DRAFT-NOT FOR CITATION OR QUOTATION

From Patents to Traditional Resource Rights, the panorama from plant genetic resources for food and agriculture.

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This paper explores the institutional evolution and role of property rights regimes and traditional resource rights in conserving and using plant genetic resources and associated knowledge. Until recently, efforts to conserve and develop plant genetic resources had to a large extent been undertaken by public sector institutions engaged in agricultural research and development. As the private sector has become involved in genetic resources research over the past decade and development has increased significantly the appropriable portion of PGR, the seed, has moved from public institutions to the private sector. Privatization of agricultural research in the developed world was in some measure catalyzed by technological advances that facilitated the capture of economic, largely commercial, value from the use of genetic resources. This recent change has resulted in growing conflict about rights and responsibilities with respect to public and private values that derive from plant genetic resources (Swanson 1996). One consequence of the growing appropriation and use of PGR by private sector institutions has lead to a growing concern with how various kinds of access and entitlement regimes channel economic benefits to the deserving investors or innovators or to meet public policy objectives, such as poverty reduction or biodiversity conservation..

Plant genetic resources for food and agriculture (PGRFA or PGR), like most environmental goods, inhabit a fuzzy realm where private good cannot be completely separated from public goods. They are often referred to as impure public goods. In this context, basic questions about ethics and equity arise. Ethical concerns underpin our responsibility to ensure that genetic resources are managed in ways that continue to make them available for future generations; concern with equity impel us to share the benefits of diversity with local peoples who conserve it (Ethics and Equity, 1997). A particular public policy concern for institutions such as IPGRI is to ensure that the benefits and use of these resources contribute to improving the livelihoods of farm communities in areas of high biodiversity that serve as reservoirs of agrobiodiversity for the global community.

We begin by examining this set of issues from a legal perspective. The paper considers the different levels of jurisprudence that affect institutions and individual choices in diverse ways that are important to understand before embarking on law making. In this field there are three schools of thought that shape the PGR debate. We analyze them in order to trace the history of PGRFA legislation at the international level, and to draw conclusions about how the formalization of benefit sharing systems would affect farmers and communities that use and protect biodiversity as an essential asset for their livelihoods. Our analysis will go from the international level to the local level to consider traditional resource rights institutions, eventually distilling conclusions about how communities value biodiversity and organize local institutions to do so. In this rather broad sweep the type of legal and policy instruments range from the highly formal and restrictive such as patents to less formal and inclusive concepts embedded in custom and diverse cultural practice. In all cases, our concern is that the impetus to formalize benefit-sharing derives more from a desire to protect elite stakeholders rather than from a guiding principle to maximize the accruing of benefits to local knowledge holders, such as farmers, and that this has been reflected in policy prescriptions. A comparison between the formal and the informal systems may tell us which stakeholders benefit most from the international PGRFA agreements and how to more effectively share benefits with local users, providing incentives to conserve and use plant genetic diversity. Furthermore, given the unquestioned benefits to humankind and agrarian societies in all regions that the exchange and wide use of diverse genetic resources has had and continues to have, we also are concerned with how the exchange and use of PGR may be constrained by inappropriate policies and laws at the global and national level.

Three Schools of Thought Shaping the PGR Debate

I. Plants as Private Property

Historically, plant genetic resources were relatively freely exchanged[i] in accordance with the idea that these resources were the common heritage of humankind.[ii] Since the beginnings of written history we have records of explorers taking plant species they had discovered abroad back to their own countries as new foods and raw materials for plant propagation. In the 19th century plant exploration was for carried out for the first time in order to bring back material for plant breeding, a conscious use of plants as genetic resources.[iii] The movement of plant genetic

resources between Europe and its colonies supported economic expansion and further colonization, and changed the cultures of civilizations.[iv] Implicitly, genetic resources of plant varieties were recognized in nation's laws as valuable but they were not themselves explicitly recognized as independent from the physical specimen itself. Plants (and their genetic codes) were considered as consumptive goods only. De facto, their genetic resources were common property.

Classical property theory defines the right of property as "that sole and despotic dominion which one man claims and exercises over external things of the world, in total exclusion of the right of any other individual in the universe."[v] In the twentieth century the theory of property has changed from its conception as a relationship between a person and thing to the concept of property as a bundle of rights.[vi] This change to the ownership and control of PGR became relevant as countries began to describe PGR as property rights to which they, as sovereign states held rights over.[vii]

The core meanings of property rights as a legal concept are indeterminate and have changed over time. [viii] [ix] The PGR-as-private-property school of thought has its origins in the tragedy of the commons, a term originally coined by G. Hardin in 1968, which refers to the situation where the lack of well-defined ownership rights results in an inability to capture the economic returns generated by the resource that in turn leads to the systematic overexploitation and destruction of that resource.[x] This school applied Hardin's conclusions about commons lands to genetic resources, and is typified by comments like Roger Sedjo's remark that the lack of property rights in genetic resources seems to be a "killing of the goose that lays the golden eggs"[xi] In this case, if people who conserve PGRFA are not compensated fairly they will cease to continue managing diversity. In response, concepts such as benefit sharing, intellectual property rights, and farmers' rights, are efforts to find ways to compensate conservers for the public benefit they provide such as risk management and future innovation potential that derive from system diversity, and which is wholly independent of the plant's immediate market potential as a product. A number of proposals have been forwarded for the creation of new categories of property rights to enhance incentives for the conservation and sustainable use of biological diversity. Some have proposed the creation of rights similar to IPR over the biological information in genetic resources in the countries and/or the communities of origin.[xii]

Very recently an Anti-Property Rights voice has asserted itself in response to unanticipated outcomes of successful international legislation to privatizing benefits from PGR. The protests arise from an analysis of the institutional effects that international legislation of the Convention for Biological Diversity (CBD) have had on farmers, particularly with respect to reducing seed exchange among private plant breeders and even public research centers. These unanticipated effects illustrate that efficient policy and law cannot only consider stakeholders as private entities, but must also consider on how institutions make public the benefits of PGR. In order to understand how farmers may be affected by new laws and policies, we must consider seed exchanges and seed flow in order to hypothesize how policies affect germplasm and genetic information transfers.

Bilateral transactions between states may be a useful way to funnel benefits of PGR to developing countries, however their limitations should also be recognized. Their application to PGRFA is likely to be complicated due to the unique nature of agrobiodiversity. Even for highly localized, non-dispersed genetic resources where a country of origin is readily identifiable there are issues that arise that can limit the usefulness of this approach. Crop species are now so widely dispersed and are so endogenous in the ecosystems, agriculture, and food cultures of so many countries that to claim a property right for one country may result in restricting the rights of another country where such crop genetic resources lie at the heart of people's livelihoods and health.

II. PGR as Intellectual Property

Intellectual property (IP) defines a class of goods that are intangible, such as a poem or a production process. IP can be formally protected through the act of patenting or copyrighting or trademarking for which the inventor (not a discoverer) must show that the invention is new, is not obvious, and is capable of industrial application.[xiii] Because the formal definition is contestable when distinguishing process from object, for example, it is difficult to arrive at decisions that are satisfactory to the public interest (the original objective of all patent or IPR legislation) in cases where process and product intersect. With the exception of scientific laws creating patent rights for asexually produced plants, the first form of property rights over plant varieties did not appear until the beginning of the 1960's in the US. [xiv]

Currently, plant breeders' rights provide rights to classical plant breeders. These classical IPR for genetic resource use have tended to be superseded in the public's attention by patents that are increasingly employed to cover developments in biotechnology and the applications of molecular biology at the genetic level. While the rights protected and the benefits claimed under these legal regimes can be readily applied by inventors and breeders, there is little that the IPR tools do to address benefit-sharing with respect to local and indigenous knowledge.[xv] The history of plants and legal recognition of intellectual property with respect to plants shows that attitudes regarding what deserves protection as private domain and what is considered public domain have changed over time.

In the nineteenth century plant varieties were not considered suitable for patent protection.[xvi] Throughout Europe in the early twentieth century, there was tremendous debate about the appropriateness of plant variety protection.[xvii] Nevertheless, by the 1960s and 1970s most industrialized countries had adopted some form of plant variety protection. The growth of commercial agriculture including the development of the seed industry, the advent of scientific plant breeding, and the expansion of the market economy, were key factors compelling the development of plant variety protection.

In 1961, representatives of six European nations created the Union for Protection of New Varieties of Plants (UPOV). Stimulated by the need for a tool that could be used for marketing purposes, their aim was the establishment of proprietary rights for plant varieties. Not surprisingly, the original impetus for creating UPOV came from three organizations; a commercial plant breeders' trade association formed to promote plant variety protection, an organization with a mandate to promote industrial patents, and the International Chamber of Commerce.[xviii] The Convention on the Protection of New Varieties of Plants that was adopted at the Conference created a new kind of intellectual property protection for new plant varieties called breeders' rights.[xix] The protection gave plant breeders exclusive rights to sell an invented, novel, and distinct, varieties for a specified period of time.[xx] This was the first formal recognition that plants had valued beyond being physical commodities, and recognized the product of breeders as valuable. In 1973, Stanley Cohen and Herbert Boyer were able to transfer the genes from fruit flies and frogs to E. Coli. The process of gene transfer was granted a patent in 1980 and demonstrated that intellectual processes were valuable.[xxi] It was only a short step to move from legal

IPR protection of the new process to the protection of the novel product, the gene. Once rights were established over bundles of genes and over a process to create new bundles of genes, it was only a short step to privatize the starting raw materials, the genes.

The high risk and investment involved in research and development in biotechnology combined with the ease with which a product could potentially be copied led industry to seek stronger protection for innovations in the development of plant genetic resources than was available under plant variety legislation.[xxii] Hence, largely as a result of the initiative of the private sector, patent protection in industrialized countries has been steadily extending over biomaterials both in what can be protected and how broadly. [xxiii] Nonetheless, the limits and application of intellectual property law at the national level are unclear in most developed countries. [xxiv] In the United States it is possible to obtain a patent on a gene, its application, in a plant, on a plant itself, and on basic processes and inventions, each of which has different implications.[xxv] Most recently, developing countries have rallied behind using IPR to protect indigenous species, identifying them as gene bundles, similar to what is protected under breeders' rights if a breeder develops a new variety. In arguing this case, developing country and indigenous peoples representatives at global fora make the analogy that just as breeders expend effort to develop new bundles, communities expend effort to conserve local varieties.

III. PGR Property as National Patrimony

Just as breeders request intellectual ownership over the value added they created, countries demand ownership rights over PGR. Before this, plant genetic resources were accessed under the theory that the resources were part of the "common heritage of humankind."[xxvi] The international community reaffirmed the paternal rights of States over their own biological resources and established that States had the authority to determine access to the genetic resources under their jurisdiction. [xxvii]

National patrimony became relevant in the discourse as a result of language in the CBD which was premised upon the national sovereignty of each country over genetic resources within its jurisdiction. "Article 15 of Access to Genetic Resources focuses on national action and, through reference to mutually agreed terms and prior informed consent, implies a negotiation-a bilateral approach- between countries and recipients for access to genetic resources."[xxviii] The CBD defines "country of origin"

as any country where genetic resources exist in ecosystems and natural habitats, or where they have developed their distinctive properties. In essence, the reaffirmation of the right to control access, although not to destroy, allows the creation of a market in genetic resources with the source States of those resources having a property right entitling them to deny access to genetic resources when it is not in their interest to permit it. [xxix]

IV. Discussion

Jeremy Bentham stated, "Property is nothing but a basis of expectation….. There is no image, no painting, no visible trait, which can express the relation that constitutes property. It is not material, it is metaphysical; it is a mere conception of the mind.'[xxx] Bentham's statement emphasizes that property rights only have meaning within a defined context of what is considered valuable. Before the UPOV, the process of improving plant genetic resources was not considered valuable. After 1961 improved varieties could be patented under a new form of rights, intellectual property, since they demonstrated efforts on the breeders part.[xxxi] After the Conference on Biological Diversity in 1992 the context of what was considered valuable changed again, and all PGR, particularly local landraces, were prized as contributing to biodiversity. Because rights over PGR could not be granted using the *process* consideration, a new type of value relying was created. Privatization would be demanded under the pretense of State sovereignty.

Royal Gardner argues that that threats to the environment result from the cumulative impacts of many individual actions.[xxxii] The Prime Minister of Malaysia's statement to 1992 Earth Summit in Rio de Janeiro illustrates the problem of addressing the inequity of singling out those individuals making an impact later in time that alone would not have resulted in the problem.

"[Developing] countries have been told to preserve their forests and other genetic resources on the off-chance that at some future date something is discovered which might prove useful to humanity. It is not surprising that some spokespersons for developing countries at global for a regard such conservation pressures by developed countries and international conventions to be somewhat hypocritical. When the rich countries chopped down their own forests. and scoured the world for cheap resources, the poor said nothing. Indeed, they paid for the development of the rich. Now the rich claim a right to regulate the development of poor countries. And yet any suggestion that the rich compensate the poor adequately is regarded as outrageous. As colonies we were exploited. Now as independent nations, we are to be equally exploited." [xxxiii]

History of International PGR Legislation and Initiatives

In 1967, an FA0 technical conference proposed the creation of a global network of gene banks, to store representative collections of the main varieties of food. [xxxiv] PGR were considered a “worldwide heritage,” and thus priority was given to preserving the landraces, many of which were immediately threatened. [xxxv] The FAO, the World Bank and the United Nations Development Programme founded the Consultative Group on International Agricultural Research (CGIAR) in 1971 to assist in the coordination of PGR.

The current international debate on plant-related property rights has its origins in the late 1970s and early 1980s when developing countries became concerned over the actions by the plant breeding industry in industrialized countries, and in particular about the free flow of germplasm from developing to industrialized countries. At the same time that efforts to collect and conserve PGR in gene banks heightened in the 1970s, the UPOV Convention of 1961 was amended to allow non-European members to expanded international cooperation in the recognition of plant-related intellectual property rights.[xxxvi] These events resulted in even greater attention being paid to questions of PGR ownership. [xxxvii]

In 1979 the book "Seeds of the Earth" was released and provoked bitter debate with its accusation that the North was robbing the South of its genetic resources and making huge profits from the theft of this property. [xxxviii] As a result of this and other developments noted above, developing countries forced the issue of ownership and use of PGR onto the international agenda. FAO responded in 1983 by establishing the Global System for the Conservation and Utilization of Plant Genetic Resources. A Commission on Plant Genetic Resources was created to oversee the Global System. [xxxix] The Commission's first major action was the negotiation of an International Undertaking on Plant Genetic Resources (IU), where non-binding resolutions were drawn up. Governments debated the ownership and control of PGR in a highly politicized environment concerned with intellectual property rights being granted for plant breeders' and national germplasm embargoes. [xl] The acrimonious debate on the access, ownership and control of PGR that ensued during the adoption

of the TU and its further refinement was dubbed the "seed wars" by the Wall Street Journal.[xli]

During these negotiations, developing countries pushed and succeeded in reflecting in the IU a broader reflection of the common heritage concept which would apply not just to the PGR situated in developing countries but to the PGR subject to plant breeders' rights contained primarily by industry in developed countries. In the resolution by which the IU was adopted, Member States recognized that "plant genetic resources are a heritage of mankind to be preserved, and to be freely available for use, for the benefit of present and future generations" and was intended to facilitate the conservation and sustainable use of PGR. The IU made clear that this open availability was to apply to all PGR, including "special genetic stocks" which was interpreted broadly to include the specially bred proprietary lines of seed breeders. Unindustrialized countries perceived that they could accumulate maximum benefits through sharing PGR in an open network.

The rejection of the plant-related intellectual property rights regimes made the IU controversial to seed industry and hence to governments of the industrialized world. The American Seed Trade Association declared that the IU "strikes at the very heart of free enterprise and intellectual property rights."[xlii] Nevertheless, Denmark, Finland, France, New Zealand, Norway, Sweden, the United Kingdom and the United States officially indicated their willingness to support the IU.[xliii] In total, 160 countries agreed to the new interpretations were adopted in 1989 and 1991.[xliv] Although the IU is non-binding, negotiations continue to bring together stakeholders over the issue of patenting novel PGR.

Ten years after its adoption, the IU has evolved through interpretive resolutions to reflect the growing acceptance of the need to accommodate plant breeders' rights to attract developed country interest and in light of a reverse shift on behalf of developed countries concerning national sovereignty over PGR as a preferable mechanism through which developing countries could correct the asymmetry of benefits accruing from PGR. Interpretive resolutions to the IU were adopted in 1989, one of which recognized that plant breeders' rights were not necessarily inconsistent with the IU.[xlv] Another resolution defined and recognized Farmers' Rights as "rights arising from past, present and future contributions of farmers in conserving, improving and making available plant genetic resources, particularly those in the centres of origin/diversity."[xlvi]

The Conservation on Biological Diversity (CBD) was adopted in 1992 and entering into force a year and a half later as the first global treaty to address the loss of biological diversity comprehensively. In the late 1980s a delegation from the United States urged the Executive Director of UNEP, Dr. Mostafa Tolba, to promote the idea of the convention.[xlvii] What the U.S. had in mind resembled a traditional conservation treaty along the line of the Convention on Migratory Species[xlviii] or the Ramsar Convention[xlix] and not the far-reaching CBD adopted in 1992. Ironically, the United States is currently a non-Party to the treaty.

Developing countries made it clear that they were unwilling to consider the conservation aspects of biodiversity in isolation. With the development of plant variety protection and the application of patent protection to living materials in the developed world, the world had experienced a one-sided contraction of the common heritage principle set forth by the IU. In this context, the nations of the South argued that they could exert sovereignty over their biological resources under the same "product principle" that the US companies could patent living organisms and that they demanded mechanisms to correct the imbalance and thereby establish greater economic equity.[l]

In practical effect, the treaty approved of the creation of a market in genetic resources. Source countries essentially had a limited[li] property right to accept or reject requests for access depending upon whether mutually agreed terms for access could be found.[lii] It is still unclear what the effect of legislation has been on the number of requests for access (e.g., are transaction costs reasonable and the procedures sufficiently clear and efficient or has the legislation restrained exchange, causing parties to look elsewhere for access to genetic resources), to what extent benefits have actually accrued from access transaction, and to whom benefits have actually accrued (e.g., have indigenous and local communities benefited from the transactions). Article 16 in the CBD, *Access to and Transfer of Technology,* has the only explicit reference to intellectual property rights. The final paragraph of the Article makes clear that the negotiators of the treaty were unable to reach consensus on the role of IPRs in the conservation and use of biodiversity. The gist of the provision is that Parties are to make sure that IPRs are supportive of the treaty's objectives.[liii] Perhaps as a testimony to its ambiguity, the biotechnology industry worry that the protection is too weak while some civil society organizations claim the language is too strong.[liv] Thus far the work of the Conference of the Parties and the treaty Secretariat has been confined to

information gathering. While casual relationships cannot be verified, it is not incautious to say that conflicting national laws between developed and undeveloped countries have disrupted the balance of benefits established by the IU and has played some role in the South's change of heart.

The TRIPS Agreement was one of the agreements of the WTO adopted in 1994 at the close of the Uruguay Round of negotiations under the General Agreement on Tariffs and Trade (GATT).[lv] It pushed the debate about intellectual property rights even further toward a bilateral exchange environment. The TRIPS and other WTO agreements are binding on the 131 countries that are members of the WTO.[lvi] The Agreement was innovative from both trade and IPR perspectives and embodied the notion that trade restrictions, such as embargoes on "counterfeit" goods, are necessary to promote trade liberalization.[lvii] It required that all parties meet certain minimum standards for protecting intellectual property rights.

The TRIPS agreement states that "patents shall be available for any inventions, whether products or processes, in all fields of technology.[lviii] Under Article 27.3(b) the agreement exempts PGR from patent requirements:

> "Plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof."

Members of the WTO must implement intellectual property protection for plant varieties whether through patents, a *sui generis* system or a combination of the two under Article 27.3(b). The Latin term *sui generis* means 'of its own kind'. However, as the TRIPS Agreement does not define what an effective *sui generis* system is, nor does it refer to any specific existing rights regime or treaty, providing the minimum requirements established by the TRIPS agreement are met.[lix] There is nothing to stop Members from going beyond the more narrow confines of *sui generis* required. Under TRIPS, a country could include indigenous knowledge as a subject matter to be covered by the *sui generis* system. The *sui generis* system has implications for systems of traditional property rights, national property rights, or those developed under the IU and CBD. Significantly from the perspective of implementation flexibility, the TRIPS Agreement does not define what a plant variety is, the

requirements for protection (such as novelty, distinctness, uniformity and stability), the scope of protection(i.e. whether a right should extend to vegetative, reproductive , harvested material, or to the export of the protected material), the duration of the right, or the relationship between a *sui generis* right and other IPR, such as patents.

The TRIPS agreement succeeded in further weakening the institutions for germplasm flow without strengthening new ones to negotiate bilateral PGR flows among countries. While it theoretically privileged PGR, it did not establish de facto steps to equalize benefits streams to farmer or plant breeders.

The last piece of history in the international PGR is a 1998 EU Directive relating to plant patentability which highlights the confused environment in which the debate is occurring. The European Patent Convention excludes plant varieties from patentability.[lx] In its 1993 decision "Plant Cells/Plant Genetic Systems", the Technical Board of Appeal of the European Patent Office (EPO) stated that every genetically modified plant is to be considered a plant variety if the genetic modification is stable and thus cannot be patented under EPO laws.[lxi] Nevertheless, in an effort to harmonize the rules in the EU, in June 1998, the European Parliament gave final approval to a controversial Directive on the Legal Protection of Biotechnology Inventions. [lxii]

In stark contrast to the EPO ruling, the Directive allows for the patenting of transgenic plants and animals provided they meet the standard criteria for patentability.[lxiii] While the Directive excludes plant varieties from patentability, it allows plant groupings comprising more than a single variety to be patented, even if they comprise new varieties of plants. Although the EPO ruled that the Directive would only be a “supplementary means of interpretation,” it has certainly created confusion over PGR rights.

IV. Discussion

Developing countries are both producers and consumers of plant biodiversity and benefits can be conceptualized as accruing on the supply side or the demand side. The confusing history of International PGRFA legislation has really been a slow reorientation of benefit streams away from the demand and toward the supply side. The IU convention’s common heritage concept was adopted under the assumption that the benefits accrued in developing countries were greater than those they would received under a bilateral exchange system, taking into account transaction costs plus

royalties on PGR. Less then a decade later these same countries changed their views about profit maximization. The change was probably politically motivated, as a recourse against the developed countries unresponsiveness in changing national IP laws to adhere to IU resolution, considering them common heritage, that have stripped PGR rights from the purview of private goods. The emergence of the concept of Farmers' Rights in the IU in 1989 was motivated more as part of a political effort to right the perceived imbalance created by the growing use and expansion of plant breeders' rights than as a recognition that the participation of farmers' communities as private actors was necessary for the conservation and sustainable use of PGRFA in-situ.

Regulating access to genetic resources in return for a share of the benefits from their use is one benefit-sharing mechanism that has received a great deal of attention. The language of the CBD implies a bilateral transition[lxiv]. Access regimes should be seen in the context of the struggle that began with the adoption of the IU to balance the inequity created when there was a property rights system that recognized and generated tangible economic benefits from the PGR products of formal breeding and biotechnology, but that there was not corresponding rights, and hence generation of tangible economic benefits, from the germplasm conserved and developed over generations by local communities. In this context, sovereign rights of States is the basis upon which plant-related IP rights can potentially be balanced.

The most serious fear is that systems are being put in place that inadvertently restrict the exchange of PGRFA for socially valuably uses, such as reducing food insecurity and better management of ecosystems. For example, international agricultural research centers and their genebanks play an important role in restoring germplasm after disaster. Between 1981-1995 CGIAR centers restored germplasm to 38 countries suffering genetic erosion due to disaster and war. "Current patterns of germplasm movement do not so much indicate biopiracy as they indicate bioinvestments being made by developing countries. These investments are reaping tangible dividends in the form of access to additional germplasm, insurance against loss of indigenous germplasm, and procurement of improved materials.[lxv] This important benefit of large scale geneflow would in the long term be threatened under current trends in international legislation as agricultural genetic stock deteriorates and cannot be replaced economically.

Countries may have to resort to making piecemeal exceptions or amending the legislation as they gain experience. In the absence of other national or international law or an agreement between the host government and the institution to the contrary, the exchange and use of these resources requires prior informed consent, the creation of an access contract, and other requirements imposed by access legislation. Although the inclusion of *ex situ* resources does not contravene Article 15(3) of the CBD[lxvi], it does create substantial uncertainty concerning the application of the access requirements to *ex situ* resources. Since the mid-1990s the Commission has been engaged in a negotiating process to revise the IU to bring it into harmony with the CBD, perhaps becoming a protocol to the CBD treaty. Farmers' Rights in the debates of the IU have been interpreted differently by those who consider it a political concept and those who interpret it as a legal concept. The legal view of the term has prompted proposals like a defining of the rights as an alternative form of IPR covering, for example, the products of farmer selection and breeding.[lxvii] Those viewing it as a political concept have made proposals to establish a fund to finance PGRFA conservation and development work

The different interpretations arise from the different motivations behind Farmer's rights during IU and CBD negotiations. The motivation behind Farmer's Rights, Article 80(j), in the CBD was to promote an understanding that any efforts to conserve genetic resources must take into consideration the relationship between the resource and the communities actually managing and using them. The countries agreed that Farmers' Rights would be recognized through an international fund, but no decisions have been taken to make such as fund.

Without open access to the ex-situ seedbanks the role of the CGIAR Centers might well be reduced to the level of brokers for individual countries in bilateral exchange transactions. Furthermore, more hurdles, such as IP costs, to adapting local landraces will only reduce ongoing in-situ conservation and increase the adoption of commercially mass produced varieties, which will have a greater competitive advantage, and will accelerated the abandonment of diverse landraces. Finally, modern, high-yield varieties have been referred to by their detractors as "high-input" because of the high external inputs often required to maintain them, and in fact, may cause greater harm to the global environment. It is clear that during the period that IP over plant varieties has increased there has been dramatic decrease in the number of traditional crop varieties.[lxviii] The FAO's State of the World…concluded that the chief contemporary cause of the loss of genetic resources has been the spread of

commercial agriculture[lxix]. To the extent that plant-related IPR encourages this spread, they can be characterized as contributing to genetic erosion. It is worthwhile noting that the Green Revolution -- which led to the displacement of many traditional varieties -- took place without the use of IPR. Corporations in the life sciences have been the major impetus behind the expansion of IP application in genetic resources used in commercial agriculture.[lxx] Nevertheless the mass dissemination and promotion by agricultural development policies of a small number of varieties during the Green Revolution increased uniformity in global agriculture and reduced the number and extent of local varieties in cropping systems. If intellectual property succeeds in producing hurdles to local variety spread, or even its maintenance, we will see the same deleterious effects on agricultural biodiversity caused by the "IPR revolution".

Who Really Benefits From Seed Exchange

There has been a historic transfer of genes from the South to the North. Some have suggested that greater control over access would ensure that the benefits of diversity accumulate to developing countries even if there may be greater costs associated with acquisition of materials for use by these same countries. Analysis of gene flows to and from genebanks of developing countries participating in open access, ex-situ genebanks such as CGIAR showed that over the 18 year period from 1972-1990/1991 14 developing countries accessed 4 times as many samples as were collected from them, where accession was free to all participating countries in the network. As the collecting activities decreased in the 1990s, conservation infrastructure increased at the national levels and collection "became a country driven process based on national priorities." The ratio of accession to collection rose up to 60:1 in 1992. Data from CGIAR found that the majority of collected materials went to developing countries, with over 90% of pigeon peas and chickpeas and over 60% of maize and wheat doing so.[lxxi]

Nonetheless, developed countries commercial sectors also clearly benefited from the free geneflow within the network. Although ICRISAT and HUU genebanks revealed that over the past 25 years from 1973 to 1997 commercial companies averaged less than 5 percent of the transfers, in 1996 it was estimated that 75% of all seed sold by private companies in Latin America contained CIMMYT derived germplasm.[lxxii] Laird found that in countries with an important public sector, 80% of the time required and 35% of the cost of developing a new variety was publicly

funded, and in developed economies a larger percentage of germplasm is used in the commercial sector.[lxxiii] Indeed, the importance of geneflow for commercial was much greater in the developed world where one fourth of durum and bread wheat germplasm was used by the private sector, compared to only ten percent in the developing world.[lxxiv] As the international commercial sector has increased their market share in germplasm, policy makers in some developing countries have demanded part of the profits, via institutions functioning under the rubric of Farmers' Rights. Despite this highly contested debate over who gets the benefits of PGR, it is likely that all actors benefit equally from free exchange, including individual farmers, since the poor are not discriminated against by high entrance costs to planting non-local seed varieties. On the other hand, those who will benefit from the proposed IPR regimes are country's governments who will be receiving funds on behalf of the local communities. In the distribution of these funds, they exert significant power over the communities. Furthermore, since commercial and developed countries have more and better access to judicial institutions, they will be better able than local farmers to capture benefits from the use of their products.

Traditional Resource Rights

We have examined conservation institutions at the international level but now we move on to discussing how policies might be translated into observable changes via institutions at the level of agrarian communities managing high levels of biodiversity. Because these agrarian societies are often in marginal areas or part of indigenous and minority cultures that are marginal to state institutions and laws, a problem of recognition, incentives, and institutional pluralism arises. Policies are only as efficient as are the enforcement mechanisms (reward, incentives, punishments) embodied in institutions that define relationships between people and resources. In the case of many local agrarian communities, the rights of individuals or groups to use resources involves not only a legal concept but also social norms and institutions (Eggertsson, 1990, p. 33).

Referring to our earlier classical definitions of property rights on pages 3 and 4, it is increasingly clear that they are of limited utility when dealing with the institutions that regulate property rights and access and use to genetic resources in many traditional societies with stewardship over rich reservoirs of biodiversity. Western legal thinking on property has emphasized the relationship between people

and material objects they "own". Even seminal legal scholars such as Salmond, have noted, "Ownership, in its most complete signification, denotes the relation between a person and any right that is vested in him. That which a man owns is in all cases a right. When, as is often the case, we speak of ownership of a material object, this is merely a convenient figure of speech." (J. Salmond, *Jurisprudence*, 10th edition. 1920. p. 220). Legal anthropologists who have studied property rights in traditional societies emphasize the social relations entailed in property rights. "Property law in tribal society defines not so much rights of persons over things, as obligations owed between persons in respect of things." (Max Gluckman, Politics Law and Ritual in Tribal Society. 1965. p. 46) These social relations that define local cultures and their unique relations to biodiversity were globally recognized for the first time by the CBD in article 8j. Taking advantage of this opening, traditional and indigenous peoples have called for *sui generis* systems for IPR of genetic resources with specific reference to their role in maintaining and developing plant genetic resources. In their conception, the "of its own kind", refers not to the material thing e.g. genetic resources, but rather to their own customs and unique cultural interactions with the biological diversity in their environment. This particular world-view that underpins the link between biological and cultural diversity obliges us to look not only at formal institutions and processes for the assignation of property rights but the institutions and customs of local peoples in their classification, use and exchange of plant genetic resources (Darrel Posey 1999). The call for rights based approaches to PGR conservation at the local level entails greater attention to the institutions, social relations, and practices of communities than to the divination of the potential economic benefit that may reside within a particular plant's genetic information. Unfortunately, despite high visibility that traditional and indigenous communities have received in global fora addressing biodiversity conservation, few steps have been taken to focus on community-centered, rights-based approaches that support local institutions and customs that can be beneficial to global biodiversity. International law has been rather unyielding in this regard, particularly when inserted the context of global trade, e.g. TRIPS.

To understand the impacts of international laws we must understand how institutions at the community level function. Informative research has been done about the role of community- based organizations in water management (Ostrom), forest management (Gibson), and pastoral land management (Agrawal). We will

draw from the conclusions from this literature to analyze the role of community and regional institutions in PGRFA conservation.

From the literature on forest management we find that six attributes of user groups that enhance the likelihood of group formation to manage common pool resources. These include how dependent users are on the resource, how one user's actions affect other users, the discount rate of future benefits, trust and reciprocity, autonomy of the group over the resource, and prior organizational experience within the group. Attributes of the resource that affect organization include a) the feasibility of improving the resource, b) the type of cost of indicators of resource quality, c) the predictability of benefits from the resource, and d) the physical geography of how the resource is distributed. Both of these variables affect the costs and benefits to individuals who make decisions about institution building to manage the resource or resource use.[lxxv]

PGR for Food and Agriculture is a common resource in the global context but they have a distinct set of attributes from PGR in general and from other common resources such as water, forests, or pasture lands. One difference is that PGRFA is *only* useful when part of a complex network of seed sharing that includes private, pubic, and non-market interactions. Networks of exchange of both local and exotic varieties play a significant role in crop production, accounting for 40% and 15% of area planted at one research site in Mexico.[lxxvi] Unlike resources such as forests that provide benefits that are tangible and autonomous from institutional considerations, PGRFA is only valuable (a) and predictable (c) when considered within a social network or institutions. These are after all resources that are identified and managed by people, often collectively. The long-term benefit an individual farmer extracts from the diversity on his farm is negligible because, on average, genetic erosion and experimentation lead to frequent replacement of seed. In one Mexican village studied 47% of the seeds were replaced from external sources every year (Loutte, 2000, p. 113). Furthermore, benefits such as post disaster seed restoration and the ability to adapt crops to changing conditions of water and pest infestations that farmers derive from diversity do not occur at the individual level of the farmer, but are facilitated by institutions and seed systems. Thus the value of PGRFAs is directly related to the size of and ease of transactions within the network.

When considering a commonly managed resource such as a forest the physical geography is relevant to understanding how the resource is managed. PGRFAs are

geographically distributed (d) over a large area. Theoretically, as a geographic area of exchange contracts, diversity is reduced as the environment becomes less heterogeneous; even if diversity in reality does not diminish, the effect is the same at the local level as access is reduced. Diversity looses value its global value as the number of varieties accessible becomes limited. Under a seed bank or multilateral exchange systems the geographic distribution of PGRFA the geography of PGRFA is global because no seed exchange system, no matter how localized, is truly isolated (Louette 1999). But under a bilateral agreement system or any IPR system access to diversity, in other words the geography of the resource changes, and it is doubtless that the way it is managed at the local level will also change. If it becomes less valuable local conservers will be less inclined to grow diversity.

Much research has accumulated about the effects of group size and heterogeneity on functioning of common pool resources (CPR) groups, a category that PGRFA fits into. Mancur Olson (1965), Baland and Platteau, Agrawal, and others suggested that smaller more homogenous groups can overcome collective action problems most easily. Other literature by Agrawal, Tang, and Lam have found that size did not affect group functioning. Based on this the literature on forest and water management has been inconclusive regarding the ideal size of groups because effective resource management is dependent on matching group size to ecosystem in order to understand the costs to participants of resource monitoring. But all sets of data focused on water user or forest management groups with a maximum size of 475 or 700 users. PGRFA utilizes networks that consist of hundreds of thousands of stakeholders with very different levels of dependence; from full time plant breeders to isolated farming communities. The only conclusion we can draw is that transaction costs resulting from breeders rights claims or farmers rights claims will decrease the flow of seed and affect different subsectors and actors of the network to different degrees.

Benefit-sharing and plant breeders rights, respectively, offer monetary credit for knowledge and incentives to invest in innovation. Although initially it they may sound like equitable and efficient solutions they do not necessarily value everything, only what knowledge and diversity can be monetized via niche or other market institutions. In this way “traditional” knowledge becomes “cultural capital” that is easily traded. The anthropological literature has demonstrated a constant and continual informing and adapting of “traditional” knowledge from interaction with

“scientific” forms of knowledge. Yet the paradigm of knowledge that the CBD and IU established is an artificial epistemology that is unable to consider information flow between “scientific” and “traditional” knowledge. Communities utilizing indigenous knowledge are increasingly concerned with recognizing and fostering exchange between IK and scientific knowledge systems (Quek).The valuation of traditional knowledge about plant uses is just as problem ridden as trying to determine what is a plants center of origin, since it is the knowledge is itself dynamic.

A relevant distinction between PGRFA and PGR is that the latter holds the potential for biomedical and commercial profitability, accumulated by a small group of companies, which makes benefit-sharing a possible alternative. Benefits accruing from PGRFA flow to many small plant breeders, and benefit both producer and consumer because they tend to be the same class of person. Although horticulture sales were 1.75 billion US in 1996 (Rabobank, 1996), unlike the pharmaceutical industry in which value is derived from only a handful of inputs, profits would need to be shared amongst a very large population, diminishing the value of any single variety in relation to another, to the point where transaction costs may outweigh benefits received. A example of this is the VEERY wheat variety which derives from 52 parent lines from 26 countries.

Agarwal (in Gibson 2001) demonstrated that periodic assessments of resources are important to the long term functioning of groups so that participants perceive improvements in their resources from their efforts. This implies that as participants spend more assets to collectively manage resources they need to receive consistent benefit flows from it. If an investment becomes too lumpy, even if their inputs are evenly spread out (in other words they find out once every two years if their investment they pay each month pays off) they may choose not to take the risk. Agrawal’s concept informs us that greater investments in genetic diversity might not necessarily be made if benefits (derived as payments from private companies most likely from the developed world) are unpredictable or only cannot be measured consistently. If the CBD effects are to increase the cost to individuals within a network, even if they also increase the *possible* returns, Agarwal’s finding suggests that the result might actually be less investment, not more.

International policy makers have argued that conservation must be linked to economic pursuits and that locals, who have a better understanding of the ecosystem, must be part of the institutional apparatus of control. Gadial showed that in an

institutional environment supportive of local groups, such as West Bengal where the decentralized government was able to help local village level state forest groups deal with bureaucracy, and where economic incentives were provided, the same community that was destroying forests could conserve and increase forest growth and diversity if able to obtain economic benefit from wood harvesting. Nonetheless, he made clear that fostering markets for natural resources established a paradigm where one ecosystem (fast growing forest) was valued over another (mature, slow growth with rotting wood). Gadial's experience teaches us that incentive structures will really work only within a broader institutional framework.

Conclusion

Legal perspectives look at peoples' relations to things, and intellectual property rights capture value of things which are not physical and channel benefits appropriately. They do not manage things themselves, but rights between people with respect to things. The rush to assign IPR rights follows from the libertarian school of thought that proclaims the optimal social agreement as one which determines the maximium freedom of individual actions. This arrangement in fact leads to the greatest economic efficiency. Paradoxically, equity and fairness, upon which benefit-sharing are based, are the grounds upon which this school was critiqued. Property rights tended to be granted or bought by those private interests that had the greatest capital, and then used to extract rents from the poorer majority of society. The property rights school states that there is a need to define rights to individuals or communities. It promises that environmental market failures will disappear once a market has been established for these rights because property rights will mitigate externalities; there will be no need for legislation-based institutions (Arto, BIOECON 2003).

Perhaps most significant aspect about proposals to assign property rights is that they provides few mechanisms to create property rights regime within countries to ensure that benefits flow to the communities on the ground that manage and conserve biodiversity. In any rights based approach that incurs transaction costs (especially high ones like the Farmers' Rights proposal) a number of problems exist:

- there is likely to be substantial inequities in the negotiating expertise and power of the source country and the resource seeker;

- it will be difficult for the source country to trace whether or not a product is based upon its resources and would therefore have to rely on the good faith of the company;
- it is unlikely that the market can provide adequate compensation (e.g., recognize the true value of the resources) to be a long-term incentive and it is not designed to provide a stable, predictable income;
- resource seekers will look for the easiest source of the resource thereby creating competition among source countries that can drive down the price for access and/or they will look for laboratory-based alternatives where possible.

Bilateral approaches may be conceived along the lines of center of origin, centers of diversity, and centers of value; each of which has different implications for who benefits, and each of which has its own validity. The call from local communities was not for IPR but for protection from those exploiting IPR who exploited a local PRG at the expense of local communities use and benefit. Local communities recognized to that private and public benefits of PRG could not be separated from each other, and thus value could not be logically applied to the resource. During TRIPS negotiations indigenous peoples thought that the sui generis system referred to the relationship with institutions, and not to the creation of a more definitive legal framework. They recognized that the defining of one set of rights disenfranchised them from another set of rights.

As doubts have grown about the strength of the market for agricultural genetic resources[lxxvii] and the feasibility of identifying a country of origin, there is an increasing realization that the major source of benefits of a multilateral system may involve assured conservation, better utilization of PGRFA and improved crop varieties. This approach would not preclude mechanisms more closely tied to the country of origin for other types of genetic resources.

The benefits of risk reduction and gene health that accrue to local farmers from PGRFA occur through both formal institutions of markets and informal institutions of mutual sharing and gift giving. Institutions that are local are linked to more regional seed systems, which in turn are linked to international seed systems, often through the national seed centers. The numerous levels and types of seed

system make the total system dependent on many transactions as inputs, and if each is taxed, the efficiency will be reduced.

The most important, yet least understood, level relevant to PGR is the level of the local institutions of resource users that assign rights. Their notions of what is important differs from the policy makers ideas and is summarized below.

Important to Group	Important to Resource
Degree of dependence on resource	Feasibility of improving the resource
How one user's actions affect other users	Type of cost indicators of resource quality
Discount rate of future benefits	Predictability of benefits from the resource
Trust and reciprocity	Physical geography of resource distribution
Autonomy of group management of the resource	

Findings from Indian forest management in West Bengal demonstrated that individual actors needed to have incentive to conserve and use diversity. In this case management and rehabilitation of forest was devolved to local community-based groups who were provided 70% take of the wood harvested assistance negotiating bureaucracy from local decentralized government. The trees in the forest, before severely degradaded increased in number under the new system. The Farmers' Rights systems do not provide individuals incentives, only communities.[lxxviii] Since Hardin demonstrated in 1968 the literature has suggested that even if a community has an incentive to conserve, it will not do so unless institutions are able to provide benefits only to those who participate in conservation, effectively discriminating against the free rider. IT and CBD do provide incentives to those practitioners who develop new varieties, but transactions costs eventually are passed on to individuals who demand the seed, and any benefits they may receive, minus the transaction costs, will not equal what they already gain from seed flow.

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[i] It should be noted that there are historical examples of specific governmental rules restricting the export of certain specialized and industrial breeding materials such as pepper from India, oil palm from Malaysia, coffee from Ethiopia and tea from Sri Lanka. *See*, Agricultural Crop Issues and Policies. Chapter on Proprietary rights page 289. There was, however, no recourse when PGR was taken. cite to Brazil rubber incident. See page 121 of Bossellmann

[ii] David Cooper, The international Undertaking on Plant Genetic Resources, (1993) RECIEL 2:2, p. 158-166; Harold J. Bordwin, The Legal and Political Implications of the International Undertaking on Plant Genetic Resources, 12 ECOLOGY L. Q. 1053 (1985)

[iii] James O. Odek, Bio-piracy: Creating Proprietary Rights in Plant Genetic Resources, 2 J. Intell. Prop. L. 141 (1999). It was with the advent of the "Seed Wars" in the 1980s and the negotiation of the Convention on Biological Diversity that developing countries made clear that this practice was not acceptable and that legal mechanisms to formally support this position were sought. *See,* section III. *infra*.

[iv] Jack R. Kloppenburg, Jr., First the Seed: The Political Economy of Plant Biotechnology 1492-2000 (1988) at 153-155.

[v] J.E. Penner, The "Bundle of Rights" Picture of Property, 43 UCLA L. Rev. 711 (1996); A.M. Honore, Ownership, in Oxford Essays in Jurisprudence 107, 107-28(A.G. Guest ed., 1961).

[vi] *See,* section II.C. *infra*.

[vii] 2 William Blackstone, Commentaries 2.

[viii] *See,* for example Margaret Jane Radin, Property and Personhood, 34 Stan. L. Rev. 957 (1982). Ms. Radin notes that in looking at looking at the nature and content of property rights vis-à-vis the government, even the Supreme Court has not coherent explanation of when government action becomes a "taking" under the Constitution at 1002.

[ix] Nowhere is this more evident in the largely litigation-driven evolution of intellectual property law in the field of biotechnology, see section II.B *infra*.

[x] G.Hardin, The Tragedy of the Commons, Science 162:1243-48 (1968). The "common" in the phrase "tragedy of the commons" refers to a common property resource where too many owners are endowed with the privilege to use a given resource. The resource is common to them all and no one has the right to exclude to the other. Without other forms of control, the common resource will be prone to overuse.

[xi] Roger A. Sedjo, Property Rights and the Protection of Plant Genetic Resources, in Seeds and Sovereignty, 293-314, 295.

[xii] T. Swanson, 1996 Biodiversity as Information. Ecological Economics 17:1-8; Vogel, J.H. 1994, Genes for Sale: privatization as a conservation policy. New York: Oxford University Press. Sedjo (the 1989 cite to Property Rights for Plants. Resources (97):1

[xiii] A Dictionary of Law

[xiv] In 1930 the US passed the Plant Patent Act. This was followed by the adoption of similar laws in other countries such as Germany in 1933, Austria in 1938 and the Netherlands in 1941. But these acts limited patenting to asexually produced plants. *See,* Fowler supra note X, at 99.

[xv] *See,* Busch supra note X at 66.

[xvi] Klaus Bosselmann, Plants and Politics: The International Regime Concerning Biotechnology and Biodiversity, 7 Colo. J. Int'l L. & Pol'y 111, 122 (1996).

[xvii] *See* , Fowler at note X supra (Fowler's chapters on the adoption of the US Plant Patent Act of 1930 and the Plant Variety Protection Act provide insight into the relationships between small and large seed companies, seed companies and farmers, and private and public plant breeders and how these catalyzed and influenced the development of these new property laws concerned with plant genetic resources.) laws.

[xviii] *See,* Fowler at note X supra, at 104.

[xix] *See,* section III.X infra.

[xx] Community Use of Plant Biodiversity. Laid. p, 131

[xxi] United States Patent Office, "Patent 4,237,224: Process of Producing Biologically Functional Molecular Chimeras." Washington: U.S. Patent Office, 1980.

[xxii] Two of the most common theories put forward to justify intellectual property rights are the incentive to invent theory and the incentive to invest theory (which includes the idea of providing incentive to put the invention to practical use). *See,* Fritz Machlup, An Economic Review of the Patent System. Subcomm on Patents, Trademarks, and Copyrights of the Senate Comm on the Judiciary, Study No 15, 85th Congress 2d. Sess., 36-38, 56, 58-59 (GPO, 1958). *See*, also Eisenberg supra Note X for an excellent discussion of relationship of the theoretical justifications for patent law and scientific developments.

[xxiii] In developing countries, laws are emerging governing ownership, access and benefit-sharing. These may be seen as efforts to right the imbalance between the growing assertion of proprietary rights in "improved" genetic resources in industrialized countries with the lack of mechanisms to recognize the stewardship, development and conservations of PGR in developing countries. *See,* Section II.C infra.

[xxiv] *See,* for example, Hamilton Note X supra at 647; Michael A. Heller & Rebecca S. Eisenberg, Upstream Patents and Downstream Products: A Tragedy of the Anticommons? [need cite]; John H. Barton, Patents and Antitrust: A Rethinking in Light of Patent Breadth and Sequential Innovation, 65

Antitrust L.J. 449 (1997); Melissa Sturges, Who Should Own Property Rights to the Human Genome? An Application of the Common Heritage of Mankind, 13 Am.U. Int'l L. Rev. 219 (1997); David G. Scalise and Daniel Nugent, Patenting Living Matter in the European Community, 16 Fordham Int'l L. J. 990 (1992/1993); Rebecca Eisenburg, Patents and the Progress of Science: Exclusive Rights and Experimental Use, 56 U. Chi.L. Rev. 1017 (1989); Edmund J. Sease, From Microbes, to Corn Seeds, to Oysters, to Mice: Patentability of New Life Forms, 38 Drake L. Rev. 551 (1988-1989).

[xxv] John Barton. 1997. The Impact of Contemporary Patent Law on Plant Biotechnology Research. *In*. Proc. Of the IPR III Conference. Am. Soc. Agronomy, Am. Soc. oF Horticultural Sci.. Crop Sci.Soc. Am., Washington, page…

[xxvi] See footnote X supra and accompanying text.

[xxvii] Cite to CBD

[xxviii] Bragdon, Costa Rica, 1999

[xxix] Johnathan C. Carlson, Strengthening the Property Rights Regime for Plant Genetic Resources: The Role of the World Bank, 6 Transnat'l L. & Contemp. Probs. 91 (1996). The Convention on Biological Diversity limits the right to deny access in Article 15.2 which calls upon Parties to facilitate access by other Parties to genetic resources for environmentally sound uses and to not impose restrictions that run counter to the treaty's objectives of conservation, sustainable use and the sharing of benefits. The CBD, therefore, arguably limits rather than extends the sovereign rights of Parties over genetic resources which arguably pre-existed its adoption.

[xxx] Jeremy Bentham, Theory of Legislation 111-112 (Richard Hildreth trans., Fred B. Rothman & Co. 4th ed. 1987) (1931).

[xxxi] *See*, Fowler at note X supra, at 104.

[xxxii] Royal C. Gardner, Taking the Principle of Just Compensation Abroad: Private Property Rights, National Sovereignty, and the Cost of Environmental Protection, 65 U. Cin. L. Rev. 586 (1997).

[xxxiii] Report to the United Nations Conference on Environment and Development, at 230,231,233, U.N. Doc. A/CONF.151/26/Rev.1 (vol. V) (1993).

[xxxiv] O.H. Frankel, Genetic Resources: The founding years. II. The movement's constiuent assembly. *Diversity* 9:30-32 (1986).

[xxxv] Wilkes Note X supra at 80.

[xxxvi] Insert cite to UPOV 1978. Tilford, Note X supra at 409.

[xxxvii] Insert cite to UPOV 1978. Tilford, Note X supra at 409.

[xxxviii] Pat Mooney, Seeds of the Earth – A Private or Public Resource? Ottawa: Inter Pares. 1979; *see*, Frankel Note X, supra at 40-41; Tilford Note X supra at 410.

[xxxix] As of [] , the Commission has X member countries.

[xl] Mooney, P.R. "The Law of the Seed: Another Development and plant genetic resources. Development Dialogue I-2:7-172 (1983).

[xli] Jack R. Kloppensburg, Jr. and Daniel Lee Kleinman, Plant Genetic Resources: The Common Bowl, 1, 2 in Seeds and Sovereignty.

[xlii] Tilford Note X supra at 412 (citing John Willoughby, Seed Wars, San Fran. Chron., June 2, 1991 at 14).

[xliii] Tilford Note X, supra at n 251.

[xliv] Negotiations on the revised international undertaking on plant genetic resources, in harmony with the convention on biological diversity. Report by the chairman fo the commission on enetic resources for food and agriculture. Hundred and Twentieth Session, Rome 18-23, June 2001.

[xlv] FAO Conference Resolution C4/89, 1989. [is this full cite?]

[xlvi] FAO Conference Resolution C5/89, 1989

[xlvii] *Personal communication* (the author worked with the Executive Director of UNEP during the CBD negotiating process).

[xlviii] Convention on the Conservation of Migratory Species of Wild Animals June 23, 1979, 19 I.L.M. 11 (1980) (entered into force Nov. 1, 1983).

[xlix] Convention on Wetlands of International Importance especially as Waterfowl Habitat. Geb. 2, 1971, T.I.A.S. No. 11084, 996 U.N.T.S. 245 (entered into force Dec. 21, 1975).

[l] The observations and analysis on the CBD provisions are based on the notes taken by the author during the negotiating process and from memos sent from her to the Executive Director of the United Nations Environment Programme at the end of each day of the negotiating sessions summarizing key positions and bottlenecks.

[li] Article 15.2 limits a Parties ability to limit access. See Note X supra.

[lii] *See*, Carlson Note X. Article 15 maintains the overall focus of the Convention on national action and through reference to "mutually agreed terms" and "prior informed consent" in the exchange of genetic resources it implies a negotiation between source countries and recipients for access to genetic resources, hence emphasizing a bilateral approach in this exchange.

[liii] Quote Article 16.5

[liv] The Industrial Biotechnology Association (IBA) and the Association of Biotechnology Companies (ABC) to oppose US approval of the Convention. Reginald Rhein, Biological Diversity Convention Would Limit Patent Rights, Says IBA, 12 BIOTECH. NEWSWATCH 1 (May 18, 1992). The President and CEO of Genetech G Kirk Rabe wrote to President Bush before his departure to Rio where the CBD would be signed saying "the proposed Convention runs a chance of eroding the progressing made in protecting American intellectual property rights", Hamilton (1993) Note X supra at 623 (citing Steve Usdin, Biotech Industry Played Key Role in U.S. Refusal to Sign BioConvention, DIVERSITY, vol. 8, No. 2, 1992 at 8.) President Clinton signed the treaty day before it closed for signature with the support of the biotechnology industry with the promise that it would be sent to the Senate to consider ratification with an interpretive statement alleviating their intellectual property concerns.

[lv] *See*, Note X supra.

[lvi] Cite to WTO web site with this information.

[lvii] Downes, David. 1997. Using Intellectual Property as a Tool to Protect Traditional Knowledge: Recommendations for Next Steps: CIEL Discussion Paper prepared for the Convention on Biological Diversity Workshop on Traditional Knowledge, Madrid, November 1997. Center for International Environmental Law, Washington. Discussion Draft. Page 6.

[lviii] Members do, however, retain the power to "exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect the *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment, provided that such exclusions is not made merely because the exploitation is prohibited by their law." Article 27, paragraph 2. The scope of this power, and the meaning of the terms such as "morality," have not yet been defined. *See*, S. Sterckx (ed) (1997) Biotechnology, Patents and Morality. Ashgate Publishing. Aldershot and Brookfield for thorough discussions addressing morality, *ordre public* and ethical aspects of patenting life-forms.

[lix] Two of the most notable of these are the national treatment (Article 3) and most favoured nation requirements (Article 4). For compliance with Article 27.3(b) this means Members have to ensure that: 1) nationals of other member states have the same rights as those granted to nationals of the country concerned; and 2) any advantage, favour, privilege or immunity granted to nationals of any other country has to be granted immediately and unconditionally to nationals of all other member states i.e. most-favoured-nation treatment.

[lx] Art. 53 b EPC, [3].

[lxi] Leisken report, Note X supra.

[lxii] See, Note X supra (http site to epo)

[lxiii] European Union Directive Number 98/44, Preamble, paragraph 22.

[lxiv] See, Section XXX supra.

[lxv] ibid

[lxvi] Because Article 15(3) embodies the non-retroactivity principle of law, a Contracting Party cannot claim rights under the CBD to germplasm collected prior to the CBD's entry into force and now stored in ex situ collection outside its jurisdiction.

[lxvii] Bragdon and Downes, supra Note X at 27.

[lxviii] WCMC(World Conservation Monitoring Centre) 1992. Global Biodiversity: Status of the Earth's Living Resources. London: Chapman & Hall.

[lxix] Cite to FAO State of the World from Leipzig

[lxx] See Section XXX supra.

[lxxi] Fowler

[lxxii] Fowler

[lxxiii] Laid. Biodiversity and Traditional Knowledge, 256

[lxxiv] Fowler, Germplasm flows between developing countries and CGIAR. An initial assessment.

[lxxv] Gibson, 231

[lxxvi] Louette, 2000, p. 115

[lxxvii] And the related problem of multiple sources of a particular genetic resource creating competition among source countries and thus driving prices down.

[lxxviii] Biodiversity