INTELLECTUAL PROPERTY RIGHTS:

Ultimate Control of Agricultural R&D in Asia

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Intellectual property rights (IPRs) and plant breeding have, historically, had nothing to do with each other. In Asia, and much of the South, patents were never allowed on life forms because of ethics, colonial legacies and the threat that statutory monopolies in the health and food sectors pose to peoples' basic needs. Until recently, industrialized countries also excluded living organisms from intellectual property (IP) regimes. Unlike manufactured products, biological material was considered the realm of nature and therefore regarded as a "discovery", not an invention. Besides, living organisms reproduce themselves, so the tenets of IP law would need to be bent to suit their characteristics. But with the dawn of the hybrid seed industry and, later, the biotechnology-driven life sciences industry, plant breeding has become big business and those businesses want exclusive rights to their research results.

By the mid-1900s, some industrialized countries began to offer limited forms of plant variety protection (PVP) to breeders of new crop varieties. PVP was constructed as a so-called "alternative" to patenting that would supposedly be attuned to the needs of agriculture. It guaranteed breeders a commercial monopoly on the use of their varieties while leaving loopholes open for farmers and other breeders. Since then, both those loopholes have been tightened up drastically and industry is pressuring governments to provide full scale patent rights on any form of tinkering with the very stuff of life. Today, with the breeding sector dominated by a few mega-corporations, patents on plants and livestock, and draconian restrictions on farmers, are the norm in most industrialized nations. Asia has followed a different path, but it appears increasingly likely that it will meet the same end.

1. THE GREEN REVOLUTION: LAYING THE BASIS FOR PRIVATIZATION

In Asia, the foundation for the emergence of IPRs on life was laid by the Green Revolution of the 1960s and 1970s, when a package of credit, chemicals, and, most importantly, high-input responsive semi-dwarf varieties of staple crops such as rice and wheat were introduced on the region's farms. The Green Revolution spread rapidly and far. By the early 1990s, just five of these "super varieties" accounted for 90% of the rice growing area of both peninsular Malaysia and Pakistan, nearly half the ricelands of Thailand and Burma, and around a quarter of the rice area of China and Indonesia.[1] These were the heartlands of tremendous genetic diversity of rice only a few decades ago. The "super" wheat variety called *Sonalika* has taken over half the wheat growing area in northern India and 70% in Bangladesh and Nepal.[2] Other crops followed a similar trend. Green Revolution varieties now dominate most of India's most important crops,

[1] GRAIN, internal data set compiled from numerous sources.
[2] M. Lipton and R. Longhurst, *New Seeds and Poor People*, Unwin Hyman Ltd, London, UK, 1989.

accounting for 65% of the rice area, 94% of wheat, 64% of spiked millet, 61% of great millet, 52% of maize, and 46% of finger millet.[3]

The Green Revolution engineered the framework for the private sector's entry into Asia's agricultural sector. First, it established dependency on external seeds – the basis for a private seed market. As Green Revolution seeds stormed through the rural areas, Asia lost much of its abundant crop diversity. In the Indian state of Andhra Pradesh, one study found that the incursion of the Green Revolution led to a loss of 95% of traditional rice varieties without their collection or documentation.[4] Centuries of farmer innovation were abandoned as the Green Revolution institutions – the International Agricultural Research Centers of the Consultative Group on International Agricultural Research (CGIAR), plus their national counterparts – entrenched themselves as the new "leaders" of agricultural progress. And even as the early gains of the Green Revolution did not last, most farmers, with limited access to pre-Green Revolution seeds or knowledge, remain dependent today on the off-farm breeding programs of the CG and national scientists. Not without problems. In the words of one CG scientist, Tom Mew, from the International Rice Research Institute (IRRI) in the Philippines, the new varieties spawned by the Green Revolution lead to "sharp increases in the use of fertilizers and pesticides [that are] needed to ensure bumper harvests."[5] Which means that farmers planting them need cash or, more accurately, credit. With the Green Revolution, western capitalism came deep into the countryside and traditional diversity was replaced by large-scale, cash crop farming, supported by a system of banks, pesticide merchants, middlemen, and millers. The seed industry has taken a little longer, but it is now stepping in for its piece of the pay-off.

From the Green Revolution, the creation of a private seed industry was an easy step. Still, in the eyes of most corporations, the Asian seed market is vastly under-penetrated. Asia consumes a third of the world's agricultural seed, nearly 40 million tons a year,[6] but it accounts for less than a quarter of the $32 billion annual commercial seed market, with the bulk of sales currently concentrated in Japan and China.[7] By and large, Asia's seed supply still remains the domain of farmers and the public sector. Farmers in India are responsible for at least 60% of the annual seed supply,[8] while farmers in the Philippines produce 80%. But this situation is fast changing.

"Seed companies have a 20-year timeline for rice. By then, the rice seed market will look like the corn seed market today."

Sam Dryden, Emergent Genetics, 2000 (personal communication, October 20)

The private sector stepped into Asia's seed supply in the 1980s when World Bank and US-supported seed programs and hybridization of new crops converged. F1 hybrids give high yields but they lose this advantage the following generation, so farmers have to buy new seed regularly. Hybrids now exist for maize, rice, pigeonpea, millets, sorghum, oilseed rape, sunflower and many

[3] R.C. Purohit, "The Hybrid Seeds Market in India", American Consulate General, Bombay, March 1994.
[4] A. Kothari, Agricultural Biodiversity: Luxury or necessity, *Seminar 418*, 1994
[5] "A Successful Alternative Way to Control Rice Blast", *Agriculture Magazine*, Vol IV, No 12, Manila Bulletin Publishing Corp., December 2000, p.30
[6] Clive James, "Progressing Public-Private Sector Partnerships in International Agriculture Research and Development, *ISAAA Briefs*, No. 4, ISAAA, Ithaca, p. 11.
[7] FIS/ASSINSEL, World Seed Statistics, http://www.worldseed.org/stat.htm
[8] R.C. Purohit, op cit.

vegetable crops. Markets for hybrid seed are starting to swell in many countries as in the Philippines, where the area of yellow corn planted to hybrid varieties surged from 10% in 1991 to over 60% in 1997.[9] The hybrid rice seed market is dramatically opening up across Asia, with Monsanto targeting sales in the range of US$1-2 billion per year.[10]

Table 1: Some major seed companies and their subsidiaries in Asia

TNC	Home country	Asia operators
Advanta	USA	Pacific Seeds
Aventis	France/Germany	Hybrid Rice International (India) Proagro Group (India) Nunza/Nunhems/Sunseeds Asia Sun Seeds (joint venture with China National Seed Group)
Beijing Seed Corporation	China	
Charoen Pokphand	Thailand	Chia Tai Co
China National Seed Group Corporation	China	Asia Sun Seeds (joint venture with Aventis)
Dow AgroSciences	USA	
DuPont	USA	Pioneer Hi-Bred International (USA) Southern Petrochemicals Industries Corporation (India)
Hicks, Muse, Tate & Furst/Emergent Genetics	USA	Daehnfeldt (China) Mahendra Hybrid Seeds Company (India)
Limagrain	France	Kyowa (joint venture with Mitsubishi)
Mitsubishi	Japan	Kyowa (joint venture with Limagrain) Takita Seed (Japan) Qingdao International Seed (China) Plantech Research Institute (Japan)
Monsanto	USA	Anhui An Dai Cotton Seed Technology Company (China) Ayala Agriculture Development Corporation (Philippines) Cargill Seeds International (Asia) DeKalb Genetics EID Parry (India) Hebei Ji Dai Cotton Seed Technology Company (China) Maharashtra Hybrid Seed Co. (India)
Syngenta	Switzerland	Seoul Seeds (South Korea) Syngenta's subsidiary in China: Shouguang Novartis Seeds Co (Shandong Province, China)
Seminis	Mexico	
Takii	Japan	CTT Seed (Thailand) Qingdao Huang Long Seed (China) Pahuja Takii Seed (India)

[9] *The Advantages and Disadvantages Between Modern Plant Varieties and Landraces - Panel Discussion*, data set circulated at the UPOV-WIPO-WTO Joint Regional Workshop on "The Protection of Plant Varieties Under Article 27.3(b) of the TRIPS Agreement", Bangkok, 18 and 19 March 1999.

[10] Paul Teng, Marsha Stanton, and Mike Roth, "The changing private sector investment in rice," in William G. Padolina (ed), *Plant variety protection for rice in developing countries: impacts on research and development*, limited proceedings of the workshop on "The Impact on Research and Development of *Sui Generis* Approaches to Plant Variety Protection of Rice in Developing Countries" (16-18 February 2000, IRRI, Los Baños, Philippines), International Rice Research Institute, Makati City, 2000.

Source: Pesticide Action Network Asia and the Pacific, internal files.

Hybrids are a crucial piece of the privatization puzzle, but it is primarily the advent of genetic engineering that is behind the industrial sector's surging interest in the Asian seed market and its demands for intellectual property protection. Industry analysts estimate that biotech will add 50% to the value of seed markets, making previously unprofitable markets, such as rice, profitable.[11] The potential revenue has generated huge mergers between the seed and biotech industries – so much so that the five largest seed conglomerates now control nearly 50 percent of all agbiotech patents. Capturing the value of biotech requires several major changes in the global seed market – key among them, the adoption of broad IP regimes for genetic resources.

2. THE EMERGENCE OF IPRs ON LIFE IN ASIA

A significant financial attraction of biotech is the opportunity it provides for companies to claim ownership of innovation. Whereas conventional breeding relies on natural modes of reproduction, genetic engineering violates natural processes of reproduction by transferring foreign strands of DNA from one organism to another, even across species barriers. The processes of genetic engineering as well as the genes themselves and the end product, such as a plant variety, are generally regarded as "new constructs" of human intervention and therefore intellectual property. Seed companies can use various mechanisms to protect such property, including plant variety protection, material transfer agreements, and more frequently, patents. Recently, *The Guardian* of London reported that patents are pending or have been granted on more than 500,000 genes and partial gene sequences in living organisms.[12] Since patents confer commercial monopoly rights, patent owners have power to exert high levels of control over the market.

Until recently, patents on living organisms were not recognized. This has begun to change. On January 1, 1995 the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) entered into force. TRIPS falls under the World Trade Organization (WTO) and it obliges all parties to make patents available for any invention, whether product or process, in any field of technology without discrimination by the year 2000 for developing countries and 2006 for least-developed countries. However, TRIPS Article 27.3(b) allows WTO members to exclude "plants and animals other than micro-organisms and essentially biological processes for the production of plants and animals other than biological and microbiological processes," provided that they offer patents or establish "an effective *sui generis* system" of protection for plant varieties.[13] What constitutes "an effective *sui generis* system" is not defined by WTO. This has generated considerable debate – as well as delay in the implementation of TRIPS in developing countries.

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[11] G. Traxler, "Assessing the prospects for the transfer of genetically modified crop varieties to developing countries", *AgBioForum*, Vol. 2, Numbers 3&4, 1999, pp. 198-202. http://www.agbioforum.org

[12] James Meek, "The race to buy life," *The Guardian*, Wednesday November 15, 2000. http://www.guardianunlimited.co.uk/genes/article/0,2763,397827,00.html

[13] *Sui generis* means special, unique, of its own kind.

Patents vs plant variety protection

Patents and plant variety protection (PVP) are two different forms of intellectual property rights. Like any IPR, both patents and PVP provide exclusive monopoly rights over a creation for commercial purposes over a period of time. A patent is a right granted to an inventor[14] to prevent all others from making, using, and/or selling the patented invention for 15-20 years. The criteria for a patent are novelty, inventiveness (non-obviousness), utility, and reproducibility. Although patents were designed for industrial application, with biotechnology, patent offices now grant patents on microorganisms and, in some countries, on all life forms.

PVP gives patent-like rights to plant breeders. What gets protected in this case is the genetic makeup of a specific plant variety. The criteria for protection are different: novelty, distinctness, uniformity, and stability. PVP laws can provide exemptions for breeders, allowing them to use protected varieties for further breeding, and for farmers, allowing them to save seeds from their harvest. In plant breeding, PVP is the weaker sister of patenting mainly because of these exemptions.

In Asia, the seed industry and its allies have aggressively promoted the Union for the Protection of New Varieties of Plants (UPOV) as the appropriate system of *sui generis* protection. UPOV is a small intergovernmental organization that administers common rules for the recognition and protection of PVP internationally. Most of the 46 UPOV members are industrialized countries, which currently operate the UPOV Convention of 1978 or 1991. Accession to the Union is now confined to the 1991 Act. Through successive revisions of the Convention, the rights granted to breeders have become more and more similar to those granted under the patent system. While breeders get exclusive commercial control over the reproductive material of their varieties and the right to enforce licenses, farmers planting PVP-protected varieties are prohibited from saving seeds for replanting except under highly restricted conditions. And increasingly in many countries practicing PVP, the right of the breeder extends to the farmers' harvest and the direct products of that harvest.

"Countries have a great deal of freedom in devising their own laws on genetic resources and farmers' rights and so on, *as long as the new laws do not conflict with UPOV requirements*."

Barry Greengrass, UPOV, 2000

The chart in Annex 1 shows that Asia is now fast conforming to the principles of UPOV. The speed and timing of this process has to do with the need to comply with TRIPS and provide some *sui generis* form of protection over plant varieties in countries that wish to avoid the patent route. But the deeper and more fundamental trend it's part of is the push, from industry, to privatize resources and knowledge within the restructuring of global markets. Numerous Asian countries have taken the *sui generis* option seriously and sought to guarantee their huge farming populations special features to buffer the impact of PVP. Others try to ensure that some of the royalties captured by industry will flow back into genetic conservation. Thailand, for instance, has created provisions for local communities to secure rights over local varieties, compulsory sharing of profits from PVP-protected seeds and links to biosafety law. Similar thinking has been guiding the drafting process in Bangladesh. However, the overriding trend is *not* toward a world of do-as-you-please *sui generis* systems. It is toward harmonization. This is what we now see

[14] Patents are theoretically restricted to inventions, but the United States Constitution explicitly allows patents to be granted on discoveries as well.

throughout the region. For example, India and the Philippines both started off with somewhat "progressive" PVP drafts, seeking to avoid the worst of UPOV in the implementation of TRIPS. As those drafts moved further through the legislative pipeline, nearly all those special features were deleted or watered down considerably, to the extent that these countries are about to adopt unmistakably UPOV laws. When and where that process is too slow, direct pressure through bilateral trade negotiations is steering governments to the same end. The trade agreement signed between the US and Viet Nam last year provides that Hanoi will embrace UPOV as soon as possible.[15] So does the Swiss-Vietnamese bilateral IPR agreement.[16] As does the US-Cambodia trade agreement.[17] Ditto for the latest EU-Bangladesh development cooperation package.[18] Never mind that some of these countries may not have the means of enforcing these laws to begin with.[19] Through a sophisticated mesh of global, (sub)regional and bilateral trade agreements, industrialized countries are working hard to secure the conditions that will provide strategic advantages for their firms. And to penetrate Asia's seed market, that means securing standard UPOV-type laws in all countries – until they wrench the doors open to full-scale industrial patents on life.

Sui generis in action

The Asian countries with PVP systems in place so far – and which could therefore be considered TRIPS-compliant – are China, Hong Kong, Japan, Korea, Taiwan and, at least in principle, Thailand. How are they faring in terms of the promised benefits of PVP, such as increased investment, technology transfer and improved food security? It's hard to say, given the short timeframes since implementation and the lack of studies. Japan adopted its law back in 1978 and over 7,000 varieties are now protected in the country. However, the vast majority are flowers, and foreign companies are securing more rights under the system by the year. In rice, some 600 varieties are protected, but 86% of Japan's rice fields are sown to just 20 of them. Taiwan provides PVP for 62 species, excluding rice. To date, only 22 varieties have been protected – nearly half of which are, again, flowers.[20] Korea set up its PVP system in 1998. Within the first year, 224 applications were filed, a third of them on rice. The public sector is the most active applicant so far there.[21] In 1999, China joined UPOV as part of its drive to join the WTO. The following year, 66 applications were approved. Just this year, the first foreign companies have secured Chinese PVP – all on roses.[22] Thailand adopted its PVP law in October 1999, but it has not been fully operationalized yet.

[15] *US-Vietnam Bilateral Trade Agreement*, Chapter II, "Intellectual Property Rights," signed 13 July 2000. http://usembassy.state.gov/vietnam/wwwhtiss.html

[16] Swiss Federal Institute of Intellectual Property, "Ratification of Intellectual Property Agreement", Berne, 19 May 2000. http://www.ige.ch/e/news/2000/n107.htm

[17] *Agreement between United States of America and the Kingdom of Cambodia on Trade Relations and Intellectual Property Rights Protection*, http://www.cptech.org/ip/health/c/agreements/cambodia-1994-ip.html

[18] "Cooperation Agreement between the European Community and the People's Republic of Bangladesh in Partnership and Development", *Official Journal of the European Communities*, Luxembourg, C143/9, 21 May 1999, approved by the European Parliament under Consultation Procedure on 17 January 2001.

[19] See UN Conference on Trade and Development, *The TRIPS Agreement and Developing Countries* (UNCTAD, Geneva, 1997, p. 25), for an estimate of the costs to Bangladesh. Furthermore, implementation of UPOV '91 is expected to rely on the use of molecular markers to determine essentially-derived varieties.

[20] National Taiwan University Seed Laboratory web site, http://seed.agron.ntu.edu.tw/ENG/Eindex.htm

[21] Choi Keun-Jin and Ryu Hae-Yeung, "Plant variety protection and its implications for rice in Korea" in W.G. Padolina (ed), op cit.

[22] "China Grants Foreign New Plant Species Protection Rights", *Farm China Report*, 9 February 2001. http://eng.farmchina.com/seed/MRdetail.asp?id=1268

In the next few years, enormous pressure will be placed on Asian countries to take further steps to complete the legislative processes and tighten the laws in favor of corporate breeders. This is the experience of every single country where PVP has been introduced. In Australia, the first PVP Act of 1987 contained important concessions to critics of the whole system. A number of these concessions were soon discarded and, in 1994, the Act was overhauled to conform with, and even go beyond, UPOV '91. According to one Australian academic who was involved in the process from the outset, "It may confidently be expected that, if the 1994 Act does not meet the demands of the plant breeding industry, the Act will again be suitably amended irrespective of contemporary declarations to the contrary."[23] As in all other UPOV member states, the rights for the breeders get stronger and stronger while the "privilege" left for the farmers gets weaker and weaker.

The pressure on Asian countries which adopt PVP systems based on UPOV to accede to further demands of global industry will only grow. At the multilateral level, the WTO has yet to define what is meant by an "effective" system of IPR for plant varieties under TRIPS. And in the absence of a full review of this provision, as mandated in the treaty, the decision may be left to WTO's oft-criticized dispute settlement mechanism. UPOV, which is dedicated to strengthening the rights of corporate breeders, is another actor that will continue to use all its weight to lobby Asian governments to conform to its Convention. As UPOV's former Vice Secretary-General recently put it, "Countries have a great deal of freedom in devising their own laws on genetic resources and farmers' rights and so on, *as long as the new laws do not conflict with UPOV requirements*."[24] In sum, many forces are now converging to ensure uniform intellectual property rights over farm biodiversity in Asia.

PVP on trial

The few PVP impact studies available suggest that UPOV-type systems do not live up to the promises of their proponents. For example, they do not increase the quality or diversity of plant varieties released by the private sector. In his investigations, Indian researcher Dwijen Rangnekar found no clear correlation between the introduction of PVP and an increased rate of introduction of new plant varieties.[25] He also found that when rates did increase, as with wheat in the UK, it did not lead to increased "inventive activity". Commercial varieties are genetically quite similar since they are typically based on parental lines provided by public institutions. According to Rangnekar, much of commercial breeding is directed at "cosmetic differences" to serve market strategies,[26] casting serious doubt on the claim that PVP stimulates innovation. A recent study by the International Food Policy Research Institute shows that 30 years of PVP in the US have had no effect on private sector investment in breeding, nor on yields, in wheat – the country's most important food crop.[27]

[23] David Godden, "Growing Plants, Evolving Rights: Plant Variety Rights in Australia," *Australian Agribusiness Review,* Vol. 6, Paper 3, 1998. http://www.agribusiness.asn.au/agribusinessreview/1998V6/GrowingPlantsRightsIssues.htm

[24] W.G. Padolina (ed), op cit., p.172. Emphasis in the original.

[25] Dwijen Rangnekar, *Intellectual Property Rights and Agriculture: An Analysis of the Economic Impact of Plant Breeders' Rights*, Action Aid UK, March 2000.

[26] Dwijen Rangnekar, "A Comment on the Proposed Protection of Plant Varieties and Farmers' Rights Bill, 1999", March, 2000, p.6.

[27] Julian M. Alston and Raymond J. Venner, "The Effects of the U.S. Plant Variety Protection Act on Wheat Genetic Improvement", *EPTD Discussion Paper*, Number 62, IFPRI, May 2000. http://www.ifpri.cgiar.org/divs/eptd/dp/eptdp62.htm

Jeroen van Wijk surveyed the impact of PVP systems in Latin America: "PVP may help the domestic seed industry in least-developed countries to restrict the trade in seed saved from their varieties and to increase their income. There is little evidence, however, that this additional income leads to the availability of more and better varieties for farmers."[28] More broadly, he concludes that IPR over the seed supply reduces information flows, germplasm flows, and, ultimately, competition.[29] These findings echo earlier studies conducted in the US.[30]

Although PVP is new to Asia, the Chinese government is already reporting "serious impacts on the free flow of germplasm" from the introduction of PVP such as: breeders not sharing parental lines, reduced use of exotic germplasm in breeding, and lack of attention to *in situ* conservation and farmers' knowledge.[31]

3. AN ALL-OUT ASSAULT

For industry, plant variety protection law is the anchor from which it can launch a much more aggressive assault on Asia's seed markets and farmers. Once governments accept and enact PVP, it's a short way further before they open up the patent system to plants and animals. And once that is secured, there is little standing in the way of patents on any form of biodiversity-related material or knowledge.

However, this will still take a little time. In the meanwhile, industry has alternatives to enforce its intellectual property goals – and no shortage of apologists who want us to believe that by accepting corporate monopolies on life, the public interest can still come out ahead.

Beating around the IPR bush

For industry, PVP has some limitations when compared to patenting. And Asian governments are only slowly getting the legislation in place. But, where PVP is ineffective, the private sector already has ways to enforce its own IP protection systems without the IPR laws.

➢ *Material Transfer Agreements (MTAs)*

An MTA is a contract between two or more parties specifying the conditions under which materials – say, a seed sample – are exchanged. The conditions may cover confidentiality, transfer to third parties, commercialization, and other issues. MTAs are often used when the materials in question hold commercial value and embody some form of intellectual property that

[28] Jeroen van Wijk, "How does stronger protection of intellectual property rights affect seed supply? Early evidence of impact," *Natural Resources Perspectives*, Number 13, Overseas Development Institute, November 1996. http://www.oneworld.org/odi/nrp/13.html

[29] Jeroen van Wijk and Walter Jaffé, *Intellectual Property Rights and Agriculture in Developing Countries*, University of Amsterdam, January 1996; and Jeroen van Wijk and Walter Jaffé, *The Impact of Plant Breeders' Rights in Developing Countries: Debate and experience in Argentina, Chile, Colombia, Mexico, and Uruguay*, October 1995.

[30] See L.J. Butler and B.W. Marion, *The Impacts of Patent Protection on the US Seed Industry and Public Plant Breeding*, Food Systems Research Group Monograph 16, University of Wisconsin-Madison, 1985; B.W. Marion, "Plant Breeders' Rights in the US: Update of a 1983 Study", in *Intellectual Property Rights and Agriculture in Developing Countries*, Jeroen Van Wijk and Walter Jaffé (eds), University of Amsterdam, 1996, pp 17-33; and Jack R. Kloppenburg Jr., *First The Seed: The Political Economy of Plant Biotechnology 1492-2000*, Cambridge University Press, 1988, pp. 140-151.

[31] Wang Shumin and Luo Lijun, op cit., p. 73

the provider wishes to retain exclusive control over. According to John Barton and the late Wolfgang Siebeck, legal consultants for the CGIAR, "Failure to perform what is promised [in an MTA] is a breach of contract which gives one party the right to bring action against the other party, such as suing for damages."[32] Furthermore, some MTAs define the materials, such as gene constructs, as the "technical property" of the provider, "taken to mean, without limitation, tangible property such as ... germplasm and the biological materials and derivatives thereof."[33] In this way, an MTA can provide sufficient monopoly control over intellectual *property* in a country that does not provide statutory intellectual property *rights* on plants and animals.

MTAs are thus a *de facto* form of intellectual property protection, governed by contract law, not IP law. However, Barton says that in most countries the obligations of an MTA are not recognized beyond what is permitted under the country's intellectual property law. This is changing in the US, but the relationship between contract law and IP law remains, he says, "at best fuzzy." Nevertheless, according to a 1998 survey, MTAs were used in over 60% of the cases where CGIAR centers – situated in developing countries – got permission to use privately owned technology, mainly from industrialized countries. Significantly, in 30% of the cases the centers could not specify what form of IPR was involved.[34]

➢ *Biological protection*

For the seed industry, a crucial form of IP protection can be concocted biologically. Biological IP protection refers here to the development of seeds in which the intellectual property claimed by the breeder collapses or cannot be transmitted through natural reproduction. The most widespread example of biological protection is hybridization. The yield factor of F1 hybrids deteriorates in subsequent generations, forcing farmers to buy fresh seed from the company every year or two. However, not all crops can be hybridized in an economically feasible way. With biotechnology, this is changing. Scientists have now uncovered ways to genetically engineer some of these more challenging crops, such as wheat and rice, for cytoplasmic male sterility – one of the most common and efficient ways to produce F1 hybrid seeds. To date, over 60 patents have been awarded worldwide related to hybrid seed production using genetically engineered cytoplasmic male sterility.

Another development in biological protection is Genetic Use Restriction Technology (GURT), more popularly known as "terminator" and "traitor" technologies. GURTs prevent farmers from saving seeds since the genetically engineered plants will not germinate in subsequent generations or will not express a particular trait (such as herbicide resistance) unless sprayed with specific chemicals that activate the right gene. Industry intends to use these technology protection systems to secure exclusive intellectual property control in the South, where laws and

[32] J.H. Barton, W.E. Siebeck, "Material transfer agreements in genetic resources exchanges: the case of the International Agriculture Research centers," *Issues in Genetic Resources*, No. 1, International Plant Genetic Resources Institute, Rome, May 1994.

[33] R. David Kryder, Stanley P. Kowalski and Anatole F. Krattiger, "The Intellectual and Technical Property Components of Provitamin A Rice: A Preliminary Freedom-to-Operate Review", *ISAAA Brief*s, No. 20, ISAAA, Ithaca, 2000, p. v.

[34] Joel I. Cohen, Cesar Falconi, John Komen, and Michael Blakeney, "Proprietary Biotechnology Inputs and International Agricultural Research," *ISNAR Briefing Paper*, No. 39, May 1998, p.4. http://www.cgiar.org/isnar/publications/briefing/Bp39.htm

enforcement of IPRs on plants are weak. While several major companies have insisted in public that they will not pursue the technology, a recent report by coalition of groups in Europe identified 60 patents on GURTs – 25 of them held by a single seed company, Syngenta – and reported that laboratory and field tests of plants transformed with GURTs have already taken place in the US and UK.[35]

➢ *A matter of definition?*

While Asia weighs the pros and the cons of what to do in the complex IP arena, agribusiness multinationals and research labs in the North have already built up an extensive portfolio of patents for genetically engineered plants that are waiting to be transferred to or built upon here. Some of these "inventions" may already be setting foot in Asia as patents on transgenic microorganisms or breeding methods. The WTO obliges members to provide patents on both microorganisms and microbiological processes. It also requires product-by-process protection, by which any patent on a process automatically extends to the product of that process. A quick search through the online database of the Thai Patent Office reveals over 15 patents on transgenic "microorganisms", most of them covering plants! This should not really come as a surprise, given the environment of IP law today, even if Thailand does not allow for patents on plants.

➢ *Controlling farmers through purchase agreements*

In the US and Canada, contractual agreements between seed companies and farmers are now standard practice.[36] Monsanto's Roundup Ready® Technology Agreement is the most widely known and enforced example. According to the Agreement:

- The farmer cannot save seed or any other part of the crop grown from the Monsanto seed for replanting.
- The farmer is prohibited from supplying seed to any other person.
- The farmer must pay 120 times the technology fee plus the legal fees if s/he is caught violating the agreement.[37]
- The farmer must cooperate fully with Monsanto's inspections of his/her fields.[38]

While the main purpose of these contracts is to restrict the traditional practice of farmer seed saving and sharing, they are also explicitly designed to curtail research and breeding – which society might call innovation but companies construe as unfair competition. Monsanto's contract for 2001 carries added obligations that place the burden of liability on the farmer and impose binding arbitration as the sole method of settling any disputes, with the arbitration handled by a private company selected by Monsanto.[39]

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[35] *Syngenta: Switching off farmers rights?*, ActionAid, GeneWatch UK, Berne Declaration and the Swedish Society for Nature Conservation, October 2000. http://www.actionaid.org

[36] Jeroen van Wijk, "How does...", op cit..

[37] In the US, a $25 technology fee is typically attached to a $60 bag of Monsanto's Roundup Ready® corn seed.

[38] Michael Stumo, "Down on the Farm Farmers Get the Biotech Blues," *Multinational Monitor*, Vol. 21, Nos. 1&2, January/February 2000.

[39] Eva Ann Dorris, "To sign or not to sign," *Farm Progress*, December 1, 2000.

The seed industry takes these contracts seriously and polices them without remorse. Monsanto has used private security agents and toll-free "snitch" lines to enforce the agreements. In Canada in 1997, seed companies formed a Plant Technology Alliance to "allow companies to enforce their technology position." Within a few months it resulted in 24 out-of-court settlements worth more than $170,000.[40] According to one Canadian farmer now in a court case with Monsanto, "Farmers here are calling it a reign of terror. Everyone's looking at each other and asking, 'Did my neighbor say something?'" By February 1999, Monsanto had launched an unbelievable 525 cases against farmers.[41]

Making PR out of IPR

Winning social acceptance of IPR on life is intrinsically connected with winning social acceptance of biotechnology as the path to better food and farming in Asia. Biotechnologists are trying to appease an increasingly critical public with "free deals" on otherwise patented technologies. Their message is: "No IPR, no biotech. No biotech, no progress. But we can cut deals with patent holders to ensure that the poor can access the technology." Very astutely, they are using IPR as a public relations (PR) tool.

➢ *Golden rice*

In January 2000, after ten years of research and millions of dollars in public funding, European scientists Ingo Potrykus and Peter Beyer announced that they had successfully developed a transgenic beta-carotene enhanced rice. This so-called "golden rice" was immediately hailed as proof that biotech will help the poor. But such lofty ambitions were quickly thrown into doubt when the International Service for the Acquisition of Agri-biotech Applications (ISAAA), which conducted a study for the Rockefeller Foundation and IRRI, revealed that there were some 70 patents potentially tying up the technology. Fearing the complexity and expense of patent negotiations, the researchers quickly signed the publicly-funded technology away to AstraZeneca (now Syngenta), one of the world's largest agrochemical and biotech corporations.

RAFI pointed out that the researchers' fears were not justifiable. Of the 60 countries with Vitamin A deficiency – which golden rice is supposed to address – only 25 could possibly honor any of the patents involved. And in these countries, only 11 of the patents could constrain the project locally. Seven of those are held by four transnational corporations (Syngenta, Aventis, Monsanto, and DuPont), two of which have expressed their interest to make the technology freely available to the poor. The other patents are held by public institutions.[42] Furthermore, ISAAA's study looked at patent *applications* filed through the World Intellectual Property Office, without confirming whether the patents were actually granted or not in the different countries.

ISAAA's interpretation of the MTAs involved is also questionable. According to the study, there are around 16 MTAs involved in the development of golden rice.[43] In ISAAA's view, these

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[40] Barry Wilson, "Industry forms alliance to help enforce seed rights," *Western Producer*, December 4, 1997.
[41] Rick Weiss, "Monsanto's Gene Police Raise Alarm On Farmers' Rights, Rural Tradition," *Washington Post*, February 3, 1999.
[42] RAFI, "Golden Rice and Trojan Trade Reps: A Case Study in the Public Sector's Mismanagement of Intellectual Property," *RAFI Communique*, Number 65, September/October 2000. http://www.rafi.org
[43] R. David Kryder, Stanley P. Kowalski and Anatole F. Krattiger, op cit., pp.36-37.

MTAs should not be ignored since, while not limiting in any way the IP claims involved, they bind the parties to contract law which is "more uniformly acknowledged and enforced around the world, even in countries which do not have enforceable IP laws."[44] This is an extreme interpretation of contract law that may not hold water. As stressed by John Barton, "Any real barriers are barriers from patents."[45]

Rather than fight a winnable battle against the corporations, Potrykus and Beyer "cried wolf" and allowed the IP hegemony of the rich to trample over the so-called interests of the poor to access technology. Now the IPR hurdles have simply been passed down the line. IRRI, armed with a $5 million special grant from the US government, has just received the first samples of golden rice at its headquarters in Los Baños, the Philippines, and will now develop breeding lines for national programs to work with. According to IRRI, "It will be five to eight years before golden rice will reach consumer's plates."[46] In the meantime, the pressure is on the governments of Asia to put the regulatory framework in place, including IPR laws, to facilitate the local testing and commercialization of the golden rice. Syngenta may have announced royalty-free licenses, but it also made it clear that it expects to get patent protection on the golden rice technology in developing countries.[47]

Despite all the frenzy, there is little reason to believe that small farmers will reap any benefits from golden rice. Syngenta has only agreed to make golden rice freely available to a segment of farmers – those earning less than $10,000 from it each year – and only if the rice they produce is not exported. Certainly, large farmers and seed companies will not appreciate the subsidized competition. Even IRRI's own IPR advisor says that market segmentation is a "practical problem" in areas "where there are both subsistence and large-scale farmers."[48] So who's going to take care of this "practical problem"? Syngenta? IRRI? The national research institutes? At minimum, it would seem that the whole matter of market segmentation and restrictions on exports will require someone to enforce grower's contracts on golden rice farmers. Where IPR is at stake, nothing comes – truly – for free.

➢ *Rice genome maps*

In April 2000, Monsanto made headlines around the world when it announced that it would share a "working draft" of the rice genome with the International Rice Genome Sequencing Project (IRGSP), a consortium of public institutions working together to complete a map of the rice genome. There was plenty of praise for the company's heroic act of "humanitarian science" and plenty more reason to be suspicious. This was a grand public relations ploy – and much more.

According to lawyers, Monsanto has most likely already filed patents on any sequences that it feels have commercial value.[49] And, besides, Monsanto is not giving away the working draft. It

[44] Ibid, p.32.
[45] Personal communication, January 18, 2001.
[46] Tom Hargrove, "Interview with Dr. Gurdev Khush, World Food Prize Laureate," Planet Rice, September 16, 2000. http://www.planetrice.net/newspub/story.cfm?ID=383
[47] Communication between GRAIN and Dr. Adrian Dubock of Syngenta, January 24, 2001.
[48] Personal communication with John Barton, January 18, 2001.
[49] Idem.

is *sharing* the data with the IRGSP and other public researchers according to conditions set out in an MTA.[50] Under the MTA, institutions accessing the data can only pursue non-commercial research with it and are subject to several obligations regarding any intellectual property temptations:

- The institution must regularly inform Monsanto about its attempts to secure IP.
- Monsanto gets first rights to negotiate a non-exclusive license on the IP.
- Monsanto has the right to use in its own research program any results obtained by third party researchers.[51]

These conditions place Monsanto in an excellent position to patent or negotiate licenses on genes, once the public researchers identify their functions.

Monsanto's decision to make its working draft public is really a tactical move to protect itself from competing companies such as Syngenta – which announced in January 2000 that it had completed a map of the rice genome, four years before the IRGSP expects to finish. Syngenta has already made it clear that it will restrict access to the genomic map and expects proprietary control over any research carried out with the information. According to Thomas Hargrove, a well known rice journalist, "Dr. Steven Briggs, head of genomics for Syngenta, said the company's data would be like a copyrighted newspaper article – publicly available but not free for people to use as they see fit. And if collaborators make commercial inventions, Syngenta and Myriad 'would expect to share in the benefits.' Briggs also told *The New York Times* that while the companies would not seek to patent the entire genome – the raw sequences in the genetic code – they would try to patent individual valuable genes. And he indicated that Syngenta and Myriad were well on their way to finding many of those."[52]

Seemingly oblivious to this new restriction on public research, the Chair of the CGIAR had only words of praise for Syngenta: "This has the potential to usher in a new era of food security – a world where there is less hunger, healthier and better-nourished people, and reduced poverty, especially in rice-producing areas."[53] IRRI is particularly pleased with Syngenta's token offer to *share* the information with IRRI and with "subsistence farmers", even though it is far from clear what that implies. IRRI's Director General, Ronald Cantrell, waxed lyrical about it: "The fact that you now have large multinationals at least acknowledging the need to share new technologies with the poor and neglected in the developing world must be viewed, at the very least, as an important step in the right direction. . . We hope that the Syngenta announcement will just be the first of many by private companies that will allow much greater freedom in the transfer of technologies to the developing world. But, if this is to happen, we must allow these companies some way to recover their development costs."[54]

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[50] Takuji Sasaki and Ben Burr, "Monsanto Sequence and Physical Map Contribution to the IRGSP", April 4, 2000, http://demeter.bio.bnl.gov/4april.html

[51] The agreement can be downloaded at http://www.rice-research.org

[52] Tom Hargrove, "Rice Genome Map: Science Triggers Global Controversy", Planet Rice, 31 January 2001. http://www.planetrice.net/newspub/newstory.cfm?ID=621

[53] Idem.

[54] "Map of rice genome to help developing world: Philippines experts," Asia Pulse, February 8, 2001.

4. COLLAPSE OF THE PUBLIC SECTOR

Asia's incredible agricultural heritage is a product of centuries of free exchange of seeds and knowledge. Agriculture innovation occurs through a fluid process, circulating and expanding from farmer to farmer. During the 20th century, public institutions began to assert themselves in this process, with highly mixed results. More recently, the private sector has stepped in with a very narrow agenda. Now, IPRs threaten to ruin Asia's highly successful agricultural practices. They give preferential rights to already privileged formal sector breeders and fence off the innovative process – leaving farmers on the outside.

Many in the public sector, particularly within the CG system, are resigned to this shift. Citing decreased funding, they welcome a larger role for the private sector all the while insisting that the public sector serve the small farmers that the private sector will inevitably neglect. If this means conceding to American-style IPR regimes, they reason, so be it. But the real-life problems will soon emerge.

To illustrate, a large part of plant breeding at public institutions in Asia now employs molecular techniques. Molecular markers are used to track the incorporation of interesting traits from one variety to another. The technique, known as marker-assisted selection (MAS), allows breeders to tag genes that they believe are responsible for a desired trait with markers and thereby facilitates efforts to breed these genes into commercial varieties. IRRI has already tagged 35 genes of rice with molecular markers.[55] According to IRRI, "Because of their relative simplicity, easy integration into conventional breeding, and minimal background intellectual property, marker-aided selections are expected to be strong driving forces in crop improvement in the future."[56] But MAS also makes it easier to stake claims to "proprietary" genes and thus extend the reach of IP control over genetic resources immensely.

The private sector is onto this track. On September 30, 1999, Monsanto filed a patent in 81 countries on soybeans with enhanced yield (WO0018963). That patent has already been issued in Australia (AU6277599). It covers any cultivated soybean containing certain genes or segments of DNA from "wild" or "exotic" soybeans identified through MAS. The group of genes, which is only vaguely defined, is said to be responsible for enhanced yield. Not only does the patent claim an important trait in soybean breeding, but it also gives Monsanto monopoly rights on *Glycine soja* (wild soybean), particularly PI407305 from southern China and all its progeny. Further, the patent extends to any soybean carrying the yield genes.

This aggressive intellectual property environment makes it very hard for the public sector to survive. While institutes like IRRI, which perhaps can afford the lawyers, try to draw up means of coping with all these growing threats and barriers, their defences are woefully insufficient.

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[55] Ren Wang, "Strategic Rice Research: Impossible Problems, Possible Solutions," Presentation at CGIAR International Centers Week 2000, Washington DC, 26 October 2000.

[56] Ken Fisher, Hei Leung, and Gurdev Khush, "Box 2: Molecular Breeding: Biotechnology at work for rice,"in G.J. Presley, "Agriculture Biotechnology and the Poor: Promethean Science", retrieved March 3, 2000 from the World Wide Web: http://www.cgiar.org/biotech/rep0100/contents.htm

From counter-IPR policies to cosy partnerships with the devil to their own MTAs, they are advancing right into the bottomless pit of privatization.

Public-private partnerships: the win-lose game

➢ *International Potato Center and market segmentation*

Several years ago, the International Potato Center (CIP), a CGIAR institute in Peru began negotiations with Plant Genetic Systems (PGS) of Belgium to license its proprietary Bt technology for use in transgenic potatoes. Under the initial agreement, CIP could transfer the technology to any developing country, as long as the Bt potatoes were not sold to developed countries. In the second round of negotiations, PGS insisted on market segmentation, but this time they were unwilling to give CIP freedom-to-operate in important commercial markets in the South, most notably India. Before negotiations could advance, PGS was purchased by AgrEvo. CIP returned to the table to try and negotiate then with AgrEvo, but once again the talks were interrupted when AgrEvo merged with Rhone-Poulenc to form Aventis.[57] CIP's Director-General, Wanda Collins, is frustrated by the process: "Each time we are close to negotiating an agreement the company has merged or been taken over."[58]

As CIP has learned, the private sector is preoccupied with turning a profit – it is not interested in giving up commercial markets. When it comes to potatoes, market segmentation will not provide much freedom-to-operate in Asia. Potato production in Asia is a big business, increasingly dominated by foreign seed companies and food processors. For instance, over the last couple of years, Technico, an Australian potato seed company signed a $60 million multi-year deal with global food giant Pepsi-Frito Lay for production of potato seed in Thailand and China. Technico plants have been established in China and India capable of producing 10 million and 18 million Technituber seeds per year respectively.

➢ *PhilRice and Akkadix*

Researchers need access to germplasm in order to make the step from genome mapping to functional genomics and gene discovery. The genome map of a variety of rice, for example, provides a reference from which genes of agronomic importance can be identified from a wide range of rice varieties. These genes can then be patented. The CG centers and national institutes are highly regarded in certain circles for the germplasm they hold and the breeding they conduct. In 1999, the Philippine Rice Research Institute (PhilRice) signed an agreement with Akkadix, an American seed company, to collaborate on the development of targeted traits in rice using Akkadix's Rice-Tag technology. While Akkadix gets to mine the "great rice germplasm" of PhilRice's genebank and take advantage of its rice expertise, PhilRice gets an undisclosed amount of funding and the right to use any commercial developments arising from the deal in the Philippines.[59] So can Filipino farmers look forward to improved rice varieties from the contribution of their seeds that PhilRice has made on their behalf? Not likely. Akkadix is searching for traits already found in rice varieties of the Philippines. In other words, the Akkadix deal bestows upon the Philippines' prime rice research outfit the right to use its own country's genetic resources on commercial terms that will serve Akkadix.

➢ *Xa21 rice*

In 1995, Pamela Ronald and the University of California at Davis, where she works, obtained a patent on Xa21, a gene conferring resistance to bacterial blight that she and colleagues cloned from the African rice *Oryza longistaminata*. Much of the research behind UC Davis' patent was carried out by IRRI and Asian national research

[57] Personal Communication from Marc Ghislain, Biotechnology adviser, CIP, December 15, 2000.
[58] Personal Communication with Wanda Collins, Deputy Director General for Research, CIP, October 26, 2000.
[59] Mathew Dougherty, "Akkadix and PhilRice to Cooperate on Rice Functional Genomics Research", *AgBiotech Newsletter*, No. 196, January 19, 2000. http://www.bowditchgroup.com/enews196.htm

institutes. Nevertheless, the patent for genetically engineered Xa21 rice lies solely in the hands of UC Davis and the International Laboratory for Tropical Agricultural Research, an American institution with its own patents on the transformation process. In recognition of the contribution made by Mali, where *O. longistaminata* originates, and public researchers in Asia, Ronald urged UC Davis to set up a Genetic Resources Recognition Fund, which would use royalties from the commercialization of the technology to support students from developing countries studying at UC Davis. She also pushed the University to agree to give IRRI full rights to develop cultivars using the cloned Xa21 gene and distribute them freely to developing country research institutes.[60] But the national institutes will have to work out their own agreements with UC Davis if they want to *release* varieties containing the Xa21 gene. Such agreements may not come easy. UC Davis is reportedly in consultation with Pioneer Hi-Bred, a major rice seed company in Asia. Thailand's Rice Research Institute has already decided to drop its Xa21 rice project for fear of infringing upon the UC Davis patent.[61]

➢ *ICLARM and tilapia*

The forces driving IPR in plant breeding have also impacted research in fish, particularly in the area of aquaculture (fish-farming). The UN Food and Agriculture Organization estimates that 25% of the world's fish stocks are overexploited or completely depleted and that global demand for fish will be met by a 300% increase in aquaculture by the year 2010.[62] Currently, 91% of global aquaculture occurs in the Asia-Pacific region.

In the years ahead, fish farming will largely depend on the African fish tilapia – otherwise known as the "aquatic chicken" because it is easy and cheap to farm and generally suitable for commercial markets. The value of tilapia imports into the US has surged from under $10 million in 1992 to approximately $90 million in 2000. Asia accounts for over 50% of these exports. Japan is another big importer, with much of its tilapia coming from the Philippines.[63] The booming market has perked the interest of multinational agribusiness in all sectors, including production. According to one business representative, "What was once an industry of small farmers is rapidly evolving into an aquaculture version of agribusiness; relatively large companies with multinational interests controlling an increasing share of production."[64]

But the public sector is not sitting on the sidelines. The International Center for Living Aquatic Resources Management (ICLARM), a CGIAR center, and national research institutions throughout Asia are at the forefront of tilapia breeding efforts. In 1994, with support from the Asian Development Bank, ICLARM introduced its "New Super Tilapia" and launched a joint project to distribute it throughout Asia with the International Network on Genetics in Aquaculture (INGAR). ICLARM and its INGAR partners are investigating new breeding techniques, such as marker-assisted selection, hybridization, induced polyploidy, and genetic engineering, for applications with tilapia and other farmed fish. Each step brings them further into the realm of intellectual property.

Breeding holds significant commercial potential for the private sector. INGAR shares its germplasm according to an MTA, which prevents the recipient from seeking IP on the germplasm. Yet, ICLARM's Modadugu Gupta admits that

[60] Pamela Ronald, "The Genetic Resources Recognition Fund," January 1998, http://www.agbiotechnet.com/reviews/jan98/html/ronald.htm

[61] P. Hongthong, "Ministry asked to stop GMO research," *The Nation*, Bangkok, 14 March 2000.

[62] Elliot Entis, "Policy Implications for Comercialization of Transgenic Fish," in R.S.V. Pullin, D.M. Bartley and J. Kooiman (eds.), *Towards Policies for Conservation and Sustainable Use of Aquatic Genetic Resources*, , ICLARM Conf. Proc., 1999, p.35.

[63] Kevin Fitzsimmons, *Tilapia Aquaculture in the 21st Century, Fifth International Symposium on Tilapia Aquaculture*, Manila, September 2000. http://ag.arizona.edu/azaqua/ista/announce.htm

[64] Elliot Entis, op cit., p.37.

institutions seeking IP on modifications that it makes to the material would "probably not" be covered by the MTA.[65] So far, China is the only country in Asia where an outdoor release of transgenic fish has taken place, but a commercial introduction of transgenic fish may not be far ahead.[66] The US Food and Drug Administration is currently reviewing an application from A/F Proteins for its AquaAdvantage transgenic salmon. According to the company, the fish is genetically engineered to produce high levels of growth hormone and reaches maturity in half the time of non-transgenic salmon.[67] A/F Proteins says that it has found significant interest in China for salmon and Southeast Asia for tilapia and intends to open an office in Singapore in the near future. The company already says it has global orders for 15 million genetically engineered salmon eggs.[68] Another US company, Connecticut Aquaculture, is working with researchers at the University of Connecticut to produce and breed fast growing, disease resistant transgenic tilapia. Supposedly, the fish grows at two to six times the rate of non-transgenic tilapia.[69]

If these company estimates are true and the transgenic varieties clear biosafety hurdles, they will certainly expand commercial breeding. One casualty of this transformation could be INGAR's IPR policy. According to ICLARM, "ICLARM's policy on IPR on aquatic genetic resources states that it will not normally seek intellectual property protection on any material in its collection of aquatic resources or on cells, organelles, genes, or molecular constructs isolated therefrom or from ICLARM's own breeding activities . . . However, with the entry of the private sector in to the arena of genetic improvement of aquaculture species, it remains to be seen whether the free exchange of germplasm will continue or the access will be regulated."[70]

➢ *CIMMYT and apomixis*

Apomixis is a natural method of asexual reproduction found in some plants that results in offspring that are genetically identical to the mother plant. If hybrid crops were engineered with apomixis, commercial seed producers and farmers could replant the seeds they produce without losing "hybrid vigour". Since apomixis is a double-edged sword for the seed industry – reducing the costs of seed breeding but making it much easier for farmers to save seed – public researchers worry that the industry may try to control the technology. In what's known as the Bellagio Apomixis Declaration of May 1998, leading researchers in apomixis warned that the concentration of legal rights into a small number of hands will prevent the technology from addressing the needs of resource poor farmers.[71]

At present there are at least 14 patents on apomixis technologies. The major patent holders are the USDA, Novartis, and Advanta, which owns patents through its subsidiaries Maxell Hybrids and Agripro Biosciences. The USDA is setting policy on apomixis through extensive negotiation with the American seed industry. To date it has signed confidentiality agreements with more than 20 companies concerning one of its patents (US 5,710,367).[72] Another apomixis patent holder is the International Maize and Wheat Improvement Center (CIMMYT). This CGIAR center believes it can best serve its mandate by patenting the technology. The patent, according to CIMMYT, will give it

[65] Modadugu Gupta, "Perspectives on Aquatic Genetic Resources in Asia and the Pacific," in R.S.V. Pullin, et al., op cit., p.114.
[66] Ibid., p.110.
[67] Eric Niiler, "FDA, researchers consider first transgenic fish," *Nature Biotechnology*, Vol 18, February 2000, p.143.
[68] "Frankenfish for tomorrow's dinner?", *Washington Post*, October 17 2000, retrieved from http://www.thecampaign.org/newsupdates/oct00q.htm
[69] Dr. Thomas T. Chen, "Aquaculture Biotechnology Program at the UCONN Biotechnology Center," http://www.umassd.edu/specialprograms/NRAC/publications/newsletter/newsletter17/featureB17.html
[70] Modadugu Gupta, op cit., p.107.
[71] Bicknell, R.A. and Bicknell, K.B., "Who Will Benefit from Apomixis?" *Biotechnology and Development Monitor*, No. 37, University of Amsterdam, 1999, p. 17-20, http://www.pscw.uva.nl:80/monitor/3706.htm
[72] Peter Bretting, "Apomictic Maize - A Promising Advance in Hybrid Seed Production," http://www.ars.usda.gov/misc/apomixis.htm

leverage to ensure that the technology is accessible to resource-poor farmers. In July 1999, CIMMYT negotiated a research partnership with a consortium of interested seed companies, including Pioneer Hi-Bred, Novartis, and Limagrain, and the French Institut de Recherche pour le Développement, another apomixis patent holder. Under the terms of the agreement, the companies receive a global non-exclusive license to the research from the partnership. CIMMYT also receives a global license, but it is confined to research products for "subsistence farmers". According to CIMMYT's Director-General, Timothy Reeves, the companies were reluctant to finalise a definition of "subsistence farmer" and wanted to leave it "grey" until the agreement was concluded. Reeves says that a definition was agreed upon at the last minute, describing "subsistence farmers" as those with farms where over 50% of the harvest is used on the farm.[73] Not only does the definition not encompass many resource-poor farmers, particularly tenant farmers, but it leaves a key question unresolved: will the onus be on the farmer to prove that the farm is a "subsistence farm" when companies send out their agents to police the countryside?

5. IPRs VERSUS SUSTAINABLE AGRICULTURE

Farmers constitute by far the largest sector of seed breeders in every country of Asia. It is they who generate the diversity on which the breeding industry has built its billion-dollar empire.[74] There are nearly 100,000 distinct rice accessions in IRRI's genebank, for example, the bulk of which were developed by farmers. Forty years of UPOV has also resulted in 100,000 new plant varieties[75] – however, this accounts all crops combined, not rice alone, and many of them are genetic analogues of each other. PVP and patents are purely intended to protect a small number of formal sector breeders, particularly the handful of transnational corporations that dominate the commercial market. They are disastrous for farmers.

...PVP and patents undermine farmers' rights

In a narrow sense they restrict the right of farmers to share, use and save seed from their harvests by extending the breeder's monopoly to the harvest of the farmer's crop. Under UPOV, the breeder has the "power not only over the right to produce or sell, but also . . . the power to specify how this production or sale should occur."[76] But, more broadly, PVP and patents violate the spirit of farmers' rights and set a precedent for their elimination. Farmer's rights embody the rights of farmers and farming communities to conserve, develop, use, control, and benefit from not only local biodiversity but also rural peoples' knowledge systems and technologies.[77] These rights, which cannot be protected by IPRs, form the basis of sustainable agriculture and recognize the importance of farmer innovation to global food security and well being.

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[73] Personal communication, October 26, 2000.

[74] Gaia Foundation and GRAIN, "Ten Reasons Not to Join UPOV," *Global Trade and Biodiversity in Conflict*, No. 2, London/Barcelona, May 1998. http://www.grain.org/publications/gtbc/issue2.htm

[75] UPOV, "Plant Variety Protection and the Protection of Traditional Knowledge", paper presented at the "UNCTAD Expert Meeting on Systems and National Experiences for Protecting Traditional Knowledge, Innovations and Practices", Geneva, 30 October - 1 November 2000. http://www.unctad.org/trade_env/docs/upov.pdf

[76] David Godden, "Growing Plants, Evolving Rights: Plant Variety Rights in Australia," *Australian Agribusiness Review*, Vol. 6, 1998, Paper 3, http://www.agribusiness.asn.au/agribusinessreview/1998V6/GrowingPlantsRightsIssues.htm

[77] Ignatius Wijayanto (Secretariat of Network on Farmers' Rights) and Riza Tjahjadi (PAN Indonesia), "Indonesia Advances on Farmers' Rights," December 1998.

Although some countries may be attempting to include some reference to farmers' rights and sustainable agriculture within PVP legislation, IPR is completely alien to these concepts and there is always pressure under IPR regimes to scale back the rights of farmers in favor of the rights of industry. PVP in particular reduces the inherent rights of farmers to an exemption – the farmer's "privilege" to save seed – which is extremely vulnerable to international pressure, industry tactics and arbitrary political decision-making. It is not surprising, then, that in all countries where PVP has been adopted, farmers' rights have significantly diminished over time – to the point where farmers find themselves constantly policed by industry operatives for violation of seed companies' higher rights.

...PVP and patents foster dependence on foreign companies

Transnational corporations dominate applications for PVP and patents in developing countries. At present, 97% of all patents are held by nationals of industrialized countries and 90% of all technology and product patents are held by global corporations.[78] The table below shows that over half the current biotech patents on rice are owned by a handful of mostly Western chemical conglomerates. With their economies of scale and IP leverage, transnational companies can rapidly take control of the seed industry once the IP rules are set in place. This should not be confused with foreign investment and technology transfer. Studies show that PVP and patents decrease germplasm and information flows and restrict technology transfer to fixed varieties with highly limited legal spaces for further breeding. Furthermore, they marginalize farmers from society's view of innovation while insisting that farmers pay royalties to cover the costs of R&D which they had no say in. Public research, likewise, becomes more oriented to the needs of industry, with national researchers worrying more about their accountability to terms of collaboration set by industry than their responsibilities to farmers.

Table 2: Biotech patents on rice genes, transgenic rice plants or methods to obtain them worldwide

Company/Organisation	Country	Number of patents
DuPont	US	95
Mitsui	Japan	45
Monsanto	US	36
Aventis	France-Germany	28
Syngenta	Switzerland	20
Japan Tobacco	Japan	19
Cornell Research Foundation	US	18
Mitsubishi	Japan	14
CSIRO	Australia	9
University of California	US	9
Sumitomo	Japan	8
Purdue Research Foundation	US	8
Dow Agrosciences	US	8
US Department of Agriculture	US	6
Advanced Technologies	US	5
DNA Plant Technologies	US	5
Hokko	Japan	5
Total biotech patents on rice: 609		
Top 17 patent holders: 56%		

Source: Compiled by GRAIN from Derwent Biotechnology Abstracts, July 1987 – September 2000.

[78] Human Development Report 2000, *Human Rights and Human Development*, UNDP, New York, 2000, p.84.

...PVP and patents give foreign companies control over the germplasm that has been developed by Asia's farmers

With PVP and patents, farmers end up paying royalties to access their own germplasm, which is tampered with and repackaged in the North. Certain schemes have been proposed to address this unfair arrangement, but they breach the cultural practices of most farming communities. According to a statement on TRIPS released by a global coalition of indigenous people's organizations, NGOs, and networks: "Knowledge and cultural heritage are collectively and accretionally evolved through generations. Thus, no single person can claim invention or discovery of medicinal plants, seeds or other living things. The inherent conflict between these two knowledge systems and the manner in which they are protected and used will cause further disintegration of our communal values and practices."[79] The message is clear: supporting innovation in the countryside means enhancing the space in which farmers and formal sector breeders can freely exchange and develop plant varieties and knowledge. IPR regimes do the opposite: giving transnational corporations monopolies on the collective knowledge and germplasm of Asia's farmers.[80]

...PVP and patents exacerbate the erosion of agrobiodiversity

The typical UPOV criteria for plant variety protection – distinctiveness, uniformity, stability, and novelty – encourage breeding for monoculture production systems and are irrelevant to farmers who do their own breeding to produce genetically diverse seeds. This is extremely dangerous. Chemicals or genetic engineering, which the vast majority of Asian farmers cannot afford, will be used to compensate for the crop vulnerability that can be anticipated from such DUSN-driven breeding.

Essentially, Asian countries are in the midst of choosing between two utterly different models of agricultural R&D: one that is driven by TNCs in the North, and the other that is led by farmers and the public sector. By adopting PVP and/or patent regimes for life forms they are choosing a corporate model of plant breeding and, subsequently, a re-organization of agriculture according to the interests of Northern seed TNCs, which also happen to be the world's largest pesticide and biotech TNCs. These corporations have vested interests in crop uniformity and vulnerability – not the food security of Asia or the well-being of the region's farmers.

6. PEOPLES' PERSPECTIVES

Most of the official sector in Asia gives tacit support to IPR. For those in power, it is the only way to access biotechnology from the industrialized countries, which they believe will increase agricultural production. Instead of examining alternatives, they tack on provisions to PVP bills

[79] "Indigenous Peoples' Statement on the Trade-Related Aspects of Intellectual Property Rights (TRIPs) of the WTO Agreement," signed at the United Nations, Geneva, Switzerland, on 25 July l999.

[80] In 1999, Steven Price, a plant breeder with the University of Wisconsin, sent out a survey to 187 public breeders in the US asking them about difficulties they may be having in obtaining genetic stocks from private companies. Forty-eight percent of those who responded said that they had had difficulties obtaining genetic stock from companies; 45% said it interfered with their research; and 28% said that it interfered with their ability to release new varieties (*Nature Biotechnology*, Vol 17, October 1999, p.936).

that can only delay the inevitable fall out. In general, farmers, NGOs and other concerned social actors have been marginalized from decision-making and there is a danger that many do not fully recognize the urgency of the situation or understand how IPR relates to other structural problems that they are concerned with. Nevertheless, as more farmers and those working with them face the issue, there is a growing opposition based on a shared perception of what IPRs are all about. As articulated by Leopoldo Guilaran, a rice farmer from Visayas, the Philippines, "If seeds are patented, it's like cutting off a farmer's arm since you are removing the farmer's freedom to choose seeds and preserve them."

> ***"We are the original breeders."***
>
> Bamroong Kayotha,
> Forum of the Poor, 2000

There is widespread agreement among numerous farmers' organizations, and NGOs and professionals working closely with them, that patents on life forms, including microorganisms, must be prohibited. Bamroong Kayotha, an advisor to the Forum of the Poor in Thailand, expresses what many farmers in Asia feel: "Why should we give monopoly rights to a handful of plant breeders and nothing to the millions of farmers who developed and nurtured the materials these breeders rely on? We are absolutely opposed to patents on life. Breeders should not have seed monopolies. Farmers' rights must be recognized first. We are the original breeders." Similar sentiments were put forward by the thousands of Thai farmers and citizens that participated in "The Long March Against GMOs and IPRs on Life" in September 2000: "IPRs on biodiversity grant exclusive monopolies to private individuals and firms and are thus a threat to our food security. We therefore oppose such IPRs on life, biological materials and processes."

Several coalitions and groups in Asia are pushing their governments to take a strong position regarding TRIPS. They want a thorough review of the Agreement and a broad public discussion about what IPR policies their countries should implement. The overall objective is to change TRIPS so that it prohibits patents on life forms and makes no requirement for IPR on plant varieties. The South Asia Network on Food, Ecology and Culture (SANFEC) warns that the *sui generis* option in TRIPS is a trap that will force countries to ultimately implement UPOV-type of PVP. Because what constitutes an "effective" *sui generis* system, they point out, will be "determined by industrialized countries and their corporations, and subject to trade sanctions."

Many groups argue that instead of allowing IPR on plant varieties, Asian countries should urgently establish mechanisms to protect and encourage farmers' rights and community innovation. The Indonesian Network on Farmers' Rights calls for legal frameworks to be adopted to protect "the knowledge and innovation of farming and local communities," "farmers' rights over genetic resources," and "seed exchange and cultivation technologies for sustainable agriculture." The participants of the "Long March" called upon governments and state agencies to "reorient their policies to emphasize alternative agriculture" and set up legal frameworks that "allow countries to bring cases to court when companies illicitly patent biological resources." Among other demands, SANFEC calls upon governments to "develop and enforce a code of conduct for the regulation of all so-called life-science transnational corporations, with a view to protect the rights, livelihoods and food security of their people," and to "ensure accountability of the public research institutions for the protection of the interests of the poor farmers, and for

sustainable agriculture, bio-diversity and the rights of the communities over their knowledge, technology, practice and genetic resources including all plants, plant-forms, and animals."

These positions boil down to a completely different reading of what constitutes useful agricultural R&D, and how to promote innovation, than what is imposed on Asia from Washington or Geneva. They emanate from the experiences of farmers in Asia and are rooted in a broader vision of national development that supports sustainable agriculture. IPRs emanate from the boardrooms of Japan, Europe and North America. With the onslaught of IPRs, the middle ground has disappeared and Asia's governments will have to decide which side they are on.

CONCLUSION

Even the public sector admits that agricultural research and development is at a crossroads. One path leads to the privatization of agriculture and the other path, which has been neglected, leads toward farmer-led agriculture. You cannot travel both ways when it comes to IPRs.

Governments and the formal research sector have not, for the most part, acknowledged this conflict. Many Asian countries are trying to fulfil their *sui generis* requirements under TRIPS in the hope of simultaneously attracting foreign private sector investment for domestic R&D, protecting the fate of the farmers, and providing some boost for their own public research systems. They are deluded. The investment funds they are banking on are controlled by a few transnational life science companies. PVP is one tool for these corporations to divide the market among themselves – but it is not, and never has been, a tool to organize research. Patents are what these corporations are after, and countries that see private investment as the engine for future agriculture R&D are inevitably going to be pushed into a patent regime for living organisms. Jeroen van Wijk shrewdly warned the region's rice research administrators last year that, "Asian countries are now considering introducing a [plant variety] protection system that is losing its relevance even before it is adopted. It will not take long before Asian stakeholders have to prepare themselves for the possibility of recognizing patent protection."[81]

Patent proponents keep banging on about the importance of IPR for access and innovation. But this is a smokescreen. If access was the issue, then the evidence stands against IPR: it restricts the flow of germplasm, reduces sharing between breeders, erodes genetic diversity, and, all in all, stifles research. What is actually at issue is the question of whose interests agriculture R&D should serve. IPRs are suited to the profit strategies of the global seed conglomerates that want to dominate agricultural production worldwide. The transnational seed companies are building vast industrial breeding networks in all major crops and, with their economies of scale and ownership over technology through IPR, they will shut local private and public breeders out of the commercial market. For them, IPR is simply a means for controlling the market and extracting more profit from it.

On the other hand, IPRs are entirely inadequate as an incentive for research into sustainable agriculture. By their very nature, IPRs inhibit and easily destroy innovation on farms – the centres

[81] Jeroen van Wijk, "Plant variety protection and rice breeding," in W.G. Padolina (ed), op cit., p. 151.

of research and development for sustainable agriculture. There are plenty of options for rewarding innovation that encourage pro-farmer research and development, but IPR is not one of them. These options are being articulated by farmers and organizations working with them but disregarded by governments rushing to comply with TRIPS – with severe implications for the region's long term food security.

Asian governments urgently need to wake up to the inherent threats of IPR over genetic resources, take a look at other options which would better serve the interests of their people, and start implementing a truly pro-people agricultural R&D agenda.

Annex: Status of PVP Laws & Drafts in Asia (January 2001)

BANGLADESH	
Title	The Plant Varieties Act of Bangladesh
Status	Draft. Has been approved by relevant ministries and is under public discussion.
Basis	UPOV 1978
UPOV?	Bangladesh is not member and has not formally approached UPOV. However, in early 2001, the European Union approved a development cooperation package for Bangladesh under which Dhaka must accede to UPOV (1991) by 2006.
Features	• Criteria for protection: novelty, consistency, distinctness, stability. In addition, varieties must demonstrate "immediate, direct and substantial benefit to the people of Bangladesh". Hybrids only protected if parents are available as public domain. • Country of origin of materials used to develop protected varieties shall be disclosed. • Any variety that may lead to genetic or cultural erosion shall not be protected. • Any variety developed by public institutes, or by farmers/NGOs using public funds, shall be considered common property of the people of Bangladesh and shall receive Citation of Award rather than PVP certificate. • Short duration of breeders' right (e.g. 7 years for annuals). • Strong provisions for community rights and farmers' rights, which will be supported through a Plant Variety Development Fund • Where community varieties, wild materials or indigenous varieties are used in the development of a protected variety, 25% of the revenue from its commercialisation will be redistributed. • Protection is restricted to nationals of CBD member states.
GMOs?	Can be protected by PVP subject to further legislation.
CHINA	
Title	Regulations of the Peoples Republic of China on the Protection of New Varieties of Plants (23 April 1999)
Status	In force. Eighteen genera, including rice and corn/maize, are subject to protection so far.
Basis	UPOV 1978
UPOV?	China is member (1978 Act)
Features	Conformity with UPOV. There is debate on whether to abolish, further restrict or enhance the farmers' privilege.
GMOs?	Can be patented in China. No PVP on GMOs yet.
HONG KONG SAR	
Title	Plant Varieties Protection Ordinance (CAP 490 adopted in 1997)
Status	In force
Basis	UPOV 1991
UPOV?	Hong Kong SAR is not member and has not formally approached UPOV.
Features	Essentially UPOV 91. It includes a farmers' privilege and the breeder's right does not extend to either human consumption or any non-reproductive use of the harvest.
INDIA	
Title	The Protection of Plant Varieties and Farmer's Rights Bill
Status	Draft. Undergoing parliamentary examination.
Basis	UPOV 1978 and 1991
UPOV?	India has initiated the accession procedure.
Features	• Farmers may sell the harvest of any protected variety, but not as reproductive material under commercial marketing arrangements • Foresees benefit-sharing arrangements between breeders and those, including farmers and communities, who claim to have contributed genetic material to a protected variety. The burden of proof lays with the claimant, not with the holder of the PVP certificate. • A National Gene Fund will be built up with royalty fees from plant variety right holders, national and international contributions, etc., meant to be used for benefit-sharing and compensation to farming communities, and for conservation and sustainable use of genetic resources.
GMOs?	Can be protected by PVP subject to further legislation.

INDONESIA	
Title	Plant Variety Protection Act
Status	Draft. Approved by Parliament and awaiting signature of President.
Basis	UPOV 1991
UPOV?	Indonesia has consulted UPOV on the conformity of its Act with the UPOV Convention but not formally initiated the accession procedure.
Features	Essentially UPOV 91, with farmers' privilege.
KOREA, REPUBLIC OF	
Title	Seed Industry Law (31 December 1997)
Status	In force. Twenty-seven genera, including rice, are protected so far.
Basis	UPOV 1991
UPOV?	Korea has initiated the accession procedure.
Features	Essentially UPOV 91. The extension of the breeder's right to products of the harvest (Art. 57.2) is stronger than what UPOV requires. The "farmer's privilege" is restricted to the amount of seed needed to replant the crop on the land cultivated by the corresponding farmers.
GMOs?	The PVP law will be amended to secure need for biosafety approval.
Other	Korea provides utility patent protection for asexually reproduced plant varieties and breeding methods under its Patent Law.
MALAYSIA	
Title	Plant Variety Protection Act
Status	In final stages of drafting by Attorney General. May be submitted to Parliament in the second half of 2001.
UPOV?	Malaysia has consulted UPOV on the conformity of its Act with the UPOV Convention but not formally initiated the accession procedure.
GMOs	It is expected that GMOs will be protected under both the PVP and the Patent Law.
PAKISTAN	
Title	Plant Breeders' Rights Act
Status	Draft
Basis	UPOV 1991
UPOV?	Pakistan has consulted UPOV on the conformity of its Act with the UPOV Convention, although in 2000 the government announced that it would not join UPOV.
Features	Essentially UPOV 91, with farmers' privilege.
PHILIPPINES	
Title	Philippine Plant Variety Protection Act
Status	Draft. In final stage of Senate approval. Could be enacted by mid-2001.
Basis	UPOV 1991
UPOV?	The Philippines has consulted UPOV on the conformity of its Act with the UPOV Convention but not formally initiated the accession procedure.
Features	Essentially UPOV 91. A farmer's privilege will apply to the reproduction and exchange of seeds of certain crops among certain farmers operating on their own land holdings, subject to conditions which will be defined at a later stage.
GMOs?	Can be protected by PVP subject to biosafety approval.
TAIWAN	
Title	Plant Seed Law (1988)
Status	In force. Protection is available for 62 species, excluding rice.
Basis	UPOV 1978.
UPOV?	Taiwan is not member and has not formally approached UPOV.
Features	Essentially UPOV 78.
THAILAND	
Title	Plant Varieties Protection Act, B.E. 2542 (1999)
Status	Adopted but not yet in force. National PVP Committee now being established.
Basis	UPOV 78

UPOV?	Thailand has consulted UPOV on the conformity of its Act with the UPOV Convention
Features	• Covers four kinds of plants: new varieties, local domestic varieties, general domestic varieties and wild species. Wild species need not express uniformity. General domestic plant varieties and wild species shall be protected automatically, without registration. There are special provisions for farmer's and community rights over local domestic plant varieties, which must be unique to a particular locality within the Kingdom. • Rights will be granted for 12 years in the case of registered annual species. • Revenue accruing from the procurement and use of general domestic varieties and wild species will be on a profit-sharing basis through a Plant Variety Protection Fund. The Fund will benefit local communities and government units involved in conservation, research and development of plant varieties.
VIET NAM	
Title	Decree on the Protection of New Plant Varieties (1999)
Status	Draft. Currently before Parliament.
Basis	UPOV 1991
UPOV?	Viet Nam has consulted UPOV on the conformity of its Act with the UPOV Convention but has not initiated formal accession procedures. Viet Nam has agreed to implement UPOV as part of its bilateral trade agreement with the US (2000) and to seek membership in UPOV as part of its bilateral IPR agreement with Switzerland (2000).
Features	Essentially UPOV 91

SOURCE: Compiled and adapted by GRAIN from numerous sources including: PVP drafts and laws themselves; Asia Pacific Seed Association, "PVP Asia in the Balance", *Asia Seed and Planting Material*, Vol. 7, No. 3, Bangkok, June 2000, pp. 18-19; William G, Padolina (ed), *Plant Variety Protection for Rice in Developing Countries: Impacts on Research and Development*, IRRI, Manila, 2000, pp. 65-116; Rolf Jördens, UPOV Vice Secretary-General, personal communication, 12 February 2001; government websites and national newspapers. The interpretations presented in the table are of mixed origin but can be traced back to their source.

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