILC farmers, researchers, and other stakeholders in regard to on-farm management and conservation strategies for endemic genetic resources, promotion of food security, climate change adaptations, and innovative partnerships in agricultural production.[136]

Despite major conceptual and practical constraints in the Treaty text (which are outside the focus of this paper),[137] at the substantive core of the Treaty—and certainly at the core of the Treaty's programs and priorities—is the establishment of an open innovation approach over dealings in PGRFA. There is recognition in the Treaty of the open, collaborative and communal nature of innovation by various actors across epistemic boundaries in PGRFA. Interestingly, the Treaty does not foreclose the operation of a closed innovation model, as evidenced in its approach to IP.[138] Historically, dealings with in-trust

---

[135] *The Benefit-Sharing Fund in Brief*, THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE, http://www.planttreaty.org/content/benefit-sharing-fund-brief (last visited Jan. 21, 2014).

[136] *See Projects Under the Benefit-Sharing Fund (2009-2011) – 1st Call*, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, http://www.planttreaty.org/content/projects-2009-2011 (last visited Jan. 14, 2014) (listing the eleven projects, including host institutions, countries, and collaborating partners, funded under the project's first cycle of the benefit-sharing fund); *see also Call for Proposals 2010-2011*, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, http://www.planttreaty.org/content/call-proposals-2010-2011 (last visited Jan. 14, 2014) (for similar detail, listing the nineteen projects funded under the project's second cycle).

[137] For example, article 12.3(d) bars IP or other rights which limit facilitated access to PGRFA or their genetic parts or components only in the form received from the MLS leaves significant room for ambiguity. Treaty, *supra* note 10, art. 12.3(d). One way of looking at this provision is that any form of tinkering with PGRFA sourced from the MLS by a recipient may be sufficient to lift it from the "form received" and hence be eligible for IP protection. In this frame of thinking, derivatives may, arguably, not be eligible for ABS under the Treaty. However, elaboration of the Treaty provisions pursuant to the SMTA would seem to ease some of the lingering apprehensions over the logical ramifications of article 12.3(b), especially those regarding derivatives. *See* Claudio Chiarolla, *Plant Patenting, Benefit Sharing, and the Law Applicable to the Food and Agricultural Organisation Standard Material Transfer Agreement*, 11 J. WORLD INTELL. PROP. 1, 25 (2008).

[138] For instance, article 13.2(b)(iii) of the Treaty makes reference to "adequate and effective protection of intellectual property rights." Treaty, *supra* note10, art. 13.2(b)(iii). In addition, for the most part, the general language of the Treaty subjects parties' commitment to open innovation and overall ABS processes to national laws of member states as well as to the latter's pre-existing commitment to relevant international obligations. *See id.* art. 12.3. These obligations include those arising from the UPOV, the TRIPs Agreement and various bi-lateral TRIPs-Plus agreements. *Id.* These qualifications reflect the compromise between developed and developing countries in the making of the

plant genetic resources under the auspices of CGIAR-IARC involved complex collaborative relationships between public and private sector actors who have fundamentally differing interests around open and closed/proprietary approaches to knowledge protection and innovation. The Treaty's orientation reflects the conviction that closed and open approaches in co-existence is, perhaps, a more pragmatic way of securing optimal impact of innovation in society than regarding them as singular and mutually exclusive options. This reasoning is embodied in the Treaty's provisions in article 12.3(1)(e) and the current attempt by the CGIAR, in concert with the Treaty's governing body, to implement or practically realize those provisions.[139]

Article 12.3(e) provides that: "Access to plant genetic resources for food and agriculture under development, including material being developed by farmers, shall be at the discretion of its developer, during the period of its development."[140] The Treaty does not define "PGRFA under development," nor does it specify the beginning and end periods of development. Those gaps have since been filled by the SMTA.[141] Attempts to elaborate on the meaning of "PGRFA under development" via the international undertaking date back to 1991.[142] Today, however, the SMTA provides the clearest illumination. According to article 2 of the SMTA, "PGRFA under development" refers to:

> material derived from the *Material* [i.e., PGRFA in annex 1], and hence distinct from it, that is not yet ready for commercialization and which the developer intends to further develop or to transfer to another person or entity for further development. The period of development of plant genetic

---

Treaty, which results in the impression that the Treaty provisions reflect ambiguities and mixed signals in IP.

[139] Treaty, *supra* note 10, art. 15.1(e).

[140] *Id.* art. 12.3(e).

[141] THE STANDARD MATERIAL TRANSFER AGREEMENT (SMTA) (PRESENTATION 4), THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURAL: IMPLEMENTING THE MULTILATERAL SYSTEM, BIODIVERSITY INTERNATIONAL, *available at* http://treatylearningmodule.bioversityinternational.org/fileadmin/bioversityDocs/Policy_module/eng.policy_module/Handouts_13-24/Handout%2024%20The%20SMTA.pdf.

[142] *See* GERALD MOORE & WITOLD TYMOWSKI, EXPLANATORY GUIDE TO THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE, IUCN – THE WORLD CONSERVATION UNION, IUCN ENVIRONMENTAL POLICY AND LAW PAPER NO. 57 93–94 (2005) (stating that "[t]he provision follows the concept introduced into the International Undertaking under the third Agreed Interpretation of the International Undertaking in 1991 (Conference Resolution 3/91), which specifies in its operative paragraph 2 that 'breeders' lines and farmers breeding material should only be available at the discretion of their developers during the period of development").

> resources for food and agriculture under development shall be deemed to have ceased when those resources are commercialized as a product."[143]

Following the nuances in the CBD, articles 2 of both the Treaty and the SMTA define PGRFA as "any genetic material of plant origin of actual or potential value for food and agriculture."[144] Similarly, both instruments share the same definition of genetic material as "any material of plant origin, including reproductive and vegetative propagating material containing functional units of heredity."[145] A combination of the Treaty and the SMTA's definitions of "PGRFA," "PGRFA under development," and "product"[146] unravel the very wide scope of the meaning of "PGRFA under development." In this context, and certainly in the context of article 12.3(e), it is noteworthy that "developers" transcends farmers and includes diverse R&D stakeholders in PGRFA.[147] Significantly, the transfer of "PGRFA under development" does not amount to commercialization (so as to trigger benefit-sharing obligations under the MLS framework). However, such transfers do not preclude additional requirements, including payment of monetary or other incentives at the developer's discretion.

Article 12.3(e) of the Treaty's reference to "PGRFA under development" is not necessarily limited to annexed PGRFA. This is consistent with the scope of the SMTA, which has been accommodating and regulating dealings in PGRFA accessions since the Treaty came into force. The focus of article 12.3(e), and indeed that of the SMTA framework, is on general advancement of the objectives of the Treaty. To that extent, the wide ambit of article 12.3(e) is consistent with the overall historical context for the evolution of the Treaty as a model for equitable access and governance of innovations relating to global PGRFA. As such, the provisions of the article vest enormous discretion in miscellaneous actors and parties to the Treaty to determine the terms of dealing with plant genetic resources under development.

Article 12.3(e) focuses on "the developer"—a broad category generally, and also within the structure of that article.[148] It unequivocally includes all farmers, breeders, and, perhaps most importantly, all other actors, especially those involved in R&D relating to PGRFA. The most important global institutional R&D network on PGRFA is the CGIAR-IARCs, which is a

---

[143] SMTA, *supra* note 110, art. 2. article 2 goes on to define "product" as PGRFA that contain "material or its genetic parts or components that are ready for commercialization, excluding commodities and other products used for food, feed and processing." *Id.*

[144] Treaty, *supra* note 10, art. 2; SMTA, *supra* note 110, art. 2.

[145] Treaty, *supra* note 10, art. 2; SMTA, *supra* note 110, art. 2.

[146] *See* Treaty, *supra* note 10, art. 12.6. Under this definition, it does seem that so long as the PGRFA or its application has yet to mature for commercialization or is within the realm of application or use for food, feed and processing, it is "PGRFA under development."

[147] Treaty, *supra* note 10, art. 12.3(e).

[148] *Id.*

consortium of developers, funders and amalgamation of stakeholders like no other. Founded in 1971, the CGIAR is a strategic public-private partnership committed to R&D in PGRFA from a global public goods perspective.[149] Presently, it is comprised of fifteen international agricultural research centers located across different geographical regions, which remain the *ex situ* vehicles for holding in trust all the annexed crops and forages pursuant to the Treaty and the 1994 agreement between the FAO and the CGIAR.[150] In 2010, the CGIAR underwent a reorganization aimed at, among other things, streamlining the operational efficiency and transparency of the centers, as well as repositioning their research programs and collaborative partnerships with increasingly diverse and complex partners for measurable impact.[151] That reorganization resulted in a change of name to the "CGIAR Consortium."[152] The significance of the CGIAR lies in its pioneering role in networked, public-interest oriented partnerships in R&D over PGRFA envisioned to coordinate international agricultural research toward global poverty reduction and promotion of food security. In addition, the CGIAR's importance also lies in its global spread and impact across 200 countries. Beyond holding about the largest collection of global PGRFA on record (nearly ten percent), it is a site for cutting-edge research in agricultural innovation and dynamic range of public private collaborations. The CGIAR's leadership in these and other regards is critical in shaping the pattern of knowledge exchange in PGRFA.

VI. CGIAR'S INTELLECTUAL ASSET MANAGEMENT PRINCIPLES

After the Treaty came into force, its governing body effectively asserted its control over annexed PGRFA. The governing body has supplanted the 1994 agreement between the FAO and the CGIAR with new agreements between eleven IARCs.[153] The agreements are consistent with the SMTA and are aligned to the overall framework of the MLS, ABS, and the Treaty objectives. Not only

---

[149] In addition to fifteen research centers and over two hundred partners (including private sector ag-biotechnology corporations, NGOS, etc.), major sponsors/funders of the CGIAR include over sixty national governments, the FAO, the International Fund for Agricultural Development, the United Nations Development Program, and the World Bank. CGIAR continues to attract the interest of high profile international charities such the Bill and Melinda Gates Foundation in its public good approach to agricultural R&D. *See CGIAR Fund Donors*, CGIAR FUND, http://www.cgiarfund.org/FundDonors (last visited Jan. 21, 2014).

[150] *See Who We Are*, CGIAR, http://www.cgiar.org/who-we-are/ (last visited Jan. 14, 2014).

[151] *See id.*

[152] *Id.*

[153] *The Importance of Recognizing the International Treaty in the CBD's Protocol on Access and Benefit-Sharing*, SGRP (July 2010), *available at* http://www.cbd.int/abs/side-events/resumed-abs-9/id2105-sgrp-policy-brief.pdf.

has the CGIAR effectively supported the new Treaty regime, as a pivotal "developer" of plant genetic resources, the CGIAR has demonstrated far-reaching commitment towards open innovation in PGRFA. In 2012, it capitalized on the discretion provided under article 12.3(e) of the Treaty and launched the CGIAR Principles on the Management of Intellectual Assets (IA Principles).[154]

On paper, the IA Principles are a pragmatic and ambitious initiative on open innovations over PGRFA. It is neither limited to dealings in PGRFA under development, nor to IP. In a way, it is a charter of open innovation and pragmatic deployment of innovation, especially in nurturing complex partnerships, filling the gaps of equity, and accounting for the interests of diverse stakeholders in PGRFA. According to the CGIAR, the IA Principles provide "a clear framework . . . to help knowledge travel freely . . . to ensure that intellectual assets reach those who need them most [through] adopting common sets of principles with regard to production, acquisition, management, and dissemination of assets."[155]

The IA Principles apply to CGIAR Research Programs and associated agreements pursuant to their funding and implementation, such as CGIAR performance, program implementation, joint and subsidiary agreements.[156] They also apply to all results or products of R&D activities (under development) undertaken under the CGIAR-IARCs mandate, including those protected by IP.[157] These include both IP-specific and non-IP assets such as databases, publications, software, improved germplasms, plus any relevant or miscellaneous information goods associated with the work of the CGIAR, irrespective of the funding source.[158] Finally, in terms of scope, the principles are binding on all members of the CGIAR and their collaborating private, public sector and all other categories of partners.[159]

For the present purpose, an overview of the key elements of the IA Principles (articles 1–7) is sufficient to capture the new orientation toward

---

[154] Consortium, *CGIAR Principles on the Management of Intellectual Assets Approved*, CGIAR (Mar. 13, 2012), http://www.cgiar.org/consortium-news/principles-on-management-of-intellectual-assets-approved/.

[155] *See id.*

[156] These are various forms of agreements that undergird the work of the CGIAR-IARCs and diverse thirty-party partners. *See* CGIAR PRINCIPLES ON THE MANAGEMENT OF INTELLECTUAL ASSETS art. 9, n.12 (Mar. 7, 2012), *available at* http://www.cgiarfund.org/sites/cgiarfund.org/files/Documents/PDF/cgiar_principles_management_intellectual_assets_7march_2012.pdf [hereinafter CGIAR PRINCIPLES].

[157] *See generally id.*

[158] These reflect the definition of Intellectual Assets. *Id.* at 2 n.3.

[159] *See* Elise Perset, CGIAR Consortium General Counsel, Presentation at the Workshop on Socially Responsible Licensing at the Hague Institute for Global Justice: Socially Responsible Management of Intellectual Asset in the CGIAR (Oct. 9, 2012) (on file with the Chicago-Kent Journal of Intellectual Property).

openness, IP, and pragmatism around the management of innovation in PGRFA. First, as a matter of general orientation, all R&D and results thereof under the CGIAR-IARCs constitute international public goods (IPGs) to be optimally dispersed and diffused for maximum positive impact, especially on those in direst need.[160] The significance of an IPGs designation is the recognition of the near universal value of the results of R&D in PGRFA. That universality is a warrant for shared responsibility and urgency for the distribution and access to IPGs by all stakeholders.[161] Second, cultivation of partnerships through creative and pragmatic incentivization strategies is fundamental for optimal harnessing of knowledge and innovation, and efficient delivery of results of R&D in PGRFA.[162] Third, the IA Principles recognize the role of farmers and scientists in the conservation of PGRFA and innovation, and support initiatives aimed at realizing farmers' rights.[163] Fourth, the IA Principles support the conservation and effective use of PGRFA in accordance with the CBD and the Treaty frameworks.[164] Indeed, the IA Principles have the objective of amplifying the Treaty.[165] Fifth, the IA Principles endorse equity, fairness, integrity, responsibility and accountability as keys to sound management of intellectual assets and IP over PGRFA.[166] Consequently, the Principles must facilitate the adaptation of equity-enhancing practices, such as licenses and non-assertion covenants, without necessarily compromising to third-party rights.

Sixth, intellectual assets and IP at the disposal of the CGIAR-IARCs are, in principle, to facilitate global accessibility and impact on target beneficiaries toward the advancement of CGIAR vision.[167] In this regard, prompt but pragmatic dissemination of research results, use of limited exclusivity agreements to moderate potential monopolies arising from IP and intellectual assets accruing to the CGIAR, and strategic acquisition and use of third-party intellectual assets are encouraged to the extent that they advance the CGIAR vision. As part of its pragmatism, prompt dissemination of R&D results may be compromised in lieu of other considerations, such as when IP application may be required to further improve intellectual assets held by the CGIAR. Similarly, the natural monopolies of IP and intellectual assets are to be malleable and limited in their exclusivity if that is necessary to advance the vision of the

---

[160] CGIAR PRINCIPLES, *supra* note 156, art. 1.

[161] *See* Oliver Morrissey, Dirk Willem te Velde & Adrian Hewitt, *Defining International Public Goods: Conceptual Issues*, *in* INTERNATIONAL PUBLIC GOODS: INCENTIVES MEASUREMENT AND FINANCING 31–45 (Maco Ferroni & Ashoka Mody eds., 2002).

[162] CGIAR PRINCIPLES, *supra* note 156, art. 2.

[163] *Id.* art. 3.

[164] *Id.* art. 4.

[165] *Id.*

[166] *Id.* art. 5.

[167] *Id.* art. 6.

CGIAR.[168] Such limitations are pragmatic and could be product-specific. Also, they may cover diverse contexts including limitations on duration, territory or market segmentation, field of use, and field of research. Others include IP and intellectual asset rights curtailments, for example, via licensing practices that accommodate research, subsistence use by ILC farmers, scaled commercial exploitations, humanitarian, poverty alleviation, and overall accommodations or exemptions incidental to the public good's logic. As part of its pragmatism, the IA Principles allow for the acquisition and use by the CGIAR-IARCs of third-party intellectual assets under restricted use agreements; so long as there is no better alternative for such acquisitions and the resulting products can advance the CGIAR vision in countries where such products can be made available.[169] Further, at all times, the CGIAR-IARCs reserve the discretion to determine whether to apply for IP or not in regard to its R&D processes or products.[170] However, only where IP application is necessary to improve the intellectual assets of the CGIAR and, consequently, "enhance the scale and scope of impact on target beneficiaries, in furtherance of the CGIAR Vision,"[171] could it be permissible.[172]

Finally, principle seven permits the CGIAR to charge fees that are reasonably aligned to actual cost for processing access to its intellectual assets.[173] However, earnings from this financial regime are expected to be redirected back toward the advancement of the CGIAR vision.[174] Principles 8–12 focus on capacity building, implementation, and issues of transparency and accountability regarding the operational efficiency of the new CGIAR-IARCs system.[175]

For the avoidance of doubt, the non-application of IP over in-trust PGRFA remains sacrosanct and is not affected by the flexible or pragmatic accommodation of IP under the IA Principles.[176] In a rather compelling way, this last point underlines the relevance of the IA Principles to article 12.3(e) of the Treaty (i.e., the focus of the intellectual assets regarding PGRFA under development). Because of the CGIAR's leadership role and its status as a site for complex public-private partnerships in innovation in PGRFA, it has unsurprisingly set the framework for parties to exercise their discretion recognized both under the Treaty and, subsequently, the SMTA in regard to dealing with PGRFA under development.

---

[168] *See id.* art. 6.4.
[169] *Id.* art. 6.3.
[170] *See id.* art. 6.4.
[171] *Id.*
[172] *Id.*
[173] *Id.* art. 7.
[174] *Id.* art. 7.3.
[175] *Id.* arts. 8–12.
[176] *Id.* art. 7.2; *see also* Perset, *supra* note 159.

Through its revolutionary pliability and functional pervasiveness in various creative contexts, digital technology attracted global interest in open innovation potential. As its poster child, the open software movement (in its various incarnations) and the limitless possibilities of the internet platform have since symbolized the immeasurable potential of collaborative knowledge production as an empowering process.[177] Latching onto the advantages of digitization and internet platforms, open innovation models have continued to gain traction in various other contexts and through various strategies.[178] In regard to context, open innovation now extends to the biotechnology sectors and their various applications including health, agriculture, and the environment.[179] As for strategy, internet-enhanced crowdsourcing has become a veritable tool for various forms of capacity development and democratic participation via non-hierarchical or horizontal processes conducive to open innovation.[180] Open innovation strategies, such as crowdsourcing, leverage the private sector financial powers of closed or proprietary innovation models that conveniently align with strong IP protection.

For the most part, however, open innovation capitalizes on, and is better facilitated by, the convenient logic of digital technology, rather than by the necessity or consequence of legal regulatory structuring. However, the natural and customary inclination toward openness in the process of agricultural innovation across epistemic boundaries is not necessarily driven by digital or network technologies. Rather, the latter have the potential not only to complement, but also to democratize knowledge production and optimize their equitable distribution for effective impact on society. As indicated, articles 13 and 17 of the Treaty make detailed provisions for technology transfer and for a global information system on PGRFA. Through the use of digital networked technology, the system integrates PGRFA information (including accessions to the MLS) across different systems into a central portal with as comprehensive data as possible to enhance functionality, equitable access, and use.[181] Not only

---

[177] *See generally* OPEN DEVELOPMENT: NETWORKED INNOVATION IN INTERNATIONAL DEVELOPMENT, *supra* note 5.

[178] *See* Masum et al., *supra* note 18.

[179] *Id.*

[180] *See* OPEN DEVELOPMENT: NETWORKED INNOVATION IN INTERNATIONAL DEVELOPMENT, *supra* note 5.

[181] There are already a number of collaborative initiatives under this system, which advance the objectives of article 17 of the Treaty. *See Global Information System on PGRFA*, THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE, http://www.planttreaty.org/content/gis (last visited Jan. 14, 2014). The collaborative initiatives include the GENESYS, the World Information Sharing Mechanism on the Implementation of the [FAO] Global Plant of Action for the Conservation and Sustainable Use of PGRFA, EURISCO, and the GRIN-Global Project. GENESYS, http://www.genesys-pgr.org/ (last visited Jan. 14, 2014); WORLD INFORMATION SHARING MECHANISM ON THE IMPLEMENTATION OF THE GLOBAL PLANT OF

is the system expected to ensure effective diffusion of knowledge in PGRFA, it is an instrument to audit global PGRFA and gauge real and potential threats.[182] The system also seeks to ensure prompt response to detected threats, and to secure the overall sustainability of PGRFA and associated knowledge.[183]

Outside the Treaty framework, there is no dearth of initiatives to exploit ICT paraphernalia in order to advance openness in PGRFA and biotechnology in general. For example, BiOS—biological initiative for open society—is conceived as an open or commons system to facilitate access and collaborative use through improvement and modification of existing technologies, including those relevant to biotechnology plus agricultural innovation.[184] Like the more known creative commons or, general public license,[185] and most free software licenses, BiOS has a "rights reserved component." A BiOS license allows a developer, for example, of PGRFA-related technology to claim ownership of the innovation, but it bars them from asserting IP rights on the technology or improvements thereto against other BiOS licensees or even from withholding data from other members.[186] In a related fashion, Patent Lens is a "free full-text patent informatics resource"[187] created through the use of ICTs. Sponsored by Cambria, a non-profit organization, Patent Lens is a free online patent search system essentially designed to analyze and unmask patent concentrations, patent thickets, and patent dependencies in order to facilitate collaborative or democratized attempts at procuring openly accessible alternatives.[188]

ACTION FOR THE CONSERVATION AND SUSTAINABLE USE OF PGRFA, http://www.pgrfa.org/gpa/selectcountry.jspx (last visited Jan. 14, 2014); EURISCO, http://eurisco.ecpgr.org/ (last visited Jan. 14, 2014) ("a web-based catalogue that provides information about *ex situ* plant collections maintained in Europe"); GRIN-GLOBAL, http://www.grin-global.org/index.php/Main_Page#The_GRIN-Global_Project (last visited Jan. 14, 2014) (designed "to provide the world's crop genebanks with a powerful, flexible, easy-to-use global plant genetic resource information management system that will constitute the keystone for an efficient and effective global network of genebanks to permanently safeguard plant genetic resources vital to global food security, and to encourage the use of these resources by researchers, breeders, and farmer-producers").

[182] Treaty, *supra* note 10, art. 17.

[183] *Id.* art. 17.2.

[184] *See* BIOS, http://www.bios.net/daisy/bios/home.html (last visited Jan. 14, 2014).

[185] General Public Licence – originally crafted by Richard Stallman and serves as the most patronized free software license system. GNU OPERATING SYSTEM, http://www.gnu.org/licenses/gpl.html (last visited Jan. 14, 2014).

[186] *About BiOS (Biological Open Source) Licenses and MTAs*, BIOS, http://www.bios.net/daisy/bios/mta/license-intro.html (last visited Jan. 14, 2014).

[187] PATENT LENS, http://www.patentlens.net/daisy/patentlens/patentlens.html (last visited Jan. 14, 2014).

[188] Cambia, the initiator of Patent Lens, used the technology to map the informatics of agrobacterium, a Gram-negative bacteria used in horizontal gene transfer crucial for making transgenic plants. *See* LENS, http://www.lens.org/lens/ (last visited Jan. 19, 2014); Wim Broothaers et al., *Gene Transfer to Plants by Diverse Species of Bacteria*,

As Hassan Masum et al. rightly point out, transposing the concept of openness as a metaphor needs some adaptation in other contexts such as bio-technologies and related fields.[189] Research efforts or innovation dynamics in biotechnology are not structured like digital technology-driven operations such as the software industry. More importantly, traditional and industrial models of agricultural innovation and overall dealings in PGRFA inherently create the necessity for openness, collaboration, and interdependence. They have long existed on their own within a complex socio-cultural and economic network distinct from the digital network model. In fact, many of the life sciences, including agricultural sciences and technology, remain reluctant constituencies for effective digital or online collaboration for a number of reasons.[190]

Agriculture reifies or mirrors "nature" as a fundamentally open phenomena. This proposition is, for example, symbolized by pollination, for example, which involves a voluntary and non-voluntary combination of meteorological, bioactive, artificial and other forms of social and ecological collaborative interventions. Humankind and other partners in the ecosystem (i.e., insects, birds, and animals) are inevitably involved in concerted, accidental, and deliberate dispersals of genetic materials in an open manner that supports food, agriculture and environmental sustainability. The intrinsic self-propagation of PGRFA and the universal culture of seed exchange historically, even if symbolically, remains the mainstay of agricultural production and innovation.

Despite the diversity in global agricultural knowledge systems, no such system operates in isolation. For example, notwithstanding the North-South geo-ecological disequilibrium in the natural dispersal of agro-ecological resources and global plant germplasms, agricultural biodiversity is nurtured and sustained by ILC farmers in the centers of origin and crop diversity for the common good. These farmers' fields are no less laboratories of genetic revolution than those of their more powerful and better organized counterparts, steeped in modern forms of agricultural production now epitomized by the ag-biotechnology, especially

---

433 NATURE NO. 7026 557, 629 (2005). Agrobacterium was tied up in patent thickets controlled by big life sciences companies. *See Detailed Description and Protocols*, CAMBIA, http://www.cambia.org/daisy/cambia/3205.html (last visited Jan. 26, 2014). Consequently, the bioinformatics of agrobacterium enabled Cambia to develop a TransBacter, as a substitute form of gene transfer to plants using alternative bacterium group. *See Transbacter Project*, CAMBIA, http://www.cambia.org/daisy /cambia/3187.html (last visited Jan. 19, 2014); *see also* Masum et al., *supra* note 18, at 116–19.

[189] Masum et al., *supra* note 18, at 113.

[190] Explaining the failure of the BioForge, the first open biotech web portal identified challenges over standardization and taxonomic disharmony, differences in experimental protocols, and generally long period of gestation of scientific research outcome, as well as the absence of urgency to resolve a pressing challenge (cf. software-related innovation) as part of the reasons for poor digital online collaboration in life sciences. Masum et al., *supra* note 18, at 117–18.

genetic engineering. Modern ag-biotechnology not only depends on global agro-biodiversity and the sustainability of the plurality of various knowledge systems in agricultural production, its potential for optimal impact on society is largely dependent on the level of openness across these systems.[191] That is why the concerns about ABS and the imperative for open innovation models are at the center of legal regulatory structuring in PGRFA, as evident in the implementation initiatives of the Treaty coalescing with the recent strategic recalibrations at the CGIAR, especially through the IA Principles.

A few common features of the Treaty's MLS (as reflected in the SMTA) and the IA Principles demonstrate the nature of the pragmatism and the flexibility in the adaptation of open innovation models in PGRFA. First, as already indicated, under the two instruments, such open models *include* IP or other forms of closed models. In fact, under the Treaty and the IA Principles, IP is framed to advance the cause of openness. Second, both instruments recognize the diversity of stakeholders and their diverging interests, as well as the necessity of partnerships and collaborations in R&D in PGRFA. In that regard, there is reasonable accommodation of IP or exclusive proprietary claims over PGRFA sourced from the MLS. Similarly, dealings in PGRFA within the series of agreements under the auspices of the CGIAR's general operational framework, including the IA Principles, accommodate third party IP claims, especially in downstream contexts, as crucial to enhance widespread diffusion of R&D results in PGRFA.

In some instances, private proprietary rights holders may provide the missing link for optimal advancement of public-oriented R&D and its widespread diffusion. For example, one of the CGIAR-IARCs, the International Rice Research Institute (IRRI), was able to acquire third-party IP and methods for enhancing rice gene construct and incorporate them into IRRI's rice germplasm.[192] However, under that arrangement, access to the rice with the protected IP was limited to humanitarian distribution.[193] That technology was already patented by Syngenta AG, who was only able to make it available through this form of market segmentation.[194]

---

[191] *See* Emily Marden & R. Nelson Godfrey, *Intellectual Property and Sharing Regimes in Agricultural Genomics: Finding the Right Balance for Innovation*, 17 DRAKE J. AGRIC. L. 369, 392 (2012).

[192] *See* Paula Bianca Ferrer, *More Rice Research Collaboration Between IRRI and Syngenta*, IRRI (Feb. 25, 2013), http://irri.org/news/media-releases/more-rice-research-collaboration-between-irri-and-syngenta.

[193] *See* Perset, *supra* note 159.

[194] The IRRI maintains a collaborative working arrangement with a number of private sector organizations involved in rice R&D, notably Syngenta. *See* Ferrer, *supra* note 192; *see also* SCIENCE COUNCIL SECRETARIAT, CONSULTATIVE GROUP ON INTERNATIONAL AGRICULTURAL RESEARCH SCIENCE COUNCIL, CGIAR CENTER COLLABORATION: REPORT OF A SURVEY (Mar. 2006), *available at* http://www.sciencecouncil.cgiar.org/fileadmin

Third, as already noted, the strategy of market segmentation (recognized by both the Treaty and IA Principles) is an important feature of the emerging model of openness, which incorporates various pragmatic and functional compromises while highlighting the potential role of IP in open innovation. These forms of flexibilities are made possible through the instrumentality of a fundamental element of an open innovation model, namely open or flexible licensing strategies, which were made popular by the open source movement. The co-existence of public goods and private property (or open and closed models) under the two instruments has the potential to harness the complementary strengths and factor endowments which diverse actors bring to innovation. This is, perhaps, crucial in securing optimal diffusion and impact of innovation in PGRFA.

Fourth, related to the third point, the entire Treaty framework, including the ABS system (established pursuant to the MLS and the CGIAR's IA Principles), conceives of IP as a positive instrument for advancing public-regarding objectives of R&D in PGRFA. Under the shared vision of the two regimes, those objectives include the reduction of rural poverty, strengthening of food security, and improvement of global health and nutrition. Also, within the framework of the two instruments, accommodations of IP are to facilitate the diffusion of R&D outcomes and ensure their optimal impact, among other things, through the empowerment of farmers, especially those in the developing countries. ILC farmer empowerment is a way to ensure that communities have control over their food production, their food preferences, and ultimately their food security.[195]

Fifth, the funded R&D projects approved under the Treaty implementation have thus far focus on PGRFA endemic to developing countries.[196] Also, the R&D priorities of the Treaty's governing body[197] target

---

/templates/ispc/documents/Publications/1a-Publications_Reports_briefs_ISPC/SC_Center-Collaboration-Survey_Mar2006.pdf.

[195] In 1996, FAO defined food security as, "when all people, at all times, have physical, social and economic access to sufficient safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life." FAO World Food Summit Plan of Action, http://www.fao.org/wfs/index_en.htm (last visited Jan. 11, 2014) (follow "Documents" hyperlink; then "World Food Summit Plan of Action" hyperlink).

[196] So far the governing body, through the Bureau of the Treaty, has awarded funds for two project cycles (2009, 2011) in twenty-six countries falling within the categories of developing, least developed, and countries with economies in transition. For list and map of project funding schemes under the first and second funding cycle, see *Projects Under the Benefit-Sharing Fund (2009-2011) – 1st Call*, *supra* note 136, and *Call for Proposals 2010-2011*, THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE, http://www.planttreaty.org/content/call-proposals-2010-2011 (last visited Jan. 24, 2014). Not only do these funded R&D projects under the cycles focus on PGRFA endemic to these regions, the institutional host of the projects (mainly public-funded research institutions) are located in those regions as well.

critical problems that face farmers in the developing countries such as crop adaptation to climate change, on-farm conservation strategies, and capacity building for ILC farmers.[198] Capacity building is necessary to secure knowledge diffusion in a horizontal manner but also to ensure equitable ABS toward overall conversion and uptake of innovation in PGRFA by those in dire need.

Sixth, and finally, a few earlier flagship projects of the CGIAR (e.g., HarvestPlus[199] biofortification initiative) are instructive in regard to the significance of an open innovation model in PGRFA. Pursuant to its founding vision, the CGIAR's efforts at reduction of hunger and malnutrition are reflected in its almost ten-year R&D initiative on biofortification—boosting the micronutrient density of stable crops through conventional selective breeding.[200] Crops of choice[201] for the CGIAR biofortification program are those not only endemic to ILCs at the centers of crop origin and diversity but also integral to their food culture and local dietary preferences.[202] The project is delivered strictly as a public good and capacitation initiative, so that the technology is easily adapted by local farmers as a strategy for promoting food security and public health.[203] In a related manner, the more recent R&D projects funded under the Treaty's benefit-sharing fund of the MLS and the governing body's

---

[197] The priorities are in sync with the FAO Global Plan of Action, the ongoing work of the Global Crop Diversity Trust, and the Commission on Plant Genetic Resources of the FAO Global.

[198] *See BSF Projects – Progress Update*, THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURAL, http://www.planttreaty.org /content/bsf-projects-progress-update (last visited Jan. 24, 2014).

[199] HARVESTPLUS, http://www.harvestplus.org/ (last visited Jan. 14, 2014); *see also HarvestPlus Challenge Program: Weaving Nutrition into Agriculture*, CGIARNEWS 14, (Sept. 2004), *available at* http://library.cgiar.org/bitstream/handle/10947/5464 /enews_sept2004.pdf?sequence=1. HarvestPlus is a CGIAR partnership project with two IARCs—International Centre for Tropical Agriculture (CIAT) and International Food Policy Research Institute (IFPRI). Chidi Oguamanam, *Toward a Constructive Engagement: Agricultural Biotechnology as a Public Health Incentive in Less-Developed Countries*, 7 J. FOOD L. & POL'Y 257, 291 (2011). The HarvestPlus initiative was launched in 2004 and has since attracted significant funding from a number of stakeholders such as the Bill and Melinda Gates Foundation. *Id.* The initiative prides itself as "a global leader in developing biofortified crops." *Id.*

[200] Oguamanam, *supra* note 199, at 282, 291.

[201] Crops of choice include beans, cassava, sweet potatoes, rice, maize, and wheat. *Crops*, HARVESTPLUS, http://www.harvestplus.org/content/crops (last visited Jan. 14, 2014).

[202] Oguamanam, *supra* note 29, at 291. *See generally* Robin D. Graham, Ross M. Welch & Howarth E. Bouis, *Addressing Micronutrient Malnutrition through Nutritional Quality of Stable Foods: Principles, Perspectives and Knowledge Gaps*, 70 ADVANCES IN AGRONOMY 77 (2001); Penelope Nestel, Howarth E. Bouis, J. V. Meenakshi & Wolfgang Pfeiffer, *Biofortification of Staple Crops*, 136 J. NUTR. 1064 (2006).

[203] Oguamanam, *supra* note 199, at 291.

priorities focus on the identified needs of ILC farmers. Such projects manifest deliberate attempts to build capacity and, consequently, facilitate the realization of ILC insights as integral aspects of innovation in PGRFA. This approach fulfills a critical aspect of the open innovation model: freedom to innovate through access to relevant collaborative platforms, including those that facilitate epistemic convergences.

CONCLUSION

Foundational discourses about open innovation are understandably linked to the impact of digital technology and the internet platform in reifying the elements of openness—specifically collaboration, dependency, networking, and sharing. In this conceptual frame, new information technologies are essentially disruptive as they serve to catalyze pressure, disorient or even dismantle the more conventional, closed innovation model often represented (albeit, less accurately) by IP rights. Consequently, it is tempting to characterize IP as a counterpoise to openness and to deny its relevance in open innovation. However, whether as a metaphor or as a direct analogy, the information-technology driven model of openness requires a pensive approach in regard to its adaptation to sectors in which networked communication technologies are only ancillary.

This Article has focused on one such sector, the agricultural sector, specifically as implicated in the context of the global regulation of PGRFA. Like several sectors of human innovative endeavor, PGRFA has benefited from the adaptations or deployments of networked digital technology in furthering and in creating new interest in open innovation. Unlike in the software sector, the historic poster child for openness, innovation in PGRFA is prima facie an open process manifested across epistemic boundaries of all agricultural knowledge systems. However, despite the innate culture of openness over innovation in PGRFA, there is a glaring equity gap in the diffusion of the benefits of R&D, owing largely to the exaggerated stress on IP as a closed or proprietary model of innovation. That stress is exacerbated through global strengthening and universalization of the IP standard pursuant to the TRIPs agreement. TRIPs and other subsidiary systems, such as the UPOV, successfully cast IP as an exclusionary and rigidly closed regime of protection in a manner that alienated the interests and contributions to innovation made by ILC farmers at the centers of origin and crop diversity. The unbalanced focus on IP, in turn, helped to fuel concerns about equity and ABS in the realm of PGRFA and also provided an impetus for expediting long-lasting efforts in other sites for addressing those concerns, notably the CBD, the Treaty, and the CGIAR-IARC system.

As illustrated in the preceding pages, the attempt to plug the gaps in the diffusion of innovation in PGRFA crystallized in the checkered evolution of both the Treaty and the CGIAR-IARCs systems. Recent coalescing of the works of both the Treaty and the CGIAR represents a clear framework for exploring a legal regulatory schematic for open innovation in PGRFA. Explorations of the

implementing framework of the Treaty and the recent renewal in the modus operandi of the CGIAR reveal the entrenchment (albeit hardly explored) of the open innovation model in R&D over PGRFA. Quite unlike in the normal narrative of situating open innovation on the digital technology platform, in PGRFA, the open innovation trend is driven by deliberate legal regulatory intervention rather than engaged as an incidence or necessity of digital technology per se. Indeed, the adaptation of digital technology in the PGRFA sector increases the momentum for open innovation through the facilitation of new scientific networks relevant to the wider spectrum of R&D in biotechnology. In addition to this new perspective on open innovation in PGRFA, of equal significance to the implementation of work of the Treaty and the CGIAR IA Principles is the pragmatism and flexibility in which IP is being re-positioned to further open innovation and public goods approach to R&D in PGRFA.

The last quarter of the twentieth century saw stronger proprietary control of innovation in PGRFA and emboldened private stakeholder interests in R&D over PGRFA. That same period also experienced the power of collaboration and interdependence over the production and diffusion of knowledge in PGRFA. Still, this period witnessed a heightened global consciousness regarding ABS in PGRFA and the public goods imperative in the results of R&D. Perhaps no other organizations, institutions, or networks are better positioned, or constituted and experienced, to mediate the competing demands on PGRFA by diverse stakeholders and to channel those demands toward optimal outcomes for society than the CGIAR.

Similarly, the Treaty is better positioned than any other instrument to provide a complementary juridical framework to amplify a public-goods approach to R&D in PGRFA. The CGIAR is in control of nearly ten percent of global PGRFA. It is the single largest platform for public-private partnerships and various non-conventional forms of partnership, involving equally non-conventional actors. The extent to which the new, albeit currently experimental, IA Principles[204] could be successfully integrated or internalized into the various CGIAR partnerships will be crucial to the realization of open innovation in PGRFA. Similarly, the practical impact of the open innovation model under the Treaty regime would largely depend on the sustainability of project funding under the benefit-sharing fund and progressive implementation of the MLS system. Both the Treaty and the CGIAR processes represent foundational schemes for important progressive elaboration of open innovation in PGRFA. Together, they also help to put a new spotlight on the potential of IP to advance open innovation—a welcome development at a time when IP is increasingly perceived as antithetical to innovation.

---

[204] The IA Principles are introduced as a two year temporary measure (2012–2014) in the first instance. *See* Consortium, *supra* note 154.