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Plant genetic resources in an age of global capitalism

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Early in the 20th century, a scramble for the world's genetic resources was sparked by Nikolai Vavilov's articulation of the geographic centers of origin for major cereals and other crops. European and American governments sent expeditions to remote corners of the world, all in an effort to catalogue and collect the planet's genetic resources. Trekking through remote forests in Africa, Asia, and Latin America, and supported financially by the state, expeditions collected samples that would be used to improve the genetic qualities of maize, soy, and countless other crops, adding millions of dollars in value to domestic agricultural production (Saraiva, 2013).

Today, a new race to control the world's plant genetic resources is well underway. Unlike the previous eras, this race is dominated by private rather than public interests, and operates at the genetic level rather than the level of the plant. In this paper, I sketch the global terrain of ownership of plant genetic resources, focusing on the key international agreements governing the legal landscape. I briefly outline the implications of this system, asking how the global terrain conditions struggle over conservation and agricultural biodiversity, access and benefit sharing, and community and farmers' rights. I conclude by raising several areas for further research.

The policy context

The inclusion of the Trade Related Intellectual Property Rights (TRIPs) Agreement as part of the broader agreement establishing the World Trade Organization (WTO) in 1995 marked a fundamental turning point in our understanding of the ownership rights in genetic materials.

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Prior to TRIPs, plant genetic resources were generally excluded from patent protection. But under the TRIPs Agreement, all WTO Member States were obligated to provide patents or *sui generis* protection for new plant varieties.

It is difficult to understate the importance of the TRIPs Agreement in a global context. Before TRIPs, to the extent that an international consensus existed, plant genetic resources were generally viewed and managed under the principle of *res communis* as the common heritage of humanity. Even when individual plants were viewed as private goods, the genetic code of the plant was not. Indeed, the rights of researchers to use plants to develop new seed lines and the rights of farmers to save and replant seed, referred to as breeders' and farmers' privileges respectively, were incorporated into the 1978 International Union for the Protection of New Plant Varieties (UPOV) Convention. In this respect, TRIPs represented not just an extension of property rights into a new arena, but a fundamental re-articulation of the balance of competing rights claims among investors and patent holders, researchers and plant breeders, and farmers and rural communities, sharply in favor of the former and to the detriment of the later.

Today, several key international agreements govern the legal landscape in the area of intellectual property rights. While the TRIPs Agreement remains the most important and most enforceable, the Convention on Biological Diversity (CBD), the Nagoya Protocol on Access to Genetic Resources, and the Fair and Equitable Sharing of Benefits Arising from their Utilization (the Nagoya Protocol), the FAO's International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), and the International Union for the Protection of New Varieties of Plants (UPOV) all speak to the rights of patent holders, farmers, researchers, and communities. Collectively, these agreements establish a broad but sometimes contradictory framework governing the protection of intellectual property rights in the area of plant genetic resources (See Table 1).

The tensions between these agreements represent an important site of engagement for civil society. The holders of intellectual property rights most forcefully assert their ownership claims through the WTO. But the rights of plant breeders to use genetic materials to develop new seed lines, the rights of farmers to save seed from season to season, and the rights of communities to benefit from the use of genetic materials under their stewardship, are also worthy of development, clearer articulation, and greater enforcement. Indeed, this is an important part of the struggle against enclosure of the global ecological commons (Friedmann, this issue). The default assumption that the ownership rights of the private property holder should necessarily trump the claims of competing rights by researchers, farmers, and communities needs to be challenged. But equally importantly, the mechanisms of protecting and enforcing competing rights claims need to be more clearly articulated. The rights of patent holders reflect broader power inequalities in the global economy. It is therefore not surprising that such rights are more frequently and more forcefully protected. The inclusion of other rights claims in international agreements like the Nagoya Protocol and the ITPGRFA—however imperfect those agreements may themselves be—represents an important victory, particularly insofar as they impose clear requirements intended to limit the scope of biopiracy.

Table 1: Comparison of major international agreements addressing ownership of plant genetic resources

Agreement	Entry Into Force	Status of Patent Holder Rights	Status of Plant Breeders Rights	Status of Farmers Rights	Political Dynamics
WTO's Trade Related Intellectual Property Rights (TRIPs) Agreement	1996	20-year protection for new plant varieties; Provisions for sui generis protections.	Not included	Not included	Enforceable through the WTO's trade dispute settlement mechanism. Contains no provision subsuming its authority to other agreements.
Convention on Biological Diversity (CBD)	1993	Any agreement must "recognize and [be] consistent with the adequate and effective protection of intellectual property rights." (Art. 16.2)	Not included	Benefit sharing is mandated, with exact terms negotiated between governments and interested parties.	Formally replaced the common heritage doctrine with the principle that genetic resources were subject to national sovereignty.
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	2014	Facilitates the fair and equitable sharing of benefits arising from the utilization of genetic resources to incentive the conservation and sustainable use of biodiversity.	Not included	Mandated and to be implemented through national legislation.	Supplementary agreement to the CBD
FAO's International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA)	2004	Limits patent protections for varieties developed from genetic stock contained in the multilateral system (MLS).	Implied in right to use and exchange seed, subject to limits based on requirement for access and benefit sharing.	Recognizes farmers' right to use, save, sell, and exchange seed subject to national law.	Article 12.3.d limits intellectual property claims in a manner that could be at odds with TRIPs protections.
International Union for the Protection of New Varieties of Plants (UPOV)	1961 (rev. 1972, 1978, 1991)	Establishes criteria for protection of new plant varieties, which must be: (1) novel; (2) distinctive; (3) homogenous; and (4) stabile. Specific protections outlined under national legislation.	1978 version permitted use of protected varieties for the non-commercial development of new plant varieties. Exemption was limited in 1991 version.	1978 version permitted use of protected varieties for non-commercial applications (e.g., subsistence farming). Exemption was limited in 1991 version.	Exemptions under earlier versions have gradually been limited under more recent revisions, which falls closer in line with the TRIPs requirement for 20-year monopoly protection.

At the same time, such agreements are necessarily limited in two key respects. First, they all include broad language limiting their enforceability. Indeed, the Preamble to the ITPGRFA affirms that "nothing in this Treaty shall be interpreted as implying in any way a change in the rights and obligations of the Contracting Parties under other international agreements," while simultaneously asserting an understanding that this limit "is not intended to create a hierarchy between this Treaty and other international agreements" (ITPGRFA, 2001). The other international agreements in this area all contain nearly identical language in their preambles. Interestingly, only the TRIPs Agreement does not offer such concessions, suggesting a clear hierarchy in the enforceability of such rights claims.

Second, the agreements do not go far enough in specifying the scope of protections afforded the rights claims of competing interest. Article 9.3 of the ITPGRFA provides that Contracting Parties acknowledge the importance of farmers in protecting biodiversity and maintaining plant genetic resources, but includes language noting that "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" (ITPGRFA, 2001). The Treaty's Benefit Sharing Fund no doubt provides important material benefits for many farmers. But the right of farmers to save, develop, and re-propagate seed remains defined only in the abstract, subject to international limits, and protected only at the national level. And as Winter (2010, p. 247) observes, the contradictory obligations under TRIPs and the ITPGRFA effectively mean that "Article 9.3 has no functional effect."

Why should we care?

There are several reasons why the struggle over farmers, community, and breeders rights remains an important arena for political contestation. First, there is real economic value in plant genetic resources. Innovations in both conventional breeding and agricultural biotechnology—and everything in-between—depend on quality source gene lines. While recent developments in biotechnology open the possibility of creating synthetic genetic material in the laboratory, the vast majority of genetic stock available to plant breeders comes from existing resources and gene lines.

The nature of genetic resources makes it difficult to calculate a precise economic value, but it's clear that there is one. The Food and Agriculture Organization (2002), for example, observed that the introduction of genetic material from a wild relative of the tomato plant contributed an estimated $250 million per year to the value of tomato production in the State of California alone. Improved cultivars developed primarily through the introduction of new germplasm in the United States were responsible for 50 percent of the increased corn yield, 85 percent of the increase in soybean yields, 75 percent of the increase in wheat yields, and 24 percent of the increase in cotton yields in the United States between 1939 and 1978 (Day-Rubenstein, Heisey, Shoemaker, Sullivan, & Frisvold, 2005, p. 5). Further, much of the consolidation of the seed industry over the past twenty years (Howard, 2009) was driven by an effort to garner access to genetic material and techniques owned by the subsidiary, again suggesting a significant economic value for plant genetic resource stocks.

Second, extensive efforts have been undertaken at the global level to collect and catalogue plant genetic resources, often securing them in massive gene banks, it is clear that *ex situ* collections cannot replace *in situ* conservation in farmers' fields. Key elements of crop genetic resources are rooted in the agro-ecological system and therefore cannot be captured or stored offsite. Community rights provide an important mechanism to incentivize and support in situ conservation efforts.

Finally, there is a strong moral claim to be made in support of farmers' and community rights as an acknowledgement of the historical contribution of peasants and farmers who selected and bred crops for generations. The rich diversity of plant genetic resources available to breeders today is the direct result of the longstanding effort of generations of farmers. This effort deserves recognition.

This ethical argument also highlights the problematic nature of our terminology around the seed. In the literature, varieties developed by farmers over generations are usually referred to as "traditional" or "landrace" varieties, suggesting that innovation is done, and we're stuck where we are now. This is contrasted with the "modern" or "improved" varieties developed by plant breeders in laboratories. This language misrepresents, often in a very problematic manner, the actual performance of such crops in the field. It simultaneously advances technical "solutions" to poverty, hunger, and malnutrition—problems that are fundamentally political not technical and thus evade technical solutions (Chopra, this issue). While "modern" varieties are more input-responsive and thus can out-perform "traditional" varieties under ideal growing conditions found in test fields, in the real world conditions of most smallholders in the developing world, traditional and open-pollinated crops frequently provide a more stable yield under less-than-ideal growing conditions.

The path ahead

While competing rights claims clearly need to be reconciled, moving forward in the longer term requires a more fundamental rethinking of both the policy framework and the values that underlie it. As Devlin Kuyek (2001) writing for GRAIN noted, strong intellectual property rights often serve to undermine innovation, restricting the flow of germplasm, eroding genetic diversity, and stifling research. Alternative frameworks for intellectual property protection, including a nascent open source seed system modelled on the creative commons license and the open source software movement, offer interesting avenues through which the state-led models of competing rights claims may be circumvented (Kloppenberg, 2014).

Given the increased ability afforded by biotechnology to identify and transfer specific plant traits or properties, the value of plant genetic material—and the contested claims over control of such materials—is only likely to increase in the future. At the same time, broader global changes could fundamentally restructure the nature of plant breeding and with it the struggle for control over plant genetic resources. The gradual withdrawal of the public sector from agricultural investment in general—and plant breeding in particular—has created a situation in which orphaned, open pollenated crops are neglected, while billions of private dollars are invested into patented varieties of corn, wheat, cotton, and soy. While philanthropic investments have offset some of the decline, inconsistent funding through private grant dollars is no replacement for sustained investment by the public sector.

Even if it could be sustained, *philantropcapitalism* is no replacement for the state. Rather, philanthropcapitalism—rooted as it is in the broader context of global neoliberalism—depends promotes and on the hollowing out of the state and the subjugation of public policy to the business image and to the motive of private profit (Thompson, 2014). Public plant breeding efforts were recognized into public/private partnerships that render the intellectual property embedded in seed private and render the farmer a consumer rather than a producer of new seed technologies.

Going forward, synthetic biology could obviate the need for the raw genetic materials in the plant breeding processes, but competing use claims, particularly around the rights of farmers to save and replant seed, would remain. The higher cost of patented seed will likely reinforce the global two-tiered farming system in which large-scale commercial producers benefit from the latest technologies while subsistence farmers and small-scale commercial producers do not, generating greater inequality, particularly in developing countries.

All of this suggests several avenues for further research. Could a system of voluntary, open-source plant breeding replace declining public investment in agricultural research? How will the rise of synthetic biology affect demand for global genetic resources, and thus the effectiveness of access and benefit sharing agreements as a vehicle for promoting the maintenance of global biodiversity? And perhaps most fundamentally, how can competing rights claims in the area of plant genetic resources be reconciled?

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