

Property-rights regimes over biological resources

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Abstract. The increasing economic importance of biological resources and, in particular, knowledge related to these resources, has made the allocation of property rights one of the most contentious issues in the debate concerning biodiversity management at the international level. The author surveys the different property-rights regimes developed to regulate access to and control over biological resources, and the relevant international instruments and institutions. He argues that the overemphasis on private property rights regimes, in particular monopoly intellectual property rights such as patents, has been inimical to the sustainable management of biological resources at local and international levels. He suggests ways to allocate property rights so as to promote forms of biodiversity management that are both socially equitable and environmentally sustainable, and analyses some of the recent developments concerning alternative forms of intellectual-property protection.

Introduction

The management of biological resources has been an area of concern at the international level for a long time. International law has tended to focus on the conservation, utilisation, and, more recently, sustainable management of biological resources. Conservation of biodiversity and, in particular, the protection of endangered species and habitats has constituted a major focus of international treaties for more than a century, as illustrated, for instance, by the 1900 Convention for the Preservation of Wild Animals, Birds and Fish in Africa (London Convention, 1900). Similarly, the exploitation of biological resources was a subject of intense interest, considerably before conservationist goals were to influence international norms, as illustrated in the case of the Convention for the Regulation of Whaling (Whaling Convention, 1931). More recently, the notion of sustainability has become an integral part of all legal instruments dealing with biological resources, as is illustrated in the case of the Convention on Biological Diversity (1992).

Whereas the conservation and utilisation of biological resources have attracted significant attention for a long time, it is only in recent decades that the question of the ownership of biodiversity-related knowledge, and of inventions derived from biological material, has become a matter of specific concern at the international level. This is directly linked to the development of genetic engineering and the immense economic opportunities which this provides. These new developments have led to the emergence of new conflicts concerning the ownership of biodiversity-related knowledge, and have forced states to rethink real and intellectual property rights regimes in a fundamental way. With regard to physical resources, the cardinal notion of permanent sovereignty over natural resources has not been discarded but has been adapted to reflect the growing international concerns for sustainable management of biodiversity. The greatest challenges are, however, in the field of intellectual property rights. At the conceptual level, it is apparent that the international intellectual property rights currently recognised were developed for the specific context of industrial development and do not lend themselves to easy adaptation to the field of living resources. The question of the patenting of life forms has been especially controversial.

The progressive introduction of intellectual-property rights, such as patents, in the field of biodiversity-related knowledge has also been controversial because of the international context in which it is happening. Indeed, there is a marked asymmetry between the ownership patterns in developed and developing countries in this field. Whereas developing countries are host to most of the remaining diversity, and consequently assert property rights over the actual resources, developed countries are host to most of the research capacity in the field of genetic engineering and are thus strongly in favour of the extension of monopoly intellectual property rights, to foster the commercial exploitation of biodiversity-related inventions.

In this paper I first examine the different types of property rights that are relevant in the management of biological resources. The second section outlines the international legal regime and the ways in which the various instruments have dealt with these issues. In the third section I propose a critical analysis of the current international regime and highlight some possible avenues towards a regime promoting the sustainable management of these resources in an equitable framework.

Property rights over biological resources

Context

Access to, control over, and ownership of biological resources have become more contentious as these resources have declined (Esquinas-Alcázar, 1996). This has led to the increase in importance of property rights regimes at the domestic and international levels. In general, the existence of property rights is predicated upon a limited supply of resources for which different users compete. Law then assigns property rights to regulate access to these resources (Biblowit, 1991). Biological resources are, for instance, the subject of private property, common property, and sovereign rights.

'Private property' refers to exclusive rights over objects, or information vested in a single legal entity. Individuals or corporations holding such rights can exclude others from the benefits of their property and can regulate its use. Private rights include, for instance, intellectual-property rights. 'Common property' also entails exclusive rights but the holder is a collective body (Bromley and Cernea, 1989). Each member of the collective body has separate entitlements to the property, but no one user has the right to abuse or dispose of the property (Vogler, 1995). Any dealing with the property has to take into account the entitlements of others and is subject to approval by the community. Users of common property share rights to the resource and are subject to rules and restrictions, embedded in cultural or religious customs, governing the use of those resources. Private and common property both provide rightholders with incentives to invest in the resources and manage them sustainably.

'Sovereign rights' must be examined in two different contexts. At the international level, sovereignty implies that there is no authority superior to that of the state and that all states are juridically equal. It constitutes the basic principle around which international relations are organised. At the domestic level, the state is the repository of sovereign rights and their assertion is akin to a form of private property rights as the state acquires all the rights over a given resource when it asserts direct ownership of the same.

The assignment of property rights does not occur in a socioeconomic vacuum. It is therefore clear that, although the primary motive for establishing property rights may be economic, other aspects should be taken into account as well. For instance, property rights over biological resources cannot stop at providing incentives for their economic exploitation but must foster both their sustainable management and an equitable distribution of the benefits, both at the local and at the international level (Hanna and Munasinghe, 1995).

Relevant legal mechanisms for access to and control over biological resources*Intellectual property rights*

Generally, intellectual property rights (IPRs) are rights granted to reward creativity, and can theoretically have any number of attributes. In current international law, IPRs refer to rights with certain specific characteristics. First, IPRs such as patents are monopoly rights whose benefits are enjoyed in exclusivity by the holder of the right. They are usually granted for a limited period of time for innovations whose creator can be identified as a legal entity. Further, the allocation of IPRs is premised on the notion that innovation is driven by profit. From a societal point of view, patents strive to balance the private interests of creators, by ensuring that they still have an incentive to create, against those of the society at large in having the information available for its use. Even though information does not diminish once it is shared, the role of patents is to ensure that information providers do not lose their rights to the information by disclosing it, as such information can be used simultaneously by an infinite number of persons (Baer, 1995; Landes and Posner, 1989). Indeed, one of the perceived philosophic underpinnings of patents is to ensure disclosure of the information while maintaining exclusive rights for the creator.

In the context of biodiversity, IPRs distinguish between the treatment given to human and nature's creations (Walden, 1995). Thus nature's creation has traditionally been excluded from patentability. However, there has been a progressive move towards the patenting of genetically engineered life forms, first concerning plants and, more recently, concerning animals. Although IPRs could, arguably, be extended to cover agrobiodiversity, there has been opposition to this trend from a number of different actors. On the one hand, the scientific and business communities argue against the extension of IPRs to research undertaken outside laboratories (Barton, 1997). On the other hand, there are concerns that IPRs which are geared towards providing economic rewards to a single creator are incapable of accommodating the contribution of communities of farmers, even though the IPR system is not averse to the recognition of a plurality of rightholders. Indeed, there have been proposals for the introduction of community intellectual rights (see, for example, Shiva, 1996).

Patents. Patents are granted for new, nonobvious, and useful inventions—not for discoveries. An application for a patent must include a full written description of the invention and how it is to be used (Campbell and Cotter, 1996). Recently, patents on biological materials have assumed prominence with increasing biotechnological activities by individuals and the private sector. The United States has been the forefront of legal developments in this area and was the first country to allow the patenting of life forms (*Diamond v. Chakrabarty* 1980; *Moore v. Regents of UC* 1990). American biotechnology companies have been arguing for the international recognition of such patents—a move which has been opposed by most developing countries. The European Union has historically been more reluctant to accept the patentability of life forms. Directive 98/44/EC on the legal protection of biotechnological inventions affirms, however, the patentability of products consisting of or containing biological material, and of processes by means of which biological material is produced, processed, or used.

Plant-breeders' rights. For a long time, it was widely believed that agriculture should not be subjected to patents (Clavier, 1998). This was linked to traditional agricultural practices of seed saving and exchange, and to the perception that the fulfilment of food needs should not be primarily a profitmaking enterprise (CGRFA, 1999). This hampered the development of seed and agricultural businesses. However, little by little business interests progressively obtained a form of legal protection. The result was

the development of 'plant breeders' rights' (PBRs), specifically created to provide a form of legal protection for plant varieties which was different from, and less stringent than, patents. It is noteworthy that PBRs and patents are based on similar premises insofar as they both seek to give the private sector an incentive to enter a particular industry. Indeed, PBRs seek to provide stimulus for research and development of new varieties of plants to the private sector and to reward the creativity of successful plant breeders (Menon, 1997). The main difference between PBRs and patents is that the scope of protection of PBRs is more limited. At the same time, PBRs are designed to allow other plant breeders to use the protected plant for their own breeding activities and research as long as they refrain from selling the protected plant itself. Further, new varieties derived from such breeding activities can be marketed.

Farmers' rights

The concept of farmers' rights arose as a result of international debates on the asymmetric benefits derived by the donors of germplasm and the donors of technology, and the lower status ascribed to farmers' activities in contradistinction to plant breeders' activities. The plant breeders generated returns through PBRs or other IPRs, but there was no system of compensation or incentives for farmers (Esquinas-Alcázar, 1996). The idea behind the arguments for farmers' rights was thus to ensure the equitable sharing of benefits arising from genetic resources, and to give farmers incentives to preserve genetic resources and share them with others. More specifically, farmers' rights were to: ensure that the need for conservation was globally recognised and that sufficient funds would be made available for this purpose: assist farmers in all regions of the world, but especially those in regions of diversity of plant genetic resources, in protecting and conserving their resources: allow farmers, their communities, and countries to participate fully in the benefits derived, at present and in future, from the improved use of agrobiodiversity through plant breeding and other scientific methods (Resolution 5/89, 1989; Kate and Diaz, 1997).

Although it is in principle agreed that farmers' rights are necessary for the sustainable management of agrobiodiversity, they have yet to be enshrined in a binding agreement. The most recent articulation of farmers' rights focuses on the protection of traditional knowledge, the equitable sharing of benefits arising from the exploitation of biological resources, and the right to participate in decisionmaking. In effect, the Composite Draft Text of the International Undertaking on Plant Genetic Resources (CGRFA, 2000a) emphasises mainly farmers' contributions to agricultural management and not their entitlements. It further introduces a multilateral system to facilitate access to genetic resources and to foster the sharing of benefits arising from their utilisation. Under the multilateral system, it is recognised that recipients of resources cannot claim any monopoly right.

Sovereign rights

Sovereignty constitutes the fundamental principle around which interstate relations are organised. In effect, international law is based on the principle that all states are juridically equal and that there is no authority superior to states (*UN Charter*). Consequently, international law is the product of the common will of all states. In the context of biological resources, states' sovereignty over their resources is fundamental. The principle of permanent sovereignty over natural resources refers to the right of each state to exploit and develop its biological resources freely. It constitutes the basic principle for allocating rights and responsibilities in international law in this field.

One of the attributes of sovereignty is that states can freely choose to restrict it. In international environmental law, for instance, the ambit of permanent sovereignty has been qualified in various ways. Thus, the conservation of biodiversity is recognised

as a common concern of humankind (Convention on Biological Diversity, 1992), implying both a recognition of the global importance of biological diversity and a duty to cooperate in conserving and managing it. This principle seeks to facilitate and promote global cooperation in the conservation and management of in situ biological resources, but does not force any given state to participate in this process. Reference to common concern is an acknowledgment that the management of a state's own environment and resources is a matter in respect of which all states have standing (Boyle, 1994). Insofar as ex situ biological resources are concerned, access is still governed by the principle of common heritage.

The principle of sovereignty also has repercussions at the domestic level. In this case, the assertion of sovereign rights by the state is conceptually similar to private property rights. Indeed, when a state asserts control over a given resource, for instance by nationalising it, it acquires all the rights that would accrue to a private owner. In other words, at the domestic level state sovereignty is also a monopoly.

Common-heritage status

The concept of common property, which refers to the common ownership of certain resources and is a common feature of the management of biological resources at local levels in many countries, has been applied at the international level in a number of cases. In international law, common ownership or common management of a given resource is referred to as 'common heritage of humankind'. Given states' insistence on their territorial sovereignty, it is only in the case of regimes concerning resources beyond sovereignty that the principle of common heritage has received some measure of recognition: for example, the cases of Antarctica and of deep-seabed resources.

Common-heritage status has a number of consequences. It implies that all states have equal access to the resources but also that all states should benefit from the exploitation of a given 'common resource', whether they actually participate in exploitation or not. Further, common-heritage status entails the setting up of an international institutional mechanism to supervise the exploitation and to monitor states' activities. It is noteworthy that common heritage is not akin to open access, which is generally marked by the *absence* of property rights.

International articulation of property rights over biological resources

The legal and institutional framework for the regulation of agrobiodiversity has been laid out in various international environmental agreements. The regime has been characterised by a dichotomy between instruments emphasising the conservation of biodiversity, such as the African Convention on the Conservation of Nature and Natural Resources (1968), and those emphasising exploitation, such as the International Convention for the Protection of New Varieties of Plants (UPOV Convention, 1961). Conservation has traditionally been associated with the preservation of nature in pristine conditions, which is perceived as being incompatible with human-subsistence activities. Exploitation, for its part, has been primarily identified with the extraction of biological resources, driven by economic incentives. In recent years, however, the legal regime has been influenced by the concept of sustainability, which specifically seeks to reconcile exploitation and conservation. The Convention on Biological Diversity, for instance, includes conservation, exploitation, and sustainable use among its objectives.

The Convention on Biological Diversity

The Biodiversity Convention broadly delimits the rights of states and other relevant actors over biological resources. It affirms the sovereign rights of states to exploit their own resources pursuant to their own environmental policies—a direct reflection of the principle of permanent sovereignty over natural resources. This includes the authority

to determine access to genetic resources found within their boundaries, with a duty to facilitate access to those resources for environmentally sound uses by other contracting parties. These sovereign rights are limited by states' responsibility to ensure that activities within their jurisdiction do not cause damage to the environment. More generally, the sovereign rights of states over their biological resources are limited by the recognition that these resources are a common concern of humankind.

The Convention also provides a broad framework for member states' policies concerning access to, and development and transfer of, technologies. Further, it acknowledges the necessity for all parties to recognise and protect IPRs in this field. The Convention further recognises both the dependence of local communities on biological resources and the roles that these communities play in the conservation and sustainable use of the resources. It points to the need for equitable sharing of benefits arising from the use of traditional knowledge, innovations, and practices, relevant to the conservation of biodiversity and the sustainable use of its components.

The Agreement on Trade-Related Aspects of Intellectual Property Rights

The Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement, 1994) is only indirectly concerned with biological resources. However, the IPR standards that it sets have wide-ranging impacts on biodiversity management. In the case of patents, it provides generally that patents must be available for inventions, whether products or processes, in all fields of technology. This constitutes a significant departure from current patent regimes in a number of developing countries. Some general exceptions to patentability are provided. States can, for instance, exclude patentability where this is necessary to protect human, animal, or plant life or health, or to avoid serious prejudice to the environment. They can also exclude from patentability plants and animals other than microorganisms.

Among the various areas in which TRIPS has an impact, agriculture is among the most significant for a majority of developing countries. The Agreement requires all countries to protect plant varieties. This is of great significance because most countries have traditionally believed that patent protection should not be offered in this field as the satisfaction of basic food needs should not be subject to commercial interests. This position was well illustrated by the case of the Indian Patents Act of 1970, which excluded the patenting of life forms and specifically precluded the patentability of methods of agriculture or horticulture. The ratification of the TRIPS Agreement is forcing all countries in a similar position to provide property rights on plant varieties. This constitutes a change of immense significance in countries where a majority of the working population are engaged in subsistence agriculture.

The International Convention for the Protection of New Varieties of Plants

The UPOV Convention, first adopted in 1961 by a group of Western European nations, was specifically meant to introduce property rights for plant varieties. This followed pressure from the private sector, which argued that the lack of intellectual property rights in this field threatened their development. It was, however, felt at the time that the introduction of patents in agriculture would be inappropriate in light of the prevalent practices of free exchange of seeds and knowledge among farmers.

Though the UPOV Convention did not introduce patents, it sought from the outset to provide incentives to the private sector to engage in commercial plant breeding by granting them PBRs. More specifically, the Convention recognises the rights of individual plant breeders who have developed or discovered plant varieties which are new, distinct, uniform, and stable. It seeks to protect new varieties of plants, in the interests both of agricultural development and of plant breeders. On the other hand, the Convention recognises what is known as the 'farmer's privilege'. Thus, under the

1978 version of the Convention, farmers are permitted to reuse propagating material from the previous year's harvest and can freely exchange seeds of protected varieties with other farmers. Plant breeders are also allowed to use the protected variety in order to breed and commercialise other new varieties.

The latest revision of the Convention, adopted in 1991, has further strengthened PBRs and, conversely, restricted the farmer's privilege. For instance, it extends breeders' rights to all production and reproduction of their varieties, and to species as well as general and specific plant varieties. The remaining exceptions to these rights include acts done privately and for noncommercial purposes, experiments, and breeding and exploitation of other varieties. Breeders are now granted exclusive rights to harvested materials, and the distinction between the discovery and the development of varieties has been eliminated. Further, the right to save seed is no longer guaranteed. PBRs have, in effect, become akin to weakened patents and the conceptual distinction between the two is now blurred.

The International Undertaking on Plant Genetic Resources

The International Undertaking on Plant Genetic Resources (1983) was adopted by the Food and Agriculture Organization of the United Nations (FAO) Conference as a nonbinding instrument. It affirms the principle that plant genetic resources are a heritage of humankind which should be made available without restriction to anyone. This covers not only traditional cultivars and wild species, but also varieties developed by scientists in laboratories.

This encompassing concept of access proved to be unacceptable to some developed countries. Broader acceptance of the International Undertaking was only achieved after interpretative resolutions were passed by the FAO Conference in 1989 and 1991 (Agreed Interpretation, 1989). These resolutions affirm the sovereign rights of countries over their plant genetic resources and qualify the principle of free availability by recognising PBRs and farmers' rights. This recognition of private property rights implies the right to compensation for access to biological resources and associated products.

Further revision of the International Undertaking has been prompted by the growing importance of biological resources at the international level and the coming into force of the Biodiversity Convention, which raised the need to harmonise relevant provisions of the two regimes (Resolution 7/93, 1993). Some of the most contentious issues in the negotiations have been the drafting of the provision on access to biological resources and on farmers' rights.

The Consultative Group on International Agricultural Research

The Consultative Group on International Agricultural Research (CGIAR) is an important player in the management of genetic resources used to meet food needs. It holds significant *ex situ* germplasm collections. Though these collections constitute only about 15% of all samples stored *ex situ* worldwide, these accessions represent about 40% of unique food-crop germplasm (Manicad, 1999). The *ex situ* collections held by the various International Agricultural Research Centers (IARCs) have traditionally been freely accessible. However, in a changing international environment characterised by the progressive move towards the establishment of sovereign and private property rights over biological resources, the CGIAR has had to rethink its position with regard to property rights, in particular IPRs. The new guiding principles on intellectual property seek to harmonise the CGIAR's core principles—that designated germplasm is held in trust for the world community—with the recognition of various forms of property rights, including sovereign rights, farmers' rights, and private rights (CGIAR, 1999). In principle, the IARCs do not apply intellectual-property

protection to their designated germplasm and require recipients to observe the same conditions. They also refrain from asserting IPRs over the products of their research. An exception to this rule may be made in case the assertion of IPRs facilitates technology transfer or otherwise protects developing countries' interests. The CGIAR also stipulates that any IPRs relating to the IARCs' output will be assigned to the Center, and not to an individual. Although the guiding principles generally are an attempt to contain, to an extent, the monopoly elements of IPRs such as patents, PBRs are specifically welcomed. Recipients of germplasm can apply for PBRs as long as this does not prevent others from using the original materials in their own breeding programmes.

Property-rights regimes and the sustainable management of biological resources

Property-rights regimes, in particular those concerning biodiversity-related knowledge, have assumed a prominent place in international discourses in recent years. Discussions concerning the management of biological resources tend to revolve around the notion of sustainability, which is enshrined in all recent international environmental law instruments. However, IPRs tend to be defined in instruments whose focus is not specifically environmental, and significant tensions arise because of the different premises of other treaties, such as the TRIPS Agreement. The predominance of 'traditional' intellectual-property notions in discussions concerning biodiversity-related innovations has ensured that current regimes neither foster the sustainable management of these resources nor offer adequate answers to the need to reward multiple actors involved in their management.

Inadequacy of current international legal frameworks

Overemphasis on private property-rights regimes in the management of biological resources

Current property-rights regimes concerned with the management of biological resources fail to foster their sustainable use and conservation. They favour exploitation modes which focus mainly on the commercial potential of the resources, and neglect their use to satisfy basic subsistence needs. They concentrate, for instance, on commercial agriculture and overlook the contribution of local managers of agrobiodiversity such as farmers. The emphasis on private sector activities has progressively steered the regime away from concerns to satisfy basic human needs and towards the promotion of commercial interests and high-technology agriculture. Commercial agrobiodiversity activities are secured through IPRs which provide incentives for private sector involvement in agriculture driven primarily by profit motivation, rather than by the search for ways to fulfil humankind's food needs.

Indeed, it is apparent that the emphasis on private rights, and the more stringent protection they receive both at the domestic and at the international level, constitute major impediments to the sustainability of biological-resource management. The current IPR regime has a number of negative consequences. First, IPRs entail restrictions on access to biological resources which may reduce the overall flow of innovation and improvement (Esquinas-Alcázar, 1996). Second, they may widen the gap between the big players in agricultural trade and the vast majority of farmers who do not benefit from an IPR regime and who operate mainly on the basis of the sharing of knowledge. Third, the protection afforded by IPRs currently excludes genetic resources. This is premised on the need to keep access to genetic resources free to ensure that scientific research is not stifled by the erection of barriers such as property rights and the attendant requirement to pay for those resources. It is, however, remarkable that the absence of protection only applies to resources harnessed by noncommercial

actors, such as farmers; this therefore implies that farmers in developing countries subsidise the commercial agricultural sector which appropriates most benefits deriving from the resources (Balakrishnan, 1996). Fourth, it has been noted that current IPR systems reinforce the tendency of plant breeding to decrease genetic diversity, as these systems encourage the production and dissemination of new varieties which often replace the more diverse landraces.

Overall, the current international legal regime tends to overlook the rights of actors whose work and innovations do not qualify for protection under the IPR regime. On the one hand, it participates in the devaluation of local people's innovations. Any knowledge which is not 'state-of-the-art' cannot be patented and is thus in the public domain. Nonpatentable knowledge is by definition, less valuable in economic terms. On the other hand, the IPR regime, focused on monopoly rights, is incapable of rewarding the contributions made by the various actors engaged in the management of biological resources because IPRs are framed as monopoly rights which can by definition, reward only one actor.

Overlapping and contradictory property-rights systems

As noted, a number of instruments define property rights over biological resources. Although the Biodiversity Convention is theoretically the central instrument in this field, the property-rights system it enunciates lacks clarity. Indeed, although it emphasises member states' sovereign rights over their biological resources and their rights to control access to these resources, it also insists on the recognition of IPRs. The notion of common concern, which is meant to balance states' sovereign jurisdiction over their resources and the international community's desire to safeguard and have access to biological resources worldwide, is too vague to provide effective guidance. Overall, the main shortcoming of the Convention in this field is that its vague provisions allow for a variety of interpretations.

The Biodiversity Convention itself does not provide a clear framework for property rights over biodiversity, but there is even less clarity when one takes into account other relevant instruments in this field. The TRIPS Agreement is, for instance, of great relevance in the management of biological resources, but it is mainly concerned with the allocation of private property rights over inventions which are intended for commercialisation, and not with environmental management. Consequently, its goals and principles do not include the conservation and sustainable use of biological resources.

Potential conflicts and discrepancies between the various instruments are difficult to resolve a priori. In principle, there is no hierarchy between the different fields of international law—such as trade and environmental law—and states have to fulfil all their treaty obligations (Convention and the Law of Treaties, 1969). The interpretation of the provisions of a given treaty is governed by a number of rules. For example, apart from the text of the treaty, other relevant rules of international law applicable in the relations between the parties should be taken into account. This clearly excludes, for instance, the possibility of interpreting any provision dealing with biodiversity management in the TRIPS Agreement without regard to the Biodiversity Convention and other related instruments. It is noteworthy that the issue of the potential conflicts between environmental and trade agreements is the subject of increasing attention (WTO, 2000). Indeed, in the negotiations for the revised International Undertaking, attention has been drawn to draft Article 14.2.d.iv, which provides that a royalty should be paid by holders of monopoly IPRs in cases where the material used for research was accessed through the Multilateral System. After negotiating this provision in August 2000, four developed states announced at the next meeting of the Contact

Group that they could not agree with Article 14.2.d.iv—in part because they thought there could be a conflict with the provisions of the TRIPS Agreement (CGRFA, 2000b).

In the case of property-rights systems over biological resources, solving conflicts between the various instruments is probably not the most important issue while the legal regime is still being developed. The most important task is to understand into which framework all the instruments which set up property rights fall. Clearly, the setting up of property rights over biodiversity has an impact in most fields of environmental management. The guiding framework thus encompasses a number of environmental-law instruments. Today, it is agreed that the concept of sustainability has become central to all international environmental instruments concerned with the management of biological resources. Further, the idea that the benefits of the exploitation of environmental resources must be shared equitably among states and among concerned individuals has also gained prominence.

Overall, any instrument setting up property rights over biological resources should be read in the context of the principles of sustainability and equity. Apart from environmental sustainability, property-rights systems in this area should be capable of providing rewards to all actors engaged in biodiversity management. This last point is further explored in the next section.

Towards a broader conception of property rights over biological resources

Nonmonopoly property rights

A number of actors are involved in biodiversity management. Current property-rights systems, which focus on monopolistic private property rights or on the assertion of sovereign rights by a state, are incapable of providing rewards to the different categories of individuals and groups who manage biological resources.

Farmers, healers, local communities, public and private domestic enterprises, and multinational companies are some of the relevant actors who manage biological resources and innovate in their own areas. These various entities have different needs, do not operate under the same constraints, and are not necessarily in a position to compete with each other. Thus, multinational seed companies will undertake research to produce plant varieties with improved yield characteristics, or with specific pest resistance, with a view to selling these seeds and making a profit. Subsistence farmers, on the other hand, are more likely to carry out work towards improving their varieties without having commercialisation as an incentive for undertaking such work. Alternative property-rights systems which recognise the contribution of various actors and the different rationales for carrying out biodiversity management should thus be devised.

Current international agreements provide few opportunities to devise alternatives to the current intellectual property rights model, but there are at least a few areas where some openings exist. This has been partly because of disagreements among states over the appropriateness and scope of patents on life. The TRIPS Agreement provides, for instance, that plant varieties must be protected, but the form of protection is generally left to the discretion of states insofar as they can protect plant varieties through an effective *sui generis* system if they do not wish to introduce patents on plant varieties. The use of the term ‘*sui generis*’ first reflects negotiating states’ incapacity to agree on a more precise term. It also reflects the fact that, apart from PBRs no other conceptual efforts had been made at developing alternatives to monopoly IPRs in this field before the TRIPS negotiations.

Specifically, the TRIPS Agreement provides, at Article 27.3.b, that member states “shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof” (TRIPS Agreement, 1994). This is to be compared with Article 27.1 of this Agreement, which requires that patents should be

available in all fields of technology. In this case, even though protection is required, states have some freedom in devising a system which suits their needs and circumstances. Within the TRIPS context, the *sui generis* option constitutes one of the few possibilities available to states in devising an alternative to patents in a field which has traditionally been free from patent or PBRs in most developing countries. The use of this option is of paramount importance. Indeed, plant-variety protection is typically an area in which the needs of developing nations, where agriculture is mainly a subsistence activity, are significantly different from those of industrial countries.

One of the possible *sui generis* options would be to build on existing and proposed property-rights systems for plant varieties. The regime could be aimed at the recognition of the rights of all breeders on an equal level, whether they be farmers or commercial breeders. This would imply the recognition both of farmers' rights and of PBRs—an option already suggested a decade ago at the international level in the context of the International Undertaking. Although PBRs are already well defined in the context of the UPOV Convention, the articulation of farmers' rights still requires further work. Indeed, the draft revised International Undertaking, which focuses mostly on elements such as benefit sharing, does not provide at this point a comprehensive definition of farmers' rights. Among the elements that must be taken into account is the fact that farmers' rights must be recognised as IPRs like PBRs as they are also rights over knowledge. Further, given the nature of knowledge in farming communities, farmers' rights must be framed so that they contain both individual and community rights.

A number of private and official proposals have been made for *sui generis* systems, ranging from the introduction of community patents to benefit local people and communities (for example, Shiva, 1996) to the setting up of biodiversity registers to facilitate benefit-sharing claims (see, for example Utkarsh et al, 1999). Among governmental proposals, the African Model of legislation negotiated in the context of the Organisation of African States (OAU) stands out because of its continent-wide approach (African Model Legislation, 2000). It deals generally with access to biological resources, benefit sharing, and the rights of farmers and breeders over their knowledge and resources. It is premised on the rejection of patents on life and of the exclusive appropriation of any life form, including derivatives. Its provisions on access to biological resources make it clear that the recipients of biological resources or related knowledge cannot apply for any IPR of exclusionary nature. In terms of property rights, the model legislation represents an effort to strike a balance between the claims of the different actors involved in managing biological resources. The result is a regime in which both PBRs, on the model of the UPOV Convention, and farmers' rights are recognised. One of the characteristics of the model legislation is that it provides broad exemptions to the rights granted to the breeders.

Property rights based on commonalities of interest

In light of the failure of current property-rights regimes for the management of biological resources to foster sustainability and equity, there is a requirement not only for the development of alternatives within the current legal framework, as illustrated by the case of *sui generis* plant-variety protection systems, but also for a broader reconceptualisation of property rights.

As traditionally practised and recognised in the 1983 version of the International Undertaking, biological resources are, in essence, a common heritage of humankind. Biological resources are a common good on which humankind depends to meet some of its most basic needs, such as food, health, and energy needs. Further, most areas of the world are largely dependent on genetic material obtained from other countries and continents for their main crops (Flores Palacios, 1997). The allocation

of monopoly rights to biological resources is thus a monumental task because separate developments on similar varieties are carried out at the same time in different areas. Indeed, the contribution of any given farmer, scientist, or country in the development of a given variety is extremely difficult to assess (CGRFA, 1999).

Monopoly rights are, by definition, unable to recognise these commonalities of interest as they are premised on the allocation of rights among different individuals or groups in an exclusionary way. To overcome these conceptual deficiencies, it may be necessary to base an alternative property-rights system on a wider notion of equity—such as the concept of the common heritage of humankind. Common heritage does not imply an absence of property rights, but rather the possibility for various actors to use and enjoy the fruits of a given resource without being stopped by the assertion of monopoly rights. It reflects principles of equality which seek to allow all human beings to fulfil their basic food and health needs, and principles of solidarity which are fundamental to interstate relations.

The idea of fostering exchange and access to biological resources is consistent with the fact that individual contributions are difficult to assess. It is also in accordance with the principle which informs the work of IARCs: namely, that free availability of existing materials to researchers and farmers constitutes the best way to foster food security at local and international levels. Indeed, despite the changing environment which has forced IARCs to revise and strengthen their intellectual-property policies, the new policies still endorse the view that the Centers will not claim IPRs over designated germplasm, and that recipients of such germplasm must, in turn, refrain from claiming any similar rights (for example, International Maize and Wheat Improvement Center, 2000).

Conclusion

The international legal framework currently governing agrobiodiversity management emphasises sovereign and private property rights. The emphasis in recent years on private property rights has provided an opportunity for the private sector to participate in agriculture, and has thus fostered the development of a commercial seed industry. This has led to the development of higher yielding commercial plant varieties but, at the same time, has been accompanied by a lesser emphasis on public sector research focused on basic food crops. It has also sidelined the contribution of local managers of agrobiodiversity, such as local farmers and communities.

The introduction of IPRs over life forms is one of the important incentives which has led to the rapid development of biotechnology industries in recent years. The model of IPRs devised to foster industrial inventions is being applied to biological resources with no serious consideration of potential alternative property-rights frameworks. This is resulting in a legal framework which is largely inimical to local, smallscale, integrated, biodiversity-management efforts. The current system has significant environmental consequences, ranging from the impacts of monocultures favoured by the introduction of IPRs to concerns about the safety of genetically modified organisms, now partly addressed under the biosafety protocol to the Biodiversity Convention (Cartagena Protocol, 2000). Monopoly IPRs also have significant socioeconomic consequences as they favour large-scale capital-intensive research and development.

The current legal framework concerning access to and control over biological resources and related knowledge is not monolithic as it is dealt with in at least two largely different fields of international law: namely, environmental law and intellectual-property law. This leads to inconsistencies and lack of coordination among the various instruments and, in the worst cases, to potential conflicts. At present the Biodiversity

Convention and the TRIPS Agreement are the focus of significant attention as the reconciliation of their largely different objectives and purposes may be difficult in a number of practical situations. The inconsistencies of the legal framework and the significant disagreements still existing among states over life-form patentability also provide some scope for thinking about and developing alternatives to monopoly IPRs. This is what is happening with plant-variety protection in the context of the TRIPS Agreement. Even if the practical results are scanty, because a number of developing countries are not fully taking advantage of the possibility of devising a *sui generis* system, the very fact of starting a debate on the imposition of intellectual property rights over life forms and the extension of the system to all World Trade Organization (WTO) member states raises the stakes concerning all the other areas beyond plant-variety protection where the legal framework is still being developed, such as the case of traditional knowledge.

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