The regulation of agricultural resources: how international contestation of property domains impacts on agricultural R&D in Andean countries

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Abstract

The UPOV Convention, the CBD, the TRIPS Agreement and the ITPGRFA pull the levers of regulation of agricultural resources. It has not been fully appreciated that these treaties are based on different yet interacting notions of property. Common property and the sovereign and public domain rationales permeate the regulation of conservation, access and use of plant genetic resources (PGR) and associated knowledge in the CBD and ITPGRFA. The principles of private intellectual property (IP), by contrast, preside over the protection of agricultural biotechnology in commerce (UPOV and TRIPS). This paper analyses the relationships among the different property domains and investigates how the international agreements impact on agricultural R&D in developing countries in the Andean region.

The rules and promoted principles of each of the international treaties favour a particular property domain while weakening others. Yet apparently opposite property domains need each other. The private IP domain of TRIPS and UPOV feeds on the public domain and on the commons of PGR. The CBD, on the other hand, proclaims a public domain, yet with a built-in enclosure of sovereignty. The ITPGRFA, in the meantime, tries to build a ‘protected’ commons for selected PGRFA amidst IP and sovereignty enclosures and a shrinking public domain. The international cacophony of rivalling and intertwined property claims extends to nation states. Interviews with stakeholders in Andean countries reveal that developing countries tend to reproduce the partly overlapping and conflicting property claims of the international PGR regime complex in national laws and policies, a tendency with harmful consequences. Scientists in agricultural research are increasingly denied facilitated access to R&D tools. Networks of collaborating researchers have been undermined or even shattered by the lack of transparent and responsive rules or institutions regulating plant agricultural resources. Smallholder farmers, on the other hand, who dominate agriculture in Andean countries and grow/exchange crops outside the formal seed system, have experienced an erosion of their authority and autonomy in regard to the resources in their holdings.

Encouraging elements of a networked framework for regulating access and IP on agricultural resources, however, are emerging. Links between regulatory networks and nodes formed by state and non-state actors at international, national and local levels are some of those elements. Capitalising on these developments, and informed by property, regulatory and governance theories, this paper points towards some key elements an improved governance framework for agricultural resources needs to consider in order to foster innovation in agricultural biotechnologies.

1. Introduction

Agricultural resources, in particular those related to food crops, comprise the biological diversity of plants and the associated knowledge and cultural practices. The system in which plant genetic resources for food and agriculture (PGRFA) are developed and produced is a

highly dynamic and networked enterprise characterised by the presence of numerous plant materials (wild species, landraces, farmers' varieties, breeders' materials), the participation of multiple actors (farmers, plant biologists, breeders, seed companies) and a combination of non-commercial and commercial activities across public and private realms (Correa 2000).

The availability of germplasm and the application of biotechnologies are two important pre-requisites for the development of new crop cultivars (Roca, Espinoza et al. 2004; Delmer 2005; Pingali and Raney 2005). Access and use of germplasm since 1992, is regulated by access legal regimes that tend to emphasise state-sovereign rights on genetic resources. Access to biotechnology tools and transgenic/improved crops, on the other hand, is increasingly contingent upon intellectual property (IP) rights. The latter types of tools and crops are mostly developed and IP-protected by industrialised countries, notably the U.S. (Pardey, Beintema et al. 2006; Wright and Pardey 2006). Both sovereignty-based (germplasm) and IP regimes (transgenic/improved germplasm, biotechnologies) seem to erect barriers, albeit of different kind, within the complex enterprise of R&D of PGRFA. The problem with access restrictions imposed through either of these regimes is that most countries and agricultural stakeholders tend to be affected, because most of them are likely to be both provider and user of these inputs at certain points in the process. The degree of restrictiveness of access schemes may make a difference in the development of R&D capacities and in the leap from R&D to commercialisation (CIPR 2002).

This paper analyses the governance and regulatory frameworks of access to the two primordial tools of PGRFA development – germplasm and biotechnologies – at international, regional and national levels. The main focus is on the effects of these frameworks on agricultural R&D in biodiversity-rich developing countries of the Andean region (Bolivia, Colombia, and Peru). It is argued that formal rules and social norms for the governance of agricultural R&D, and in particular crops, are in great part an expression of varied notions of property (sovereign, common, public and IP-based) which are in conflict with each other and negatively affect agricultural R&D. Yet there are some encouraging developments. The failure in the regulation of biodiversity-related resources has prompted the creation of alternative governance structures in the Andean Community of Nations, which are starting to extend beyond its borders. The paper concludes with a discussion of certain key features of these alternative frameworks and suggests additional regulatory and governance components that might enhance the increasingly networked governance of agricultural R&D resources.

2. International regulation of PGRFA

Access to plant genetic resources (PGR) in general and PGRFA in particular is regulated by a range of international regimes including the International Undertaking on Plant Genetic Resources (IU), the Union for the Protection of New Plant Varieties (UPOV), the Convention on Biological Diversity (CBD), the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). The discussion that follows focuses on (i) the various property spheres advanced by these agreements and (ii) the paradoxical interdependency and conflict among the property domains at play.

From a global commons to exclusive domains

Prior to UPOV, all types of plant materials, either domesticated or non-domesticated, were as germplasm (as the genetic information of an organism) part of a global genetic commons (Raustiala and Victor 2004; Safrin 2004). Availability of this informational PGR to everyone and alienability by no one are the characteristics of a 'positive inclusive commons' domain (Drahos 2006). In such a domain, informational PGR grow through use. Open access, sharing and commingling of PGR are thought to fuel food diversity and contribute to food

security (Brush 1998; Brush 2005).

Parallel to the abovementioned domain, there was and is a sphere where breeders and horticulturalists interested in marketing plant varieties seek protection for their products. The UPOV Convention[1] was born to provide breeders exclusive rights over commercial plant varieties[2] deemed to be new, distinguishable, uniform and stable (DUS criteria). The growing consolidation of UPOV as an exclusionary IP domain for plant varieties[3] impinged on the dynamics of exchange of cultivars. In an effort to avert the contraction of the global PGRFA commons,[4] the IU of 1983 aimed at providing unfettered access to any type of PGRFA ('raw' or 'worked'),[5] including those under private plant variety protection (PVP) regimes.[6] But the attempt to reclaim a positive inclusive commons for PGRFA was short-lived. By 1991, PVP claims over 'worked' plant materials and state-sovereignty claims over national germplasm inserted into the global genetic commons of the IU reduced it once more (Roa-Rodríguez and van Dooren 2007).

The CBD of 1992[7] marks the start of an era of state-sovereign property in genetic resources. Although presented as the major international agreement on the conservation and sustainable use of biological resources (McGraw 2002), the chief objectives of the CBD are to control physical access to biological resources in order to regulate the genetic component, and to be able to capture benefits from the use of genetic resources (Glowka 1998). Consequently, state sovereignty governs over natural and biological resources[8] and gives the states the authority to determine access to their genetic resources,[9] including those for food and agriculture.

The TRIPS Agreement, adopted in 1994,[10] paved the way for the globalisation of the IP domain through minimum IP-protection standards, the connection between IP and trade and the trade enforcement tools through the World Trade Organization (WTO) (Drahos and Braithwaite 2002; Drahos 2004). In the 13 years since the birth of TRIPS the IP sphere has encompassed agro-biotechnological resources mainly under patents and *sui generis* forms of PVP.[11] Any modified plant or plant part, plant variety as well as the related knowledge are now eligible for IP protection in WTO countries (CIPR 2002; Koo, Nottenburg et al. 2004).[12]

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[1] International Convention for the Protection of New Plant Varieties (Act of 1961), 2 December 1961.

[2] Art. 2 and 6 of UPOV Convention Act of 1961 provide for the forms of protection available to plant varieties, the meaning of 'plant variety' and the conditions required for protection.

[3] The 1991 Act of UPOV extends protection of plant varieties to harvested material and plants essentially derived from the initial protected variety (Art. 14). There are 63 countries members to either of the in force UPOV Acts (1978 or 1991) (see www.upov.int).

[4] International Undertaking on Plant Genetic Resources, adopted at the end of the Twenty-Second Session of the Food and Agriculture Organization (FAO) Conference (Resolution 8/83), Rome, 5-23 November 1983. The title of the Undertaking was amended to International Undertaking on Plant Genetic Resources for Food and Agriculture to reflect the true scope of the agreement

[5] Types of PGRFA covered by the IU (Art. 2) refer to the types of plant materials used as resources in crop breeding are cultivated varieties (cultivars) in current use and newly developed varieties, obsolete cultivars, primitive cultivars (land races), wild and weed species, near relatives of cultivated varieties, and special genetic stocks (including elite and current breeders' line and mutants).

[6] Art. 1, 2 and 5 of the IU of 1983.

[7] Convention on Biological Diversity (CBD), United Nations Conference on Environment and Development (UNCED), Rio de Janeiro (Brazil), 5 June 1992.

[8] Preamble, 5th paragraph and Art. 3 of the CBD.

[9] Art. 15(1) CBD. Natural, biological and genetic resources are intimately related but not equivalent. Natural resources are the largest category and encompass the other two types of resources. Biological resources in turn encompass genetic resources and materials. Thus, genetic resources are only a type of biological and natural resources.

[10] Trade-Related Aspects of Intellectual Property Rights, Annex IC of the Marrakech Agreement Establishing the World Trade Organization (WTO), Marrakech, Morocco, 15 April 1994.

[11] Art. 27(3)(b) TRIPS Agreement.

[12] See also CIPR 2002, p.58-60.

In this way, the expansive exclusive IP domain advanced by TRIPS impinges on both the global commons and the public domain of PGRFA.

Some authors claim that the CBD created a protected sphere of common property (a biodiversity commons) to counterbalance the private IP domain advanced by TRIPS (Straus 2000; Linarelli 2004). However, the CBD has established nation-sized islands of genetic resources ruled by sovereign ownership (Roa-Rodríguez and van Dooren 2007). Claiming to protect national public resources, some states have restricted access to genetic resources, albeit for different motives than the IP regimes. In an attempt to counteract these restrictions, the ITPGRFA, in 2001, created a multilateral system of access and benefit-sharing for a selected group of crops located under *in-situ* and *ex-situ* conditions within the boundaries and premises of the contracting parties.[13] This multilateral system also encompasses the exchange of knowledge and the access and transfer of technologies related to PGRFA.[14]

The ITPGRFA aims at restoring access to a broad genetic base of crop germplasm by forging a 'protected' commons. As ITPGRFA members are not allowed to claim IP over resources "in the form received" from the multilateral system,[15] the Treaty creates an 'positive exclusive commons' (using Drahos' typology), where members of the commons access and use the resources without appropriating or alienating them. However, this *de jure* commons has the potential to be a different commons in practice. According to the Treaty and the Standard Material Transfer Agreement that regulates the transfer of germplasm, it seems possible to claim IP protection over PGRFA (including any of their parts) that have been modified after their acquisition from the multilateral system.[16] If such IP protection were to impede access and use of the plant materials and genes in their 'natural' form, the goal of the ITPGRFA would be defeated (Correa 2006). If this situation took place the positive exclusive commons would turn into a negative exclusive commons where the resources would be appropriable by anyone.

Interplay of property domains

The boundaries of the international regimes on PGR are difficult to demarcate. A background of rules and aligned interests has conditioned the emergence of the regimes[17] and continues to shape the dynamic interplay among them, in part due to the interconnected property domains they advance. The nature of the relationships among property domains is such that whatever is done to one domain invariably affects another one in one way or another (Samuelson 2003; Chander and Sunder 2004). Overall, the expansive IP-based enclosures advanced by UPOV and TRIPS, and the sovereignty-based enclosures forged by the CBD have effectively reduced the global PGR commons.

Paradoxically, as noted by Roa-Rodríguez and van Dooren, the growth of IP relies on the existence of public and common spaces. The private domains of TRIPS and UPOV feed on such domains by extracting 'raw' plant materials to which 'value' is allegedly added, resulting in 'worked' products that are the object of property. Likewise, the CBD's sovereign

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[13] International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) adopted through Resolution 3/2001, Thirty-first Session FAO Conference, 3 November 2001. As of May 2007, 110 countries and 11 CGIAR centres are members of the Treaty. See International Treaty on Plant Genetic Resources for Food and Agriculture-Signatures and Ratifications, at http://www.fao.org/Legal/TREATIES/033s-e.htm; and Statement of the CGIAR Centres Regarding Implementation of the Agreements Between the Centres and the Governing Body of the International Treaty on Plant Genetic Resources for Food and Agriculture, 16 October 2006, at http://ipgri-pa.grinfo.net/media/1/CGIAR%20Alliance%20statement.doc.

[14] Art. 1, 3, 11 and 13 of the ITPGRFA.

[15] Art. 12.3(h) of the ITPGRFA. IP claims are barred for any PGRFA "in the form received from the multilateral system".

[16] The prohibition of IP claims on PGRFA "in the form received from the multilateral system" does not extend to post-acquisition modifications of resources "in the form received".

[17] Raustiala and Victor 2004, p.296-298.

domain over genetic resources relies on the public and common genetic resources as it seeks to obtain benefits resulting from the use of accessed resources. If the restrictive domains of both IP-based and sovereignty-based regimes continue their unrelenting growth we might witness resource depletion, but not because of over-use. Instead, restrictive access and use regimes might lead to an under-use of plant genetic resources and affect PGR-based innovation and product development.

The IP domain and the sovereign domain seem to have entered a noxious cycle of escalating ownership or 'hyper-ownership' as noted by Safrin. In an attempt to counterbalance the IP domain, the sovereign domain of the CBD has turned into its antithesis. Recent measures such as the demand for disclosure of origin of biological and genetic resources as a requisite for patent applications on biodiversity-based inventions (Chatham House 2006; Sarnoff and Correa 2006)[18] are attempts to restore the balance of power between the sovereign and IP domains. However, if implemented, this measure might only affect the distribution of benefits between providers and users of the resources. The ever-swelling ownership unleashed by the CBD and TRIPS, and the concomitant growing enclosures of the PGR commons would remain unabated.

3. PGRFA regulation in the Andean region

In response to the CBD, the UPOV Convention and the TRIPS Agreement, the Andean Community of Nations has enacted landmark regional legislation on access to genetic resources, biodiversity in general and IP. The Andean legislation bears the distinctive signs of the international agreements (Figure 1).

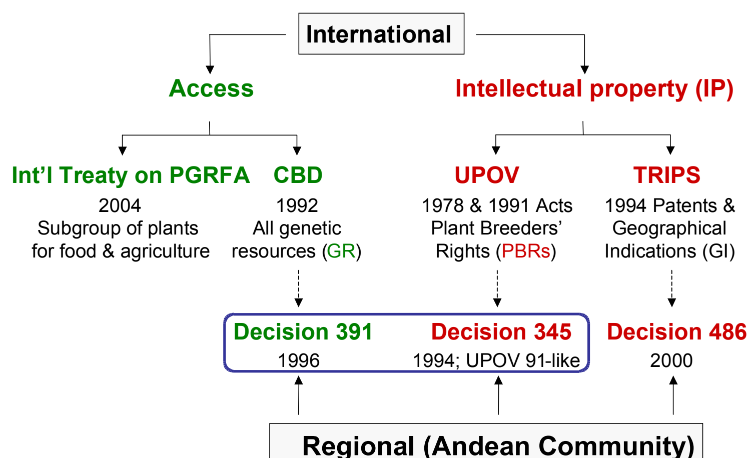

Figure 1. The regional laws of the Andean Community governing PGR.

Sovereign property dominates the Andean Decision 391 on access to genetic resources, while the Andean Decision 345 on Plant Breeders' Rights and the Decision 486 on Industrial Property are about exclusionary private IP regimes. The Decisions, however, also reflect the particular understandings, needs and positions of the member countries as well as political and economic pressures coming from other countries.

Access to genetic resources: Decision 391

Andean countries see biodiversity as a 'strategic green asset' for biological, climatic and

[18] A group of developing countries led by India tabled a proposal for disclosure of origin as a new requirement for patent applications before the WTO on 31 May 2006. As to June 2007 the proposal is under consideration. See Doha Work Programme- The Outstanding Implementation Issue on the Relationship Between the TRIPS Agreement and The Convention on Biological Diversity, Communication from Brazil, India, Pakistan, Peru, Thailand and Tanzania. WTO, General Council, Trade Negotiations Committee, WT/GC/W/564, TN/C/41.

food stability and security, and perhaps even more importantly for world bio-trade.[19] Concerns about bio-piracy and bio-prospecting led the mega-diverse countries of the Andean Community to adopt an approach to genetic resources (GR) access and benefit-sharing which is dominated by strict state-sovereign ownership (Ruiz Muller 2000; Correa 2003).[20] This approach is reflected in the concept and scope of access and its multi-tiered contract scheme.

Access, according to Decision 391,[21] is an overarching concept that encompasses the obtainment of *any* non-human GR from *any* source for its use in *any* non-commercial or commercial activity. The scope of GR also includes any isolated biological molecule or compound derived from GR, resources for food and agriculture, and GR-associated knowledge and practices of any group (indigenous, farmers, scientists). Resources located on state or private land and *ex-situ* collection centres are equally ruled by the access regime. Thus, owners, hosts or administrators of these resources have no longer control over access to GR located in their premises.

There are five types of bilateral contracts stipulated in the Andean access regime that govern access transactions. Each contract has different parties and each is concerned with different biodiversity-related objects (ten Kate 1997; Grajal 1999; Gamache 2001; Gemar 2002; Correa 2003; Ruiz Muller 2003). To appreciate the complexity of such a system of multiple contracts consider an example of a hypothetical applicant (Figure 2).

A scientist, either an Andean national or a foreign person,[22] who wants to get access to a rare potato variety (*the biological resource*), must first enter into an **Accessory contract** with the provider of the potato plant. The provider could be a group of farmers or a research institute, depending on whether the plant is located on-farm or in an *ex-situ* collection. If the potato plant grew on private land, the scientist may need to enter into an accessory contract with the landowner or administrator of the land. The scientist wants to perform an analysis of the potato's genetic makeup (*the genetic resource*) in comparison with the most commonly cultivated varieties. She also wants to analyse some antioxidant compounds (*the derived resource*), which might be of interest in the context of the eventual development of more nutritious potato varieties. To access the genetic material (DNA) and other plant compounds, she requires an **Access contract** with the state, represented by the National Competent Authority, which is the provider party of the GR.[23] In addition, as she is interested in uses of the potato variety by traditional communities (*the intangible resource*), she requires an **Annex contract** with the farmer community who would be the provider of the intangible resource.

[19] Decision 523 on a Regional Biodiversity Strategy, for example, affirms that the "world market for biological resources" moves an excess of "900 billion dollars" (Introduction).

[20] The drafting of the Andean access regime was dominated by a couple of strong perceptions among the governments of the Andean countries. First, that bio-piracy (the misappropriation of biodiversity-related resources), allegedly carried out by international entities, was rampant in their territories; and second, that there was a global interest in bio-prospecting (the commercial exploration of biological materials for potential commercial use). Given the biological wealth of the Andean countries, the Andean governments conceived the access regime as a defensive tool against bio-piracy and as a mechanism to obtain compensation for the provision of biodiversity.

[21] Art. 1 of Decision 391 defines access as "the obtaining and use of genetic resources conserved in situ and ex situ, of their by-products and, if applicable, of their intangible components, for purposes of research, biological prospecting, conservation, industrial application and commercial use, among other things." By-products or derived products are "a molecule, a combination or mixture of natural molecules, including crude extracts of live or dead organisms of biological origin that come from the metabolism of living beings." Intangible component encompass "all know-how, innovation or individual or collective practice, with a real or potential value, that is associated with the genetic resource, its by-products or the biological resource that contains them, whether or not protected by intellectual property regimes."

[22] An additional requirement for foreign applicants is the support of a national institute, which must accompany the applicant throughout the application and access process. It also must collaborate with the national competent authority in controlling and monitoring activities carried out by the foreign applicant with the accessed material (Art. 26 and 43 of Decision 391).

[23] Article 32 of Decision 391.

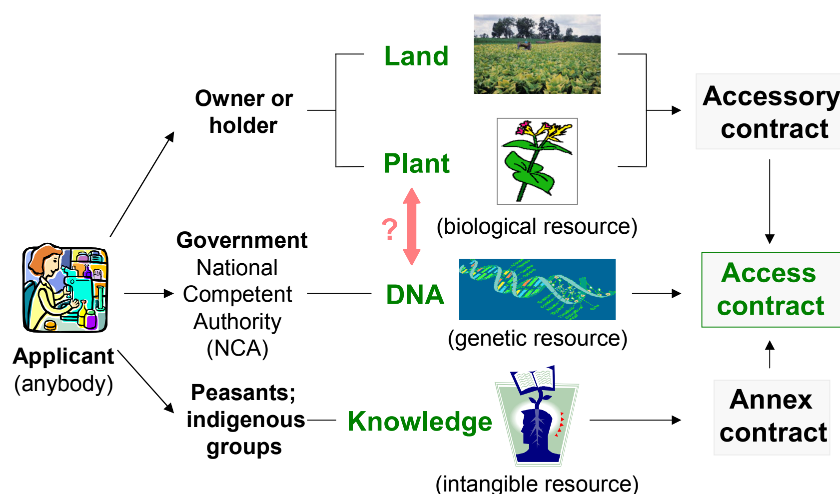

Figure 2. Access contracts under Decision 391 of the Andean Community.

Access and Annex contracts, in particular, must specify any sorts of possible benefits (monetary and non-monetary) arising from the use of the resource and eventual IP rights that might apply to the resources.[24] None of these contracts provides for sub-licence rights or transfer of the accessed material to third parties, nor do they authorise future activities with the accessed material not disclosed in the Access contract.[25] As their names imply, the validity and enforcement of the Annex and Accessory contracts are tied up to the existence and enforcement of an Access contract. If the Access contract were terminated, nullified or modified, so would be the others.[26]

Other contract types apply to the regulation of activities by research centres, universities and *ex-situ* collection centres. A **Framework contract** authorises a recognised research centre or university to multiple instances of access.[27] This privilege, however, is not extended to *ex-situ* conservation and collection centres of seeds or any reproductive material. These centres must enter into individual Access contracts to pursue collection activities[28] and are expected to enter into **Administration, Deposit or Intermediation contracts** to regularise their tasks as repositories, custodians and users of biological and genetic resources, including derived and synthetised products. The state retains sovereign ownership and access control to resources in those centres.[29]

Problems with contracts

The multi-tiered approach of contracts is complex. The complexity derives from the different parties to the contracts, the diverse objects contracted for (biological, genetic, and knowledge resources); the possible property realms applicable to the objects (private, state, common or public); the myriad of uses; and the diverse sorts of potential benefits. Managing and understanding such complexity could well be beyond the social and financial capabilities of the National Competent Authorities, which are the state regulatory entities for all contracts.

For a potential applicant, the transaction costs of bargaining so diverse contract terms with so many different parties for the simple purpose of a single access event could be off-putting. Furthermore, demanding benefits and obligations that are not commensurate with the intended use of the resources would be an additional reason to repel potential applicants.

[24] Article 35 of Decision 391.
[25] Model of Access Application provided by Resolution 414 of 22 July 1996.
[26] Articles 42-44 of Decision 391.
[27] Article 36 of Decision 391.
[28] Article 37 of Decision 391.
[29] Article 36 and Fifth Complementary Measure of Decision 391.

Evidence gathered by myself and other authors indicates that high transaction costs effectively operate as a disincentive for both academic and commercial activities with biodiversity resources. Access to genetic resources would either not take place, or it would take place outside the official regulatory regime. In either situation, none of the expected benefits will flow to the Andean countries.[30]

Lastly, the subordinated character of private contracts (Accessory and Annex) to a public Access contract may raise equity concerns. In particular, indigenous and local communities, the providers of the intangible resource component, may feel that their right and capacity to decide over such resources is not acknowledged and respected by the state.[31] As Ruiz Muller points out, the treatment of these communities as mere providers would not give them enough incentives to make the resources available under the terms set up by Decision 391. Given the current government structures and bureaucracies in Andean states, it is also uncertain that the resource providers would actually be recipients of benefits flowing from the use of resources. Andean indigenous groups have actually raised claims on these grounds, in some cases so strongly that access processes have been disrupted and halted without reaching any solution.

Patents according to Decision 486

Patents are available to inventions in all fields of technology as long as the patentability criteria of novelty, inventiveness and industrial application are met.[32] However, with respect to biological materials, Decision 486 bars patents on both entire plants and parts of plants (including the genome and germplasm), animals and any living being as existing in nature or in isolated form.[33] In addition, "essentially biological processes for the production of plants and animals" are not patentable, although they could be inventions.[34] In this latter category are therapeutic, surgical and diagnostic methods for the treatment of, or application to human beings and animals.[35] Patents granted on any of these objects are deemed invalid, and any person can request invalidity of these patents before the National Competent Authority.[36]

'Modified' biological materials, on the other hand, are patentable because they are considered artificial processes that involve technological intervention and skills.[37] For instance, it would not be possible to obtain patent protection for a conventionally bred plant variety (i.e., repetitive cycles of crosses and selection) or a plant variety arising from a natural mutation in a cultivar. However, it would be possible to obtain a patent for a genetically modified plant containing a transgene introduced to confer resistance to a pathogenic bacterium.[38]

These measures are in line with what is permissible and desirable under Decision 391. Intellectual property-derived benefits of biodiversity products are some of the benefits contemplated from the access to Andean resources. By allowing patents on artificial or

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[30] See, e.g., Grajal 1999, Ruiz Muller 2003, and Correa 2003. All of them present evidence indicating that the poli-contract approach of the Andean regime has repelled academic and commercial researchers because of the costs in time, effort and money associated with an access application and process.

[31] Art. 7 of Decision 391 says to "recognise and value the *rights and capacity* of indigenous, Afro-American and local communities to *decide* over the intangible component associated to genetic resources and derived products" (emphasis added).

[32] Art. 14 of Decision 486.

[33] Art. 15(b) of Decision 486.

[34] Art. 20(c) of Decision 486.

[35] Art. 20(d) of Decision 486.

[36] Art. 75(c) of Decision 486.

[37] See Andean Community, Economic Policies, Intellectual Property, at http://www.comunidadandina.org/politicas/intelectual2.htm (last visit on December 2001).

[38] For patent applications on genetically modified organisms or the processes for their production, a copy of a document granting biological safety of the material has to be provided (Art. 280 of Decision 486).

transformed products of nature it is possible that such benefits are eventually obtained. However, granting patents on inventions based on materials of Andean heritage or based on Andean knowledge is subordinated to the acquisition of these resources according to Decision 391 and national laws.[39] Patent applicants are required to provide a copy of the access contract for genetic resources and/or a copy of the licence or authorisation to use knowledge.[40] The same criterion is spelled out in Decision 391.[41] The lack of compliance with these measures is a ground for rejection of IP applications and invalidity of granted patents or affected claims.[42]

Protection of plant breeders' rights under Decision 345

Decision 345 is very much in line with UPOV 1991. What are the implications for Andean agriculture? The countries of the Andean community are centres of origin and domestication of 45 different tuber, root, vegetable, fruit and fibre crops, some of global importance (potato, tomato, common beans, peanuts and tobacco) (González Jiménez 2002). The wealth of traditional cultivars of some of these crops is enormous and largely in the hands of local farmers and indigenous communities. For instance, there are easily 350 different potato cultivars in one community alone of traditional Andean farmers (*campesinos*) in the Peruvian departments of Junín and Cusco.[43] In general, many traditional cultivars are exchanged and consumed locally, but only few are commercialised at national level. Even less get to be traded outside national borders. Hence, a key question is how the Andean plant breeders' rights (PBR) regime treats Andean cultivars and farmers in the context of granting PBR to 'new' varieties.

Novelty, distinctiveness and 'creative activity'

As Decision 345 determines the novelty of a plant variety on commercial grounds, native plant varieties that are only marginally represented in the market are unlikely to count towards assessing novelty of a plant variety in the Andean region, even if the native variety had the same essential features as the one to be protected.

It would appear that a different situation arises in the case of assessing distinctiveness. A distinct variety means a variety clearly different from any other variety "whose existence is a matter of common knowledge". According to UPOV, landraces that are capable of satisfying the definition of "variety" and can be propagated *unchanged* should be regarded as varieties of common knowledge for distinctness purposes (UPOV 2002). 'Common knowledge' even includes the knowledge of communities around the world.[44] The possibility of landraces being used as benchmarks for evaluating the distinctiveness of a purported new variety, however, seems to fade away when one looks at how the DUS criteria are practically evaluated. Typically, only a handful of well-known and highly *commercial* varieties are used in DUS trials.[45] The chance of traditional Andean cultivars being part of such trials is slim. As a result, a 'new' variety could be judged as 'distinct' even if it were indistinguishable from a non-commercial traditional cultivar.

Another UPOV prerequisite for the recognition of a new plant variety is that it has to be the result of 'creative activity'. Creative activity has to be measured against an existing status quo. For the reasons outlined above, non-commercial Andean landraces may not be considered when defining this status quo. Hence, the possibility that properties or features of

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[39] Art. 3 of Decision 486.
[40] Art. 26(h) and (i) of Decision 486.
[41] Second and third Complementary Provisions of Decision 391.
[42] Art. 75(g) and (h) of Decision 486.
[43] Stef de Haan and María Scurrah, Centro Internacional de la Papa, CIP (personal communication).
[44] UPOV 2002, Revision Document C(Extr.)/19/2, numeral 23, p.6.
[45] Information gathered from interviews with PBR authorities in the Andean countries of study.

landraces are ‘recreated’ in ‘new’ varieties does not appear all that far-fetched.

Farmers’ rights

Decision 345 confers on farmers the right to save and use protected plant materials (harvest products, protected varieties and essentially derived varieties) on their own holdings. According to the Andean regime, “anyone who *stores* and *sows* for his own use, or *sells* as a raw material or food, the product obtained from the cultivation of the protected variety shall *not* be infringing the breeder’s right. This Article does not apply to the *commercial use* of multiplication, reproductive or propagating material, including whole plants and parts of plants, of fruit, ornamental and forest species” (emphasis added).[46] A criticism to the regime is that it does not give a definition of “raw material”, but one could assume according to the meaning of “material”, that raw may include whole plants and any part of the plant, including parts used for multiplication and regeneration (e.g., sexual seed and vegetative seed). This interpretation is indeed supported by the fact that commercial use of seed is allowed with the exception of few categories of cultivated plants considered cash crops in the Andean region.

The clause is of major importance for the agricultural dynamics of the Andean region. Small holders (with an average of around two hectares) are by far the biggest group of Andean farmers. They acquire more than 90% of their seed through direct farmer-to-farmer exchanges (Thiele 1999). With this clause, the Andean regime on PBR ensures their right to food and sustainable livelihoods.

Double protection of varieties

Double protection for a single plant variety, through patents and plant variety protection, is not possible according to the Andean IP regime. Decision 345 does not contain a clause banning double protection, but Decision 486 does.[47] The cyclical process of crossing plant parents and selecting progeny for special characteristics are “essentially biological procedures”, which are not patentable according to Decision 486. Therefore, PBR are available to breeders for plant varieties bred through conventional methods while patents are applicable to plant varieties developed via substantial intervention of biotechnologies (e.g., genetically modified varieties).

Globalisation of law vs. adaptation to regional interests

In the globalisation of legal rules on access to genetic resources and intellectual property one could say that the Andean Community of Nations has adopted the spirit of the international agreements with respect to their principles and mechanisms of regulating access and IP as well as their core concepts of property (sovereignty-based in the case of the CBD; private IP-based in the case of TRIPS and UPOV). Thus, *apparently* there is convergence of the law, in the sense that regional and international legislation seem aligned.

However, as noted by Halliday and Osinsky, this convergence is apparent because the globalisation of law is always subject to negotiation by national or local agents (Halliday and Osinsky 2006). Andean agents selectively “admit, sponsor, adapt and resist” exogenous rules.[48] So while the core principles and concepts of the international agreements have been admitted and sponsored, selected aspects have been accommodated and tailored to the particular interests of Andean countries. Examples of the latter tendency are the peculiarities of the Andean access regime, the limits of patentability of biological materials, the types of IP protection available to plant varieties and the position of the PBR regime with respect to farmers’ rights.

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[46] Art. 26 of Decision 345.
[47] See supra note 33.
[48] Halliday and Osinsky 2006, p. 456.

4. Country-level experiences

According to Andean law, Andean Common laws precede national laws, are of immediate national effect and applicability (no ratification required), and prevail over national laws in case of dispute or contradiction (Casas Isaza 1999). However, as in other aspects discussed in this paper the *de jure* and *de facto* situations are not one and the same.

Access to biodiversity-related resources

Adoption of Decision 391

The lack of full adoption of the Andean access regime is perhaps one of the first hurdles to accessing Andean genetic resources. Of the four current countries belonging to the Andean Community (Bolivia, Colombia, Ecuador and Peru), only Colombia adopted Decision 391 without passing further national legislation. Bolivia and Ecuador have enacted national laws that regulate the Decision in full or in part, respectively.[49] Peru, until now, has only a draft of a national legislation to formalise the implementation of the Andean Decision. This disparity in adoption has resulted in inconsistencies and difficulties in implementing the Decision.[50]

The designation of a National Competent Authority is a key step for the implementation of the Andean access regime at national level. Apart from the administration of contracts, the Authority is responsible for monitoring and compliance of contracts, and for making relevant information (on rules, procedures and results) available and accessible to the public.[51] The Authorities of different countries must also exchange information and work in a coordinated manner, not only among them, but also with other national and Andean agencies managing IP rights, as mandated by both the Andean IP and the access regimes.[52]

While Bolivia and Colombia have appointed Competent Authorities that oversee access to all types of non-human genetic resources,[53] Peru does not have a clearly identifiable authority. Two Peruvian government agencies are supposed to have competence on access to terrestrial genetic resources; one is in charge of *wild* resources and the other is in charge of *domesticated* resources.[54] This division of competences allegedly applies to agricultural resources as well. It is easy to foresee difficulties in having one institution controlling access to wild relatives of crops and a different institution regulating access to crops themselves, because both types of plants are routinely used and crossed with each other in the R&D of crops. Moreover, Peruvian traditional farmers and indigenous communities have legal rights to manage agriculturally diverse areas as conservation areas.[55] However, those communal rights are only exerted over the *biological* agricultural resources. The two government institutions (INRENA and INIA) exert authority over the *genetic* component of these agricultural resources.

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[49] Bolivian Supreme Decree 24676 of 21 June 1997 and the Ecuadorian Resolution 019 of 1997. The latter makes reference to Decision 391 for the collection and exportation of flora and fauna in forestry areas (Gemar 2002).

[50] Correa 2003, 798-799.

[51] Article 50 on the Competent National Authority, Decision 391.

[52] Second and Third Complementary Measures, Decision 391.

[53] In Colombia the Direction of Ecosystems at the Environment, Housing and Territorial Development Ministry is the Competent National Authority on access, while the General Authority on Biodiversity at the Sustainable Development Ministry is the Bolivian counterpart.

[54] The competences of the two organisations, the National Institute of Natural Resources (INRENA) and the National Institute of Agricultural Research (INIA), with respect to the terrestrial flora and fauna resources are spelled out in Peruvian national laws (Law 26839 of 1997 on the Conservation and Use of Biodiversity and Law 21811 of 2002 on the Protection of Collective Knowledge Related to Genetic Resources) rather than laws emanated from the Andean Common Decision 391.

[55] Art. 28 of Law 26839 of 1997.

Implementation

The lack of universal adoption of the Andean access regime and the remaining ambiguities in regard to access authorities have not facilitated access to biological resources (Table 1). But even in countries with laws and regulatory authorities in place, only four access contracts were established during the first nine years of the access regime's existence.

Table 1. Access contracts under Decision 391 between 1996 and 2005

Country	Rules	No. applications /contracts
Bolivia	yes	9/2
Colombia	yes	40/2
Peru	no	0

Regulatory authorities

Part of the explanation to this outcome seems to lie in the lack of provision of transparent, explicit and complete information in regard to requirements, processes and outcomes of access applications to potential applicants by the National Competent Authorities. Public registries on access to genetic resources[56] are either non-existent or poorly maintained.[57]

Poor communication and collaboration between national institutions regulating access to genetic resources and those regulating IP is prevailing. In addition, competition and rivalry seem to drive the interaction between national authorities with a mandate for *managing* biodiversity resources and those that *regulate access* to the same resources.[58] In particular, the regulation of access to agricultural resources by environmental government institutions has generated hostility among the involved institutions (e.g., Bolivia and Colombia).

Whether the Andean access regime has not motivated applicants with commercial interests to access Andean genetic resources because of the peculiarities of the regime and the difficulties in its implementation, or because of other technological developments allowing companies to prescind from collecting genetic material,[59] is difficult to establish empirically. It may be a combination of both factors; or material accessed in the past may still be available as a substitute for new material. However, evidence seems to suggest that the Andean regime has actually discouraged prospective applicants and in some instances hindered access. I will return to this claim soon.

Researchers at national institutions

National agricultural research institutes (NARIs) in Andean countries, typically linked to agricultural ministries, host and administer national *ex-situ* collections of wild and domesticated crop resources and perform the bulk of agricultural R&D. NARIs, however, no longer manage access to these resources. Therefore, any time a local or foreign researcher requests access to, or transfer of *ex-situ* materials, the requests are diverted to the regulatory environmental authorities. Illegal acquisition and transfer of resources (outside the Andean

[56] Article 50(f) of Decision 391.
[57] The results on access applications have been asserted through a collection of sources including reports by the Andean Community of Nations; workshops held in the Andean region; authors such as Gemar 2002 and Correa 2003; and interviews with personnel from National Competent Authorities and related dependencies performed by the author between October 2004 and February 2005.
[58] Correa 2003, p. 798.
[59] Correa 2003, p. 800.

access regime) is a criminal act, at least in Colombia.[60] Law binds national researchers to this situation. However, as the number of applications and granted access contracts appears to suggest, it may be ineffective to follow the official route. How then do things work in practice?

Interviewed agricultural researchers and breeders mentioned several options, some of them foiling strategies, to continue with crop R&D. These include pretending ignorance of the law, carrying on work with whatever available resources under their physical control and entirely forgoing R&D projects because of lack of access to biological resources. Another possibility seems to consist in accessing resources outside the terms of the access regime, but still within an 'official' legal framework. In some cases such an alternative framework has entailed *negotiation* of division of powers between the agricultural and environmental national authorities. In this way, agricultural R&D institutions have regained flexibility in regard to collection, acquisition, transfer and use of agricultural resources within national borders (e.g., Bolivia). In other cases, national laws and rules are invoked and used as substitutes for the regional access regime (e.g., Colombia). In yet another case, researchers make use of the legal distinction between accessing a *biological* resource (in most cases regulated by a simple and relatively easy-to-obtain national research permit) and a *genetic* resource. Thus, by law, researchers access biological resources but actually use genetic resources, which they consider part of biological resources.

Researchers at international centres

Two international agricultural research centres (IARCs) in the Andean region, the *Centro International de Papa* (CIP) in Peru and the *Centro Internacional de Agricultura Tropical* (CIAT) in Colombia are bound to the national and regional laws on access. The Framework and Administration contracts supposedly designed for the regulation of *ex-situ* collection centres and research institutes have, however, yet to be signed between these centres and the national governments. In absence of these contracts, collection and use of germplasm is subject to individual access contracts. In 1998, both CIP and CIAT stopped bio-collections, in great part due to the uncertainty and ambiguity of the implementation of Decision 391 in the region. The collections have not resumed to this date in a significant way.[61]

Both centres have an important role to play as global providers of valuable germplasm of neotropical crops including beans, cassava, forage grasses and legumes, fruits and Andean root and tuber crops such as potato and sweet potato. These centres are also involved in breeding crops for developing countries, training and educating local researchers, and developing agricultural technologies for regional and potentially global application. Since the entering into force of Decision 391 at national levels, these centres have no longer the freedom to provide materials through Material Transfer Agreements without the express consent of the National Competent Authorities. For CIP, the measure has meant a halt to the transfer and distribution of *ex-situ* materials. The centre has also decided not to accept donated germplasm collections because of the uncertainty of whether it will be able to transfer and use the material within the legal framework of the Andean access regime. By contrast, CIAT has continued to transfer and distribute materials (both nationally and overseas), thanks to an express recognition of such activities by the Colombian Congress.[62]

The impeded flow of germplasm to and from NARIs and IARCs is one of the casualties of the lack of transparency and certainty in the national adoption of the Andean access

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[60] Art. 328 of the Colombian Criminal Code. Illegal use of, or benefit from genetic resources carries prison for 2 to 5 years and a fine equivalent to 10,000 times the current minimum national wages. Correa (2003) relates the case of a herbarium researcher imprisoned for allegedly illegal transfer of herbarium material (p. 799).

[61] CIP has resumed germplasm collections in a limited way in Peru in 2007.

[62] Daniel Debouck, Head of the Genetic Resources Unit at CIAT, personal communication.

regime. Restrictions on access, exchange and use of germplasm, the primordial input for agricultural R&D, have the potential to seriously affect quality and quantity of products delivered. The consequences, however, may only become apparent after a considerable lag period because it takes time to develop new cultivars (5-15 years, depending on the crop species). The restrictions have also negatively impacted on existing R&D networks and partnerships among Andean researchers, and between Andean and foreign researchers. Yet for the delivery of most food and feed crops, Andean countries rely on their public R&D institutions and their associated networks and partnerships. The current situation, therefore, has the potential to affect the overall agricultural development of Andean countries.

Traditional farmers and indigenous communities

Unlike researchers, farmers and traditional communities still enjoy autonomy of accessing biological resources under their physical control for the purposes of propagation, multiplication and any other customary uses. However, their autonomy in regard to accessing their knowledge and practices seems to have been weakened. Annex contracts give communities a *de jure* control on benefit sharing in exchange of access to their knowledge. However, state regulators have the last word on the terms of benefit sharing, and if the access contract does not go ahead nor does the annex contract (e.g., case of Bolivian traditional healers).[63] There is not a single example of successful access to intangible resources in the Andean countries to this date.

Perhaps one of the major concerns voiced by representatives of farmers and traditional communities is the lack of meaningful participation of these communities in decision-making regarding access to knowledge associated with biodiversity. Initiatives such as the Peruvian Initiative for the Protection of Traditional Communal Knowledge associated with Biodiversity and its Andean-Amazonian counterpart (see section 5) are aimed at the preservation and protection of traditional knowledge (TK) through the creation of TK registries administered by official government authorities (Ruiz Muller 2005). Peasants and indigenous communities are encouraged to deposit their knowledge into these registries. In exchange, national authorities offer to monitor the use of TK, and to licence access to this knowledge on behalf of the communities. The proceedings from licensing will go to a common fund for the development of indigenous groups. To access those funds, traditional groups must submit projects that are evaluated by a committee of representatives of indigenous communities.

Whether these sorts of initiatives offer more autonomy and meaningful participation to communities is difficult to establish at present. One aspect, however, that is often overlooked in these sorts of endeavours is the particular notion of knowledge and property held by traditional communities. Ownership as ‘control exerted over a thing’ is not a notion shared by Peruvian traditional farmers interviewed for this study. Their relationship with crops is one of kinship. Plants are their (typically female) relatives who have their own personality and ought to be respected as people and treated with dignity. Peruvian traditional farmers refer to agriculture as a rearing and nurturing process. The knowledge associated with biodiversity grows out of this nurturing dynamics; it arises and evolves from “conversations with nature”. There is no control over this knowledge; instead “the knowledge and the seed are one; the

[63] In 2000 the University Mayor de San Simon, the Association of Traditional Doctors Capinota-Apillapampa and the University of Ghent signed a Memorandum of Understanding on a collaborative study on the chemical and therapeutic properties of traditional healing plants used by the Bolivian doctors. Although the terms were satisfactory to all parties, the Bolivian regulator disapproved the benefit sharing terms, disallowed the annex contract and refused to grant an access contract. Bolivian Sustainable Development Ministry (2004). The Bolivian Experience in Applying Decision 391: The Common Regime on Access to Genetic Resources. La Paz, Bolivia, Eclipse Producciones.

paths of the seeds are numerous and we cannot control them."[64]

It is worth noting, however, that Peruvian traditional farmers are also conversant with commerce. For instance they cultivate and sell commercial potato varieties. But the latter are segregated from traditional non-commercial varieties and receive a different treatment –the treatment of a foreign 'thing', a commodity. It is the wealth of traditional non-commercial cultivars and the practices associated with them that are held as a commons that grows through sharing. Such social norms are far removed from concepts such as exclusive property, separation of intangible from tangible resources and monetary benefits embraced and fostered by Andean and national legislation and policies.

Usage of IP protection

Unlike the access regime, the Andean PBR and industrial property regimes have been fully adopted in all countries of the Andean Community. Yet the use of both IP regimes in Andean countries is minimal. Table 2 gives an overview of PBR applications and titles in three of the four Andean countries.

Table 2. PBR applications and titles in selected Andean countries (1995-2005)

	Bolivia	Colombia	Peru
No. applications/titles	50/26	883/393	11/11
Crops	Soybean (55%); cotton, rice, sunflower, maize, wheat	Flowers (80%); cotton, soybean, sorghum, rice	Rice (50%); flowers, cotton
Int'l vs. national holders	80% vs. 20%	94% vs. 6%	36% vs. 64%
Costs	USD 1,300 - 1,600	USD 10,000	?

The use of patents on modified biological materials is negligible; so most of the discussion that follows focuses on PBR. Patent use, however, may increase in years to come with the eventual entry into force of the bilateral trade agreements signed between the U.S. and both Peru and Colombia, because the draft agreements widen the scope of patentable biological products.[65] In addition, some countries have recently accepted the introduction and commercial release of transgenic crops (e.g., soybean in Bolivia and cotton and maize in Colombia), [66] which may lead to the patenting of transgenic crops in these countries.

Plant breeders' rights

Most protected plant varieties are cash crops (e.g., soybean in Bolivia; flowers in Colombia). With the exception of rice in Colombia, there are virtually no protected staple crop varieties. Foreigners are the major users of the PBR system. This usage pattern reflects the structure of R&D in cash crops because the Andean countries typically import varieties bred overseas.

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[64] Common conception expressed in different ways by participant traditional farmers. This statement comes from Nestor and Walter Chambi, Aymara farmers and activists, Association Chuyma Aru, Puno (Peru).
[65] Free Trade Agreement (FTA) USA-Peru, Final Text at http://www.ustr.gov/Trade_Agreements/Bilateral/Peru_TPA/Final_Texts/Section_Index.html; FTA USA-Colombia, Summary, at http://www.ustr.gov/assets/Document_Library/Fact_Sheets/2006/asset_upload_file485_9023.pdf
[66] See, e.g., *Colombia approves GM corn*, at http://www.scidev.net/News/index.cfm?fuseaction=readNews&itemid=3464&language=1; *Soya convencional y transgénica en Bolivia: Quienes realmente se benefician?*, at http://www.biodiversidadla.org/content/view/full/23063

Researchers and breeders

Why do national breeding programs not use the PBR system? To start with, comparatively little breeding takes place in Andean countries, and researchers and breeders usually attach little importance to PBR. One reason may be that there is in general a lack of knowledge about the PBR scheme, its possible advantages and disadvantages for the commercialisation of seed, an aspect also identified by Louwaars et al in their research in Colombia (Louwaars, Tripp et al. 2005). PBR regulatory authorities also lack financial resources and personnel for promotion and education campaigns (e.g., Peru). In addition, the process of evaluating a new variety can be lengthy (e.g., more than two years in Bolivia). The cost of PBR protection could be an additional factor, especially for the usually cash-strapped public institutions and for non-cash crops (e.g., potato). Another factor relates to the enforcement of PBR titles. Sanctions for violations are not well defined and courts are not well prepared to enforce the rights. Finally, public researchers in Andean countries still think of the products of their work as public (open-access) goods. The notion that widespread adoption of new varieties by farmers is the principal criterion of success of a new variety was common among the public breeders interviewed for this study.

Farmers

The predominant smallholding agricultural production in the Andean region appears to determine the attitudes of farmers towards PVP. With the exception of some export cash crops most crops are produced on areas smaller than three hectares. Informal seed systems in which non-certified seed of unregistered varieties is produced, exchanged and purchased dominate over formal seed systems, which account for only 3 to 5% of seed production and acquisition. PBR schemes are tailored for and thrive in formal seed-production systems linked to extensive seed markets. The PBR scheme, therefore, does not really match the needs and dynamics of the prevailing agricultural system in the Andean countries.

Farmers are affected by PBR to the extent that the right to farm-save seed is in place and respected. Bolivia appears to safeguard farmers' and indigenous communities' rights to save and exchange protected seed, with some exemptions according to crops and the size of production area.[67] The Colombian PBR regulator, on the other hand, is considering imposing further limitations to saving seed on-farm. Currently, flower growers are the only ones who do not enjoy PVP exemptions. If the planned changes are introduced, farmers with holdings greater than five hectares may generally be banned from saving seed. This would probably affect rice farmers, whose production costs would increase.[68] Also, a recent Colombian resolution bans seed-saving of any transgenic crop, which at the moment only applies to transgenic cotton and maize. It remains to be seen how these restrictions will affect Colombian farmers. Moreover, infringement to PBR is now a criminal act.[69]

Exogenous rules vs. endogenous dynamics

It is in the translation of regional laws into national laws and policies and their implementation where most conflict and contestation between official rules and social norms arises in the Andean countries. This situation is in line with the work of Halliday and Osinsky on the globalisation of financial law. They argue that the farther the globalised rules are from local social norms, the greater is the possibility of contestation.[70] This tendency is evident in

[67] Art. 36 of the Bolivian norm for the Protection of Plant Varieties exempts growers from PBR where the growers have equal or less than 200 arable hectares with up to 100 hectares planted with soybean, wheat, sorghum, maize, sunflower and cotton; up to 50 ha in the case of rice; and up to 20 hectares for other plant species.

[68] See Lowaars et al 2005.

[69] Amended Art. 306 of the Colombian Criminal Code, according to Law 1032 of 2006 (22 June).

[70] Halliday and Osinsky 2006, p.466.

the dynamics of contestation between social norms of Andean researchers and farmers and the regional/national laws regulating access and IP protection, which are responding to the internationalisation of standards.

Fitzpatrick argues that defined property rights are meant, according to economics principles, to encourage exchange of resources because they lower transaction costs. But deficiencies in the ability of institutions in developing countries to supply and enforce property rights lead to the failure of exclusionary strategies and measures, and this in turn causes social contestation and conflict (Fitzpatrick 2006). As presented here, regulatory institutions in Andean countries have serious problems in providing and governing an access regime based on exclusionary sovereign ownership. However the issue goes deeper than deficiencies in social and financial capabilities. The issue appears to be that the subject of the law (the PGRFA system) is not well understood because the networked system of research and development of PGRFA by Andean researchers and traditional farmers is poorly reflected in the rules and measures devised for their governance. There is a wide divergence between the predominant mode of informal seed production and the formal seed production systems that usually accompany the implementation of exclusionary IP regimes. This does not mean that the seed system should not change. The issue here is that the implementation of these IP regimes was largely motivated by exogenous interests that were either 'negotiated' or imposed and are not in tune with the endogenous dynamics of Andean agricultural R&D and production.

5. A nascent alternative governance framework

The overall lack of responsiveness of the regional and national regimes regulating access to biodiversity-related resources is perhaps one of the major failures in the governance of biodiversity and genetic resources in the Andean region. The principal goal of an access regime is to exchange access and knowledge for downstream benefits. The Andean countries resorted to a strict command-and-control approach instead of a more interactive and participatory approach where a multiplicity of actors with a stake in biodiversity would contribute to shaping the rules. Rather than "influencing the flow of events"(Parker and Braithwaite 2003) and taking a primarily steering and guiding role (Stoker 1998), Andean countries have sought absolute control over the provision of resources. Evidence suggests this style of governing biodiversity-related resources fails to "respond to peoples, problems, environments and demands, [and] to the complex texture of social life" (Braithwaite 2006).

This state of affairs has driven the creation and growth of social institutions formed by networks of both non-state and state actors concerned with the protection, access and use of Andean biodiversity and the associated knowledge. The Andean-Amazonian Initiative for the Prevention of Biopiracy (or simply the Initiative)[71] is a salient example of new developments in the governance of these resources. The Initiative aims at preventing the misappropriation of Andean biodiversity, related knowledge and cultural resources through research, information provision and monitoring of appropriation of tangible and intangible biodiversity components. It seeks to influence the procedures employed by the major IP offices of the world with respect to the inclusion of information on customary, local, regional and national uses of biodiversity and related traditional knowledge as prior art for the evaluation of novelty and inventiveness requirements for patent applications. The Initiative is in fact a 'network of networks' (Drahos 2007) across five South American countries, connecting not-for-profit private environmental, legal and developmental institutions, NARIs and an IARC, state agencies, regional governmental bodies and international agencies. It started with a 'coalition of willing and concerned' non-state and state Peruvian actors in 2002 and has been able to gain legal recognition, both nationally (in Peru) and regionally (by the Secretariat of the

[71] See website of the Initiative, http://www.biopirateria.org/en/index.php.

Andean Community of Nations). Several international organisations provide logistic and financial support. Most Initiative members are key players in their own geographical and expertise areas and contribute their own networks, resources and interests to the Initiative.

The networked governance structure of the Initiative is, without doubt, an excellent framework for preventing biopiracy and for "contributing to better access systems and more effective use of resources and knowledge" (Bazán 2005). The participation, coordination and cooperation of institutions of mixed origin and agendas are critically needed for governing the networked system of biodiversity resources. However, a number of features may be critical for the long-term viability and legitimacy of the Initiative as a defender of the interests of local communities:

- *Meaningful participation of relevant stakeholders*. Only very few Andean-Amazonian indigenous and local communities seem to be currently associated with the Initiative. The active involvement of these communities (and all other relevant stakeholders) in reflection, design, consultation, monitoring, enforcement and decision-making will ensure that the networks are participatory and truthful to their commitments.
- *Learning through experimentation and acting upon it*. The inaction and lack of national implementation of the Andean access regime has elicted foiling strategies to overcome the difficulties of access. Any initiative that seeks restoring access to resources needs to be put in place evaluation mechanisms of its performance. Providers and users of resources should be able to provide feedback on the performance of the schemes, and members of the networks and regulators ought to take into account this information and respond by adjusting the schemes accordingly.
- *Information flow.* A common problem with the current regimes of access and IP is the lack of transparency and the frequently incomplete information provided. Information flow, accuracy, completeness and transparency should be important priorities of the initiative and any improved schemes.
- *Improvements/changes to the current official access schemes*. If the Initiative wants to contribute to better access and use of resources, the rigid notion of sovereign ownership and the command-and-control approach of current access schemes need to be abandoned. Perhaps a set of schemes needs to 'evolve' adapting to:
  - the peculiarities of different resources and uses (for example, food vs. pharmaceutical plants and applications),
  - the duality of PGR as informational and 'physical' resources, and
  - the networked dynamics of R&D of PGRFA.
- *Enforcement pyramid*. It is not yet clear how members will monitor resource protection and compliance in the networked governance structure of the Initiative. Drahos (2004 and 2007) and Braithwaite (2006) propose an enforcement pyramid, which by default starts with dialogue and persuasion. The stringency and punitive character of enforcement measures augment according user's conduct, ending with the most punitive possible measure, but only after all other measures have been attempted and failed. Sub-networks and groups of actors participate at different levels in the enforcement pyramid according to their interests and the availability of resources.

6. Concluding remarks

Partly overlapping, partly conflicting notions of property on PGR and associated knowledge are present at all levels of governance of these resources. Negotiation and contestation of formal rules supporting particular notions of property appears to be happening at the interface between governance levels. Thus, regional regimes on access and IP challenge and negotiate terms with international laws and institutions; nations do the same with regional

regimes; and local groups challenge or negotiate terms with national lawmakers. The 'law on the ground' (the social norms) appears to have a stronger normative power than formal rules. This becomes particularly evident when the formal rules oppose, and do not respond to social norms. The dynamics between rules and norms, currently locked in contestation, could elicit bottom-up approaches that may result in more sustainable, effective and responsive models of PGR governance and regulation. These models may incorporate norms into rules and involve a greater and more diverse range of actors. If successful, they may overcome the current deadlock on access to primary resources and tools, and re-balance resource conservation with facilitated access for agricultural R&D.

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