

## Towards a Balanced Regime of Intellectual Property Rights for Agricultural Innovations

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The utilization of intellectual property (IP) rights in crop research is rapidly evolving, with an increasing number of countries and intergovernmental organizations becoming members of—and thereby ratifying the framework provided by—the International Union for the Protection of New Varieties of Plants (UPOV). Nevertheless, in some countries there has been intense debate over whether to implement the most modern version of UPOV (i.e., the 1991 Convention, or UPOV 91). The example of Chile is paradigmatic, where UPOV 91 has been ratified by the national legislature but not yet signed into law by the President. The delay in Chile is at least in part the result of misunderstanding surrounding the changes that UPOV 91 could effect in the country. This article seeks to clarify misconceptions by comparing the most controversial provisions of UPOV 91 with its predecessor (i.e., the 1978 Convention, or UPOV 78). Additionally, the authors draw upon the example of public sector research institutions—especially the University of California, Davis—to demonstrate that the utilization of IP protections to incentivize agricultural innovation need not come at the expense of other socially beneficial goals.

**Keywords:** Agriculture, public university, intellectual property, international law and policy

Global practices surrounding the use of intellectual property (IP) protections for agricultural innovations are rapidly evolving. The issue of how IP is used to protect new varieties of plants is one of critical importance in the modern world. Among many fundamental issues for the future of human society, appropriate utilization of IP mechanisms in the agricultural sector has been widely discussed in relation to food security,<sup>1</sup> economic development,<sup>2</sup> biodiversity,<sup>3</sup> and the rights of traditional and indigenous communities,<sup>4</sup> among other areas of debate. Unfortunately, the result has often been polarization of stakeholders. Fundamental issues have been confused, conflated, and subordinated to political or other agendas. The purpose of this paper will be to clarify these loci of contention, by outlining the extant international framework for the protection of new varieties of plants, and by discussing the implications of this framework through brief case studies of the situation surrounding the reform of the national agricultural IP law in Chile, and the use of plant IP protections by the University of California.

In many countries, the primary form of IP protection for new plant varieties is based in the framework provided by the International Union for

the Protection of New Varieties of Plants (UPOV). UPOV is an intergovernmental organization based in Geneva, established by the first International Convention for the Protection of New Varieties of Plants in 1961.<sup>5</sup> Since its creation in 1961, the UPOV Convention has been revised three times, in 1972, 1978, and 1991. The mission of all versions of UPOV is “to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society.”<sup>5</sup>

UPOV currently has 72 members, all of whom adhere to either the 1978 or 1991 versions of the Convention (UPOV 78 and UPOV 91, respectively).<sup>6</sup> As a condition of membership in UPOV, ratifying states must provide plant variety protection (PVP) certificates (a/k/a “plant breeders’ rights” or PBRs) to seed developers. As of 2014, 50 states and two organizations<sup>7</sup> (72% of membership) were bound by UPOV 91, while 19 states (27% of membership) adhered to UPOV 78. The most recent member to join UPOV is the African Intellectual Property Organization (OAPI), which bound itself to UPOV 91 on 10 July 2014.<sup>8</sup>

It is likely that even many more countries will join UPOV in the near future. Actions are currently being undertaken in the African Regional Intellectual

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Property Organization (ARIPO) to conform the domestic laws of its member States to the UPOV framework. To this end, ARIPO recently submitted its Draft Protocol for the Protection of New Varieties of Plants to the UPOV Council, which took a positive decision, indicating that the Protocol conforms to the provisions of UPOV 91.<sup>9</sup> This favourable opinion of the UPOV Council suggests that ARIPO will likely soon become the third intergovernmental organization to have ratified the UPOV IP framework.

### Global Trends

The increasing number of discussions and actions underway across the world to reform agricultural IP laws represents the recognition that reasonable forms of IP protection can support agricultural innovation and are, indeed, becoming essential for a modern and productive agricultural sector. Clearly, much is bound to change in many countries, which will undergo transition from a status quo in which there are effectively no policies governing IP for new plant varieties, to complete adherence to the most recent international framework in existence (i.e., UPOV 91). This process can be understood as “substantive harmonization,” referring to the actions that individual countries take to render the provisions of their domestic IP laws essentially equivalent with those of other States, thereby meeting a standard set forth by international treaties.<sup>10</sup> While some have criticized “upward harmonization,” or ratcheting up of IP laws in developing countries as primarily benefitting developed countries, there is some evidence that developing countries have had success in pushing a “development agenda” through the mechanisms provided in major international IP treaties.<sup>11</sup>

Generally, the global trend—in both industrialized and developing countries—is towards strengthening IP protections for new plant varieties. Notwithstanding the fact that critics have alleged that the UPOV framework is unimportant or obsolete,<sup>12</sup> utilization of IP rights mechanisms for the protection of agricultural innovations appears to be increasing worldwide. Specifically, the use of plant breeders’ rights to protect new plant varieties has become commonplace in many regions of the world, as indicated by the heightened number of applications. In particular, countries with large agricultural industries are increasingly becoming members of UPOV. In the 1990s there were about 20 UPOV members, but that number increased steadily in the 2000s, reaching the current 72 members in 2014.<sup>13</sup>

Furthermore, the recent actions by the multilateral African organizations OAPI and ARIPO suggest that the world’s IP landscape is trending towards harmonization, even among countries in which large agricultural industries have not yet been established.

However, developments towards a unified framework have not been entirely uniform. For instance, in some countries, significant opposition to the UPOV 91 framework has recently been voiced. Protests over the implementation of domestic regimes based on UPOV have also been launched in countries as diverse as Thailand<sup>14</sup> and Canada.<sup>15</sup> As discussed below, much of the controversy stems from a misunderstanding of the actual content of UPOV 91 and how it differs from that of its predecessor, UPOV 78. The debate over the implementation of UPOV 91 in Chile provides a paradigmatic example.<sup>16</sup>

### The Chilean Framework for Plant Variety Protections

Multiple domestic laws in Chile create the modern framework for IPRs over plant genetic material. The system of legal protections for plant IPRs in Chile started with Law No. 1.764 of 1977, which initiated the domestic regulation of PBRs for new varieties.<sup>17</sup> Subsequently, the framework for PBRs was revised in 1994 with Law No. 19.342. This statute enables breeders to claim rights over new plant varieties, via inscription in a national Register of Protected Varieties.<sup>18</sup>

The framework created by the UPOV conventions has had an impact on protections for new plant varieties in Chile. In 1996, Chile ratified UPOV 78, effectively adopting its standards for obtaining protection over a new variety, the scope of such protection, the scope of both breeders’ and farmers’ rights, and the allowance of combined (and potentially conflicting<sup>19</sup>) protections for claimed varieties. Currently in Chile, all genera and species may be protected by PBRs. The minimum period of protection is 18 years for trees and grapevines, and 15 years for other types of plant varieties, pursuant to UPOV 78. Most recently, in May 2013, the Chilean Congress approved the ratification of UPOV 91. However, at the time of writing, the President had not yet signed the legislation that would enact UPOV 91 in Chile. In fact, in May 2014, the administration of President Bachelet announced that it was withdrawing the legislative proposal that would have implemented UPOV 91.<sup>20</sup>

The project of ratification and implementation of UPOV 91 has led to significant discussions in Chile. Membership in UPOV is required by free trade

agreements that Chile has signed with the United States (US), the European Free Trade Association, and Japan.<sup>21</sup> Nevertheless, various efforts to enact the provisions of UPOV 91 into domestic legislation have been stymied at several stages of the political process. The challenges presented by the implementation of this new IP policy have elicited debate among various stakeholders. Unfortunately, some of the concerns surrounding the prospective change to the Chilean IP framework are based on misinformation.

### Differences Between the 1978 and the 1991 Versions of UPOV

When it was updated in 1991, the UPOV Convention embraced many significant differences in comparison with its 1978 predecessor (see Table 1). These differences led to four main concerns among stakeholders, which will be discussed in turn below.

First, it has been alleged that the most recent version of UPOV is biased towards for-profit breeders at the expense of farmers, as compared to its

predecessor.<sup>22</sup> Yet, the guiding theory of both UPOV 78 and 91 is that guaranteeing IP protections rewards innovation. Protections are only granted to plant varieties that can be shown to be “new,”<sup>23</sup> “distinct,” “homogenous,” and “stable.” It is true that UPOV 78 does not expressly enumerate these four requirements in the manner that UPOV 91 does. Although UPOV 78 does specifically refer to the requirements that a variety be distinct, homogenous, and stable, it does not explicitly require novelty. Nevertheless, UPOV 78 implicitly requires novelty as this term is defined in the 1991 Convention. Under UPOV 78, the claimed variety must not have been previously offered for sale or marketed; in other words, it must be new for all commercial purposes.

The fact that both versions of UPOV require novelty for a variety to be protected indicates that the essential underlying value of both versions of the convention is analogous. That is, the purpose of the PVP system imagined in UPOV is to reward

Table 1—Major differences between UPOV 78 and UPOV 91

Topic	UPOV 78	UPOV 91
Conditions required for protection (a variety needs to be)	Distinct Homogenous (Uniform) Stable	Distinct Homogenous (Uniform) Stable New (eliminates “common knowledge” language of UPOV 78)
Scope of protection	Breeder’s prior authorization required for: (1) production for purposes of commercial marketing; (2) offering for sale; and (3) marketing of the reproductive or vegetative propagating material of the variety	Breeder’s prior authorization required for: (1) production or reproduction; (2) conditioning for the purpose of propagation; (3) offering for sale; (4) selling or other marketing; (5) exporting; (6) importing; (7) stocking of all propagating material of the protected variety
Genuses and species that are subject to protection	Initially (upon becoming a Member of UPOV), 5 species, and 24 after the passage of 8 years following accession	Progressively all genuses and species (over a period of 5-10 years after accession)
Restriction on the production of seeds for personal use (farmer’s privilege)	No such restriction exists	Yes (although this privilege may be restored by domestic legislation under Article 15(2))
Breeder’s right over acts in respect to harvested material	No such right exists	Acts in respect to harvested material, including entire plants and parts of plants, obtained through the unauthorized use of propagating material of the protected variety require the authorization of the breeder
Essentially Derived Varieties	Not protected	Afforded the same protections as the protected variety itself
Period of minimum protection	18 years for trees and vines; 15 years for other varieties (measured from the date of filing)	25 years for trees and vines; 20 years for other varieties (measured from the date of filing)
Prohibition on dual protection (i.e., UPOV protection + patent under national law)	Yes, for varieties of the same genus and species	No

agricultural innovation, not to facilitate the exploitation of smallholder farmers. Nevertheless, the objective of reconciling the protection of ancestral farming practices with a desire to spur agricultural innovation could be more readily achieved if the provisions of UPOV were coupled with other international treaty frameworks, such as that provided by the Convention for Biological Diversity (CBD).<sup>24</sup> Thus, a comprehensive and balanced legal framework could support both economic development via modern technologies, and the preservation of traditional ways of life.

In a second and related criticism, opponents of UPOV 91 have argued that its implementation will lead to biopiracy, i.e., the protection of heirloom varieties with IP rights, to the detriment of those who previously used those varieties.<sup>25</sup> Yet in reality, ancestral and widely used varieties cannot be granted protection under either UPOV 78 or UPOV 91. The provisions in Article 7 of UPOV 91 expressly enumerate the criteria for a variety to be considered “distinct”—namely, new varieties must be clearly distinguishable from both (1) existing varieties already in the common knowledge, and (2) varieties that are already protected in another UPOV member country.<sup>26</sup> In this respect, wild and ancestral varieties cannot be protected because their existence and use is considered “common knowledge.”

A third reason for which UPOV 91 has been denounced by some individuals and civil society organizations relates to the ability of farmers to engage in non-commercial practices surrounding the use of protected varieties. While UPOV 78 implicitly allowed farmers to engage in non-commercial use (e.g., seed storage, trading, or development of new varieties) of protected varieties without authorization from the breeder,<sup>27</sup> UPOV 91 eliminated this “farmers’ exemption.” However, UPOV 91 does provide a mechanism whereby member countries may restore a version of the farmers’ exemption through national legislation. Specifically, countries that ratify UPOV 91 may “restrict the breeder’s right,” in order to “permit farmers to use for propagating purposes, on their own holdings, the product of the[ir] harvest.”<sup>28</sup> Therefore, although it is true that the farmers’ exemption is differentially constructed under the respective versions of UPOV, it is incorrect to conclude that smallholder farmers may never be protected from being labeled as “unauthorized users” under UPOV 91.

Fourth, critics of genetically modified or engineered (GM) crops have spoken out against UPOV 91, on the

premise that the latest version of the convention would lead to widespread cultivation of such crops. However, the reality is that ratification of the UPOV 91 Convention does not require the introduction of GM plants into a country. Indeed, UPOV 91 specifically provides that internal commercial regulation is independent from the granted breeders’ rights.<sup>29</sup> Successful examples of such independent regulation include Peru and Cuba, among others. Peru, for example, has enacted a 10-year moratorium to consider the use of genetically engineered crops,<sup>30</sup> while also subscribing to the guidelines of the UPOV 91 Convention as of April 2011. In contrast, Cuba, a recent adopter of GM technology, has remained a non-signatory to any UPOV convention as of October 2014.

### **Flexibility in the Implementation of Intellectual Property Frameworks**

A final criticism of the UPOV 91 framework is that in comparison to UPOV 78, it would comprehensively and unreasonably limit researchers’ and farmers’ use of protected varieties. The so-called “farmers’ exemption” and “research exemption” are important checks on the scope of IP rights, because they seek to balance the objective of rewarding innovation with that of use of protected varieties for other socially beneficial purposes.

Both UPOV 78 and 91 provide for some form of a breeders’ or research exemption, which allows for varieties protected by PBRs to be used by anyone for the development of new varieties.<sup>31</sup> Nevertheless, the relationship between the IP regimes outlined in UPOV 78 and 91 is complex. A major difference between the two versions of the Convention is the elimination of a true “farmers’ exemption,” meaning that although breeders can still use protected varieties freely for research purposes under UPOV 91, farmers can no longer replant protected varieties, or trade them in noncommercial settings. The elimination of the farmers’ exemption in UPOV 91 is a major reason for the intensity of the debate over the ratification of this version of the Convention in Chile, and in other countries. However, as discussed above, UPOV 91 member countries may elect to restore a version of the farmers’ exemption through national legislation, which would allow farmers to replant protected varieties in subsequent seasons.<sup>28</sup> Furthermore, similar controversies over the extent of IP protections have previously been resolved outside of the legal frameworks, where IP rights holders decide to observe *de facto* exceptions, electing to forgo potential legal actions for infringement.<sup>32</sup>

Such has been the case with the UPOV 91 research exemption. While the international framework envisioned under UPOV is designed to ensure that breeders can recoup their investments, it still provides for an exception under which varieties protected by PBRs may be used by anyone for the development of new varieties. The research exemption has been embraced by public and private sector entities alike, which have interpreted its scope beyond the explicit language of UPOV. For instance, the position of the Dutch seed industry trade association, Plantum NL, is that biological material protected by IP rights should be freely available for the development of new varieties, and that such free availability, use, and exploitation should not be obstructed in any way, either directly or indirectly, by IP rights.<sup>33</sup> Therefore, actors who hold rights to plant varieties can agree, *de facto*, to broaden the UPOV 91 research exemption beyond its *de jure* scope, by making it a policy not to bring infringement actions against individuals or organizations who use protected varieties solely for investigative and non-commercial purposes.

A similar, flexible interpretation of the farmers' exemption could be adopted by trade associations in Chile, or region-wide, while still comporting with the requirements of the UPOV Convention. Therefore, while the UPOV 91 framework in Chile might not contain an express farmers' exemption, this "farmers' privilege" could be recognized through either formal or informal practices. First, as discussed above UPOV 91 provides for an explicit mechanism through which member countries may relax the restriction on the production of protected varieties for personal use, under Article 15(2).<sup>33</sup> This provision of UPOV 91 grants discretion to national governments to decide whether or not seed saving should be permitted.<sup>34</sup> Second, even if a UPOV 91 member country were unable or unwilling to provide a domestic farmers' exemption pursuant to Article 15(2), private sector leaders of that country could agree to a *de facto* farmers' exemption for personal use, similar to the Plantum NL model for the research exemption. Although no such example of a *de facto* farmers' exemption currently exists, its creation is not unfathomable. Indeed, one could speculate that the European Community Plant Variety Office (CPVO) has brokered talks with European seed company leaders surrounding farmers' practices in developing countries in which these companies do business, given the fact that the CPVO's PVP system—which is based

on UPOV 91—gives farmers the right to use farm-saved seed without the right holder's consent.<sup>35</sup>

### **The Perspective of UC Davis, a Public-Sector Research Institution**

The expanded use of formal intellectual property rights (IPRs) to protect agricultural-based innovations and new plant varieties is not specific to the research-intensive private sector. In the US, the Bayh-Dole Act of 1980 played a substantial role in encouraging public sector institutions to use mechanisms for IP protection to support technology transfer. The essential function of the Act was to allow public sector institutions to own and manage inventions resulting from government funding, and to require these institutions to actively manage the resulting IP. In the last few decades, public research institutions and universities—like the University of California—have been employing IP strategies to protect, market, and facilitate the transfer of agricultural technologies and new plant varieties.

The history of the University of California (UC), and in particular one of its ten campuses at Davis (UC Davis), is relevant to understanding how to utilize IP protections in a balanced manner, to advance publicly-oriented, not-for-profit goals. UC Davis is a global leader in agriculture, and the university has had a long-term commitment to plant breeding and to supporting the food and agricultural industries. Since its establishment in 1906 as the University of California, Berkeley's "University Farm," UC Davis has focused on developing new plant varieties to enhance agricultural vitality. The UC System's use of intellectual property management tools dates to the 1920s, with the filing of the university's first patent application in 1926 (US Patent 1 657 230).<sup>36</sup> The university filed its first patent applications in agricultural and forestry innovations in 1927.<sup>36</sup> As the result of this early activity, the UC quickly recognized the need for guiding principles to govern the protection of its research products. Thus, the University of California adopted its first IP policy in 1943.<sup>36</sup>

The administrative office for technology transfer at the UC has evolved significantly throughout its history, transitioning from a centralized network to a de-centralized model, in which each campus manages its own local IP portfolio.<sup>36</sup> With an annual research investment of US\$ 3.35 billion dollars, a portfolio of over 4,000 active patents, and US\$ 119 million dollars in licensing revenue (in 2012), the UC System

is likely the largest public-research enterprise in the world.<sup>36</sup> Its extensive technology transfer program is an important tool for the UC to fulfill its mission of using research to benefit society.

In the US, fundamental changes in the nature and ownership of innovations in basic and applied agricultural research have led to increased patenting and licensing of university innovations, which in turn have encouraged product and commercial developments. While this trend has contributed to many positive economic outcomes, new IP policies have also created challenges for public research institutions and universities in supporting broad innovation, particularly for agricultural applications that address small markets such as specialty crops, or those that support humanitarian, rather than commercial, purposes.

Thus, the UC has developed management practices that allow licensing of inventions protected by IP for commercial markets, including niche markets, while reserving rights for use of technologies to serve people in need. For example, the Public Intellectual Property Resource for Agriculture (PIPRA) at UC Davis implemented the first “patent pool” to develop “open access” technologies for agriculture and to license for commercial and humanitarian applications in the US and developing countries, respectively.<sup>37</sup> Furthermore, UC campuses are using IP strategies to protect and market new plant varieties. An illustrative example is the UC Davis Strawberry Licensing Program.<sup>38</sup>

The strawberry improvement program at UC Davis focuses on breeding new cultivars for the California strawberry industry. However, because of the similarity of growing conditions between California and other world regions, such as southern Spain, Italy, South Africa, and the Southern Cone of South America, the UC Davis strawberry breeding program has become the basis for the development of global fresh-market strawberry industry.<sup>38</sup> The UC’s varieties now represent 70% of the California industry—valued at US\$ 2.5 billion, as of 2014<sup>39</sup>—and 50-60% of global production.<sup>38</sup> UC Davis’ strawberry program is considered a successful case study for strategic IP protection, licensing, and revenue generation.

The strawberry program utilizes not only the domestic system for IP protection in the US, but also the international IP protection mechanisms that are available in the worldwide strawberry-industry markets that the breeding program targets. Thus,

varieties developed by the UC Davis strawberry program may be protected under US plant patents, and also by mechanisms such as PBRs in countries such as Spain, which grow these UC varieties.<sup>38</sup> Use of these IP mechanisms have contributed to the explosion of Spanish strawberry cultivation, transforming from zero to a US\$ 1 billion annual industry in 25 years, primarily through the utilization of UC Davis varieties and know-how.<sup>39</sup> Additionally, the UC Davis Strawberry Licensing Program has facilitated the development of industries in Chile, Mexico, Morocco, South Africa, and Turkey.<sup>39</sup>

Not surprisingly, the UC does not license or allow its strawberry varieties to be produced or marketed in countries that do not have UPOV-compliant IP systems under which its varieties can be protected. Because the UC strawberry varieties are productive, farmers in countries without a UPOV-compliant IP system are unable to access a resource that could benefit their productivity and farm income. Notably, the UC does not require that a potential licensee be located in a jurisdiction that adheres to the 1991 Convention. However, the jurisdiction must, at a minimum, be a member of UPOV 78, as is the case with strawberry licensing in Mexico, South Africa, and—at least for the moment—Chile.<sup>6</sup>

Public sector research institutions outside of the United States have begun to implement the UC model for technology transfer toward commercialization of new varieties developed at these institutions. For instance, in Chile, the national agricultural research center INIA (Instituto Nacional para la Innovación Agrícola), is now using formal IP mechanisms at both national and international levels to protect and market new grape varieties resulting from its breeding programs.<sup>40</sup> Furthermore, PIPRA is currently working with the national agricultural research institute in Ecuador (Instituto Nacional para la Investigación Agropecuaria, “INIAP”) to develop an internal IP policy that would facilitate the transfer of INIAP’s varieties to private sector entities. While the appropriate strength of the PVPs that these public sector research institutions utilize may be debated, it is clear that the existence of some form of IP rights in new plant varieties is considered by many actors in the developing world to be fundamental to agricultural innovation and national economic development.

#### **Rationale for the Protection of Plant Varieties with IP**

Significant differences of opinion exist in the academic literature over whether strong IP protections

are good for simultaneously promoting innovation and other public interests, such as economic development or poverty alleviation. On the one hand, some studies have demonstrated that PVP systems have led to the development of more varieties of some crops, in turn leading to increased yields.<sup>41</sup> Similar results have supported a model providing that the greater the amount of effective IP (as measured by the ability of seed companies to profit from successful research), the greater the genetic gain.<sup>42</sup> Such findings provide an argument for strong PVP frameworks, since they suggest that both innovative and social welfare ends are served by robust IP rights.

Yet the results of other studies send mixed messages. For instance, an analysis of the US Plant Variety Protection Act (PVPA) of 1970 found that this law might have stimulated public, but not private sector investment in wheat varietal improvement.<sup>43</sup> The same study indicated that the PVPA did not cause any increase in experimental or commercial wheat yields.<sup>43</sup> Similarly, another recent investigation found little effect when analysing the impact of IP protection policies on agricultural innovation surrounding soybean production in Argentina, Brazil, China, India, and the United States.<sup>44</sup> The results demonstrated a significant correlation between research and development expenditure and hectares planted, but not crop yield.<sup>45</sup> Furthermore, an analysis of UPOV's "innovation effect" and its "transferability effect" found that PVPs might be most relevant to fostering investment rather than trade.<sup>46</sup> Specifically, UPOV's PVP framework appeared to provide an important mechanism for the support of foreign investment and collaboration activities, but not for the direct transfer of protected varieties.<sup>46</sup>

Finally, some scholars have argued that a balance "between IP protection and sharing of genetic resources and knowledge will ultimately foster investment and stakeholder confidence in innovation."<sup>47</sup> This is the sort of balance that public sector research institutions such as the University of California seek to achieve. Specifically, the UC believes in utilizing IP ownership and management tools to enhance its own capacity for innovation, while also enriching social welfare. Thus, public universities such as the University of California and other large agricultural research institutions in the United States such as Cornell,<sup>48</sup> have licensed their agricultural innovations while reserving rights for humanitarian uses, to strike a balance between the

mobilization of new technologies to concurrently meet the needs of the world's poorest people, and the commercial needs of wealthy countries.<sup>49</sup>

## Conclusion

The global IP framework is continuously evolving. As this process unfolds, a balance should be struck between an agricultural IP regime that can simultaneously benefit basic science, markets, and society as a whole. Ideally, this balance will be found not only in wealthy, industrialized countries such as the United States, but also in nations seeking to develop internationally competitive agricultural sectors while maintaining the objective of benefitting their local populations.

When a country considers whether or not to reform its domestic agricultural IP laws to conform to global frameworks such as that contained in the most recent version of UPOV, many factors must be considered and lively debate may be warranted. However, the experience of large, public sector research institutions in the United States—and in particular the University of California—tend to support the implementation of a UPOV-compliant framework for the protection of agricultural IP. Such a paradigm for PVPs can: (1) support agricultural innovations; (2) ensure that the best genetics are available; and (3) contribute to the alleviation of poverty in the agricultural sector. Finally, even the relatively more stringent 1991 version of UPOV envisions flexibility, for instance through the restoration of the farmers' exemption through domestic legislation. It is therefore possible for developing countries to balance the interests of multiple stakeholders, while still adhering to the UPOV framework.

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  - 20 Abasolo P D, The unknowns left by the withdrawal of the Plant Breeders' Law, *El Mercurio, Santiago* (31 March 2014), <http://www.litoralpress.cl/design3/lpi/mostrarrjgg.asp?id=29377458,29377463,29377468,29377473,29377475&idT=700982&ve=0> (accessed 18 August 2014).
  - 21 Chile has signed free trade agreements with the European Free Trade Association (requiring that Chile join either UPOV 78 or 91 by 2007); Japan (requiring that Chile join UPOV 91 by 2009); and the United States (requiring that Chile join UPOV 91 by 2009).
  - 22 See e.g., Ragavan S & O'Shields J M, Has India addressed its farmers' woes? A story of plant protection issues, *Georgetown International Environmental Law Review*, 20 (2007) 97-109 (arguing that UPOV promotes commercially profitable varieties, and in so doing reduces agricultural diversity, adversely affecting varieties that are socially but not commercially valuable).
  - 23 Notwithstanding the requirement that a variety be "new" under the UPOV guidelines, UPOV 91 provides a one-year grace period to breeders who have previously filed an application for the protection of the variety at issue in another UPOV 91 member country. Thus, "[a]ny breeder who has duly filed an application for the protection of a variety in one of the Contracting Parties (the "first application") shall, for the purpose of filing an application for the grant of a breeder's right for the same variety with the authority of any other Contracting Party (the "subsequent application"), enjoy a right of priority for a period of twelve months. Article 11, International Union for the Protection of New Varieties of Plants (UPOV), <http://www.upov.int/portal/index.html.en> (accessed 1 October 2014).
  - 24 Ganguli P, Intellectual property rights: Mothering innovations to markets, *World Patent Information*, 22 (2000) 43.
  - 25 See e.g., UPOV on the war path, *Seedling*, (June 1999), <http://www.grain.org/es/article/entries/257-upov-on-the-war-path> (18 August 2014).
  - 26 Article 7, Chapter III, UPOV 91 Convention.
  - 27 See Article 5, UPOV 78 Convention.
  - 28 Article 15 (2), Chapter V, UPOV 91 Convention.
  - 29 Article 18, Chapter V, UPOV 91 Convention.
  - 30 Peru Congress bans GM crops, *Farming Online*, 9 June 2011, <http://www.farming.co.uk/articles/view/4140> (accessed 18 August 2014).
  - 31 Article 15, Chapter V, UPOV 91 Convention.
  - 32 For example, it has been argued that there essentially exists a *de facto* research exemption for agricultural biotechnology research conducted by non-profit organizations in the United States, although no statutory (i.e., *de jure*) research exemption exists for most non-profit institutions in that country. Thus, in



- the US it is unlikely that a private sector rights holder would bring an infringement suit against universities and research institutes, where the nature of their research is clearly non-commercial. Nottenburg C, Pardey P G & Wright B D, Accessing other people's technology for non-profit research, *Australian Agricultural and Resource Economics Society*, (2002) 396, [http://www.cambia.org/daisy/cambialabs/92/version/default/part/AttachmentData/data/\(2002\)%20Accessing%20other%20people's%20technology%20for%20non-profit%20research.pdf](http://www.cambia.org/daisy/cambialabs/92/version/default/part/AttachmentData/data/(2002)%20Accessing%20other%20people's%20technology%20for%20non-profit%20research.pdf) (accessed 2 October 2014). See also Wright B D & Pardey P G, Changing intellectual property regimes: Implications for developing country agriculture, *International Journal of Technology and Globalisation* 2 (2006) 102 (noting that in US agricultural biotechnology research, "[s]cientists continue to consider themselves to have a de facto research exemption," largely because the probability of infringement suits brought by private sector rights holders was so low).
- 33 Plantum NL position on patent- and plant breeders' rights, <https://www.plantum.nl/Content/Files/file/Standpunten/Plantum%20Position%20on%20patent-%20and%20plant%20breeders%20rights.pdf> (accessed 18 August 2014).
  - 34 See Article 15 (2), Chapter V, UPOV 91, (providing that the restriction on the production of seeds for personal use (farmers' privilege) may be restored by domestic legislation).
  - 35 See The Community Plant Variety Protection System, Community Plant Variety Office (CPVO) (2009), [http://www.cpvo.europa.eu/documents/articles/2009-07-10\\_Article\\_Italy.pdf](http://www.cpvo.europa.eu/documents/articles/2009-07-10_Article_Italy.pdf) (accessed 2 October 2014).
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  - 39 See Carriere M, UC Davis – International Agriculture – UPOV PBR – Strawberry Variety Licensing, in *Benefit of the UPOV Systems to Farmers and Growers*, presentation by P Button & J Koide, 8 August 2014, Vientiane, [http://eapvp.org/report/docs/Keynote\\_address\\_2\(UPOV\).pdf](http://eapvp.org/report/docs/Keynote_address_2(UPOV).pdf) (accessed 2 October 2014).
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  - 41 See *e.g.*, Naseem A, Oehmke J F & Schimmelpfennig D E, Does plant variety intellectual property protection improve farm productivity? Evidence from cotton varieties, *AgBioForum*, 8 (2005) 100 (analysis suggesting that PVP has led to the development of more varieties of cotton and that these varieties have had an overall positive impact of PVP on cotton yields).
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