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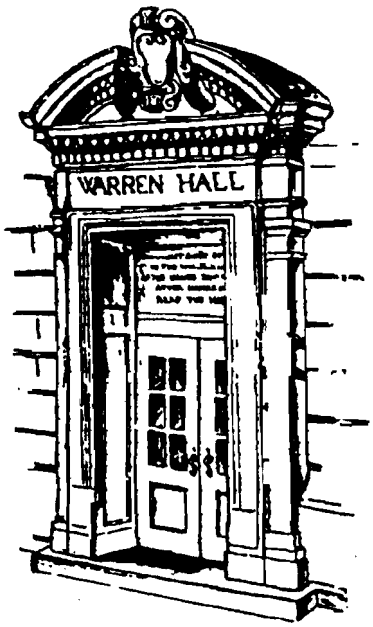

Staff Paper

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INTELLECTUAL PROPERTY PROTECTION FOR INDONESIA

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I. INTRODUCTION

With a GDP of US$ 126 billion growing at a rate of four percent annually and a population of 185 million, Indonesia is a force in world economics (1992 data; World Bank 1994, Tables 1 and 3). Its status of intellectual property rights (IPR) protection lags significantly behind. While the first modern patent laws have been traced back to the mid-15th century, Indonesia did not adopt its own national patent law, having relied for years on the Dutch system, until 1989 (Law No. 6). Plant Breeders Rights (PBR) remain unavailable, and it appears The Philippines within the region will accede to UPOV, the international PBR union, prior to Indonesia.

There is and has been an ongoing debate about whether strong IPR precede or follow economic and technical development (summarized in Lesser 1991). At the margin that is a reasonable issue, but many would agree that whatever the critical point may be, Indonesia has long passed it. Indonesia's is an advanced, sophisticated economy, and growing more so. It is time its IPR legislation reflected that level of sophistication. My comments are addressed to the considerations and requirements to meet those needs. But Indonesia remains a predominately agricultural nation, with 68 percent of the population living in non-urban areas (1992 data; World Bank 1994, Table 31). Hence my remarks are particularly related to agricultural technologies, especially biotechnologies, as well as to that emerging product from rural areas, genetic resources.

My points are organized as follows. First I review the conceptual justifications for IPR, followed by the empirical support for them. From that conclusions about the general needs in Indonesia can be derived. IPR legislation however is not general, it is specific. Issues regarding the specifics of legislation are considered in Section III. In Section IV, attention is directed to protection for genetic resources, in particular the applicability of existing forms of IPR. Finally, Section V contains an assessment of issues regarding any new legislation covering genetic resources, the term "new legislation" being but a foil for access law.

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II. NEEDS: IPR FOR TECHNOLOGIES

A. Theoretical Basis and Roles of IPR

There are two fundamental justifications for IPR systems, known as the personal property or "natural law", and economic incentive approaches. The personal property approach is based on Locke's concept of a right to property being conferred by God upon all men in common (see Thompson 1992, also Hughes 1988). This is in contradistinction to the absolute power of sovereigns. That concept though applies to common property, but what of personal property? Locke handles that matter by introducing the idea of labor, "he that mixed his labour with and joined it to something that is his own, and thereby makes it his property." Underlying is a view that a free person controls his labor, and a loss of the right to the product of that labor implies a loss of freedom. Property rights, including IPR, are thus a means of protecting freedom.

The economic incentive approach is more pragmatic, less philosophical (the classical explanation is Machlup 1958). It recognizes the inventor assumes time and other costs associated with the creation process such that she/he could never compete on equal terms with copiers whose costs, minus the creation process, are lower. Hence the creator will always be undersold and has no incentive to invest. IPR legislation redresses the balance, at least in part, by prohibiting direct copying as long as the protection is in effect.

To be more specific, the invention process has been divided into three components, discovery, development, and commercialization. The discovery process itself seems to be driven more by the creative drive, or mere luck, and hence is somewhat removed from financial incentives. Development and commercialization however are the lengthy and costly processes of turning an idea, an insight, into a marketable product. Work at these stages is very responsive to incentives and can be considered as the real target of IPR systems (Jewkes, Sauers, and Stillerman 1969, Chaps. 15 and 16). Much plant breeding activity fits this description.

Of these competing concepts, which is the operable one for current systems? An insight can be gained from the authorizing legislation in the United States. There in the Constitution (Article 1, Sec. 8, emphasis added) it states, "The Congress shall have the power . . .*To promote the progress of science and the useful arts*, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." This terminology has quite conclusively been identified as fostering economic incentives (Anderfelt 1971).

A key function of IPR is therefore providing **incentives** for investment in the creative process, and in particular the transformation of basic insights into marketable products. These incentives are most applicable to private entities but have been used increasingly by the public sector as a source for generating research funding. Certainly that has been the experience in the USA and Canada and likely elsewhere.

When considering the incentive effects, it is important to recognize what privileges IPR do and do not provide. They do not assure a return; indeed only up to 15 percent of patents are ever

commercialized (Nogues 1989). They do not necessarily permit the use/practice of the creation. That is often controlled by regulation (biosafety) or even other patents. All they allow is the right to exclude others from use, what can be called negative rights. All financial rewards come from market sales. Hence key factors such as the breadth (scope) of protection and enforcement are critical in determining the practical value of IPR.

A second, and generally less recognized, aspect of IPR is the ramifications for **access** to protected creations (see Lesser 1991, Chap. 4; Primo-Braga 1989; Gutterman 1993). Since, in the absence of IPR or of effective enforcement, it is often difficult or impossible to prevent copying, creators may choose secrecy as an alternative mechanism. This may mean creations are unavailable in IPR-deficient countries, available only following substantial delays, or are available to only say large farms which are more cost-efficient to monitor. Those entities for which access is denied or delayed are at a potential commercial disadvantage, something which could be quite critical in the highly competitive food sector. Indeed, there is a current trend for new bioengineered foods to internalize the entire production and distribution process to the exclusion of independent producers and suppliers. Calgene, owner of the FlavrSavr tomato, for example, is said to be producing exclusively under contract or using its own facilities. No open sale of seed is permitted. Access also implies access to regulatory dossiers submitted elsewhere in the world. The cost and time delay of recreating those data, often in the millions of dollars for both bio and food safety, should be counted as a cost of the absence of patent protection.

IPR has an additional role in the maintaining of export markets access, for non-protected products can be barred access. Within this context it should be noted that IPR law is strictly territorial; it applies only where available and obtained. Hence if a rice variety were protected in Indonesia but not Thailand, it would be legal to use it without permission in Thailand, but possibly not export into Indonesia.

In agriculture it is difficult to predict how significant the access issue will be. Certainly self-reproducible living organisms are largely non-controllable once released anywhere in the world. Seeds can easily be picked up and transported into and from anywhere so that it is impractical to deny access altogether. On the other hand, private investors would understandably be unwilling to release a variety where little in payments could be expected, and with some possibility that illegal sales will enter the home market.

What would likely be done is to delay availability as long as possible. Even a slight delay in access to a major cost saving or quality enhancing innovation could have significant implications for producers and consumers. Countries for their part have been reluctant to pass strong IPR for a number of reasons, but as applies to agriculture the principal economic reasons are the lack of national inventive infrastructure and the cost of royalties of what might otherwise be acquired free. In times past, countries would at minimum have had to make an economic policy decision between the cost of royalties vs. the cost of delayed access, not an easy task in the controversial

IPR environment. Now due to TRIPs the basic commitment has already been made, as will be described in more detail below.

B. Forms of IPR

Next it is important to understand in more detail what is known about the operation of the several key forms of IPR. That is done at the conceptual level in this subsection, followed by a review of the literature of the practical effects.

Patents: Patents, like other forms of IPR, operate as a balance between the inventor and society. Society grants a temporary, partial monopoly to the inventor. Temporary refers to the duration of protection, generally about 20 years, while partial describes the scope of protection. The degree of difference required before a related development is not covered by the patent determines in part the scope of the monopoly power. What society receives in exchange is more investment than it is expected would otherwise occur and the revealing (disclosure) of the invention. Disclosure "in such full, clear and concise and exact terms as to enable any person skilled in the art or science to which it appertains . . . to make, construct, compound or use it" is a typical patentability requirement. When a written description for living matter is judged insufficient, a deposit may be required (Straus and Moufang 1990). Disclosure not only permits competition soon after a patent lapses but also provides a storehouse of technical knowledge which would not otherwise exist.

An additional patentability requirement is novelty — the invention must not be previously known. Finally, and perhaps best known, the invention must not be an obvious extension of what already exists. This is known as the nonobviousness or inventive step requirement. Hence it is not possible to patent anything; the requirements are specific and exacting. Moreover, there must be human intervention in the inventive process. The mere identification of something existing in nature (technically known as discovery as opposed to patentable inventions) would not be sufficient for a patent. Examples of human intervention are the purification of a strain of microbes, or the identification of an especially rare rose mutant.

It should be further noted that, to identify a specific hypothetical case, a patent would not apply to all rice. Rather, the application would apply to rice with certain characteristics, such as the built-in insecticide *Bacillus thuringiensis*. Recently, Agracetis in the USA has received much negative publicity for a patent grant covering the genetic transformation of cotton (subsequently revoked). Technically, that is known as a product-by-process patent, while what is described here in the example is a straight product patent.

Plant Breeders' Rights: Plant Breeders' Rights (PBR) is a specialized patent-like system for cultivated plants. PBR were first systematized in 1961 under the International Union for the Protection of New Varieties of Plants (UPOV). Presently there are 27 members, including Australia, Japan, and New Zealand. In total only three developing countries are members of UPOV (South Africa, Argentina and Uruguay). Membership is pending for two (Chile and

Colombia), while others (minimally Kenya and Peru) have national laws but the degree of their implementation is not always known. Membership, among other steps, requires that signatories adopt national legislation along the lines of the Convention.

In place of the novelty, nonobviousness, and utility requirements of patent law, PBR uses distinctness, uniformity, and stability (DUS). Uniformity and stability are measures of reproducibility true-to-form, respectively among specimens within a planting and intergenerationally. The principal test then is distinctness, that the variety be "clearly distinguishable from all" known varieties. The DUS attributes are (excepting the USA) generally measured in growouts of the planting materials.

PBR are further distinguishable from patents by the allowance of so-called "farmers' privilege" and "research exemption", sometimes called "breeders' privilege". The farmers' privilege is the right to hold materials as a seed source for subsequent seasons (farmer-saved seed or bin competition), something which would generally be an infringement with patented materials. The research exemption refers to the right to use protected materials as the basis for developing a new variety or other research use. Research or experimentation under patents is not as well defined but is generally believed to be fairly broad.

Because of these differences, PBR are generally considered to provide less protection than patents. They also apply to the whole plant or the propagating materials thereof. What they do not protect is the unique characteristic (the distinguishing characteristic) of the variety. For that reason, no real protection is provided for a variety with a bioengineered gene which legally can be removed and used in another variety or with another distinguishing attribute added. Two Acts of UPOV are presently open, 1978 and 1991. The distinctions between these and their relevence for Indonesia is discussed in the following Section III.

Trade Secrets: Trade secrets, to describe them in their simplest terms, assist in the maintenance of secrets by imposing penalties (the recovering of costs) when information held as secret is improperly acquired or used. Examples of trade secrets include customer lists and practices for improving the efficiency of a breeding process. An employee going to work for a competitor typically would be enjoined from revealing sensitive information for a specified period. Unlike patents and the like, no formal application procedure is needed for a trade secret; rather the information must have some commercial value, and an effort made to keep it secret. As long as these conditions are met, protection can be permanent. For a description of the law and its application in the USA see Coe (1994).

Within agriculture, F-1 hybrids may be considered a form of trade secrets. As long as the crosses and/or the pure lines are protected, the product is difficult to copy. However, the self reproducible nature of most living organisms precludes a major role for agricultural products. In other technological areas, trade secrets may substitute for or complement patents and PBR. When a product or process is difficult to copy, then trade secrets can be a substitute.

Trademarks: Trademarks are the reservation of a word or symbol in association with a product or service. In effect the trademark name represents the product to consumers, justifying an investment in its identification. From a theoretical, economic perspective, trademarks assist customers in identifying products of consistent (and often high) quality. Trademarks are permanent as long as they remain in use, are identified as such, and do not acquire a generic connotation. Often a trademark like CocaCola is the most valuable asset of a corporation.

Within agriculture, trademarks can be associated with products at the firm level (Pioneer Hi-Bred), or individual products like the FlavrSavr tomato. Note that the tomato variety is also patented, so the two forms of IPR are in that instance complementary. At the plant variety level, the role, however, could be more of a substitute than a complement. Indeed, because of the farmers' privilege and research exemption under PBR, I (Lesser 1987) have previously argued that in the US, the PBR law really protects the variety name rather than the germplasm itself. Hence there is a degree of substitutability between trademarks and PBR. The same would not apply to patents because of the emphasis there on identified novel characteristics rather than the entire plant.

C. Evidence on the Implications of IPR for Plants

As was discussed above, IPR are primarily a form of economic policy intended to advance the production and use of new products and technologies. That, however, is but the promise. This subsection explores the available information on what is known about the practical results of the legislation in the areas of investment and access. The available information is anything but complete, but it is all that is presently available for planning purposes.

Investment (R&D): Since a (the) major justification for IPR is the attraction of funds for research and development, it is a reasonable question to inquire about the evidence indicating actual experiences (this material is drawn principally from Lesser 1991). For patents covering all technologies what is known is inconclusive. The analytical complication is largely methodological, attempting to determine what would have happened in the absence of the legislation. Additionally, for many technologies, other forms of protection can serve as at least a partial substitute for patents. Indeed, surveys of business leaders typically place a low ranking on patents as a stimulant for R&D investment (Nogues 1990, pp. 11-14).

When specific sectors are examined the results become more definitive. In general it is recognized that patent protection is especially important for pharmaceutical products and for living organisms. Both are relatively expensive to develop and easy to copy. A major cost is that of satisfying regulatory requirements. For pharmaceuticals in the US, human trials are said to use the bulk of the $250 million per product development cost, and the preparation of a food safety dossier for a genetically engineered food costs, in round numbers, $1 million. One source of information on the role of patents is the implications of the **removal** of protection. In India, pharmaceutical R&D fell 40 percent from 1964-70 to 1980-81, something Deolalikar and Evenson (1990, p. 237) attribute to the weakening of patent protection in 1970.

An ancillary point, and one particularly relevant to agricultural applications, is that of adaptive research. Deolalikar and Evenson (1990, p. 251), again referring to the case of India, conclude, "If anything, the relationship that is often observed is one of complementarity." In Evenson's view (1988, p. 152), "Indirect transfer does not take place without research capacity in the destination country."

A number of more formal economic studies have been conducted on aspects of the patent system, such components as optimal duration and the consequence of the "winner take all" approach (review in Primo-Braga 1990). Overall, as might be expected, these issues are very sector specific and general studies lead to inconclusive results with limited policy implications. However indications are that patenting and R&D are not dominated by major firms. Rather, medium sized entrepreneurial firms which are dependent on technological advantages for their market position are the market leaders.

Overall, PBR are relatively much more recent and sector specific than patents, which eases the methodological problems in evaluating the impacts. The major study was conducted in the USA in 1980, a decade into the Plant Variety Protection Act (Butler and Marion 1985). When considering the results, it should be recognized that the USA interpretation of not requiring objective standards for performance claims means the scope of protection there is relatively narrow (see Lesser 1987).

Despite these caveats, it was found that PBR did have a significant impact on private investment and numbers of private breeders, especially for soybeans. Those results have been confirmed by other observers (e.g., Brim 1987, Tables 3 and 5). Butler and Marion (1985) added the recommendation that continued public breeding is an important hedge against domination by the private sector.

More recently for the USA, there are some suggestions that the initial investments by the private sector were over responses, that the actual profits are insufficient to maintain the current investments. The premium for certificates for soybeans in New York State was placed at only 2.3 percent (Lesser 1994) and is consistent with that position. Moreover some companies including Stine Seed Company have not been pursuing PBR in favor of sales agreements. At typical agreement would read in part, "Purchaser hereby acknowledges that the production from the Stine Brand Seeds herein sold . . . will not be used or sold for seed, breeding or any variety improvement purposes." The level of enforceability of these provisions is not known.

Recently, limited information has begun to appear on the operation of PBR in other countries. A graphic plot of new variety registrations in South Africa indicates a notable increase following the adoption of PBR in 1976 (van der Walt 1994, Table 1). Similarly, the Argentine private sector increased their investments in plant breeding, a provisional study shows, but only after the law was enforced (Jaffé and van Wijk 1995; van Wijk 1995). Hence the available information is consistent with the theoretical expectations that increased IPR does indeed lead to greater investment, especially for easily copied products like open pollinated plants. The more relevant,

and difficult, question for exportation is the implications for trade.

Trade: The conclusion that PBR leads to greater internal investment in breeding expenditures leaves some ambiguity regarding its effects on trade. Trade conceivably could be enhanced, supplanted by recipient country investments or remain unaffected. Many of these are long term issues for which a few countries are just approaching the initial stages. Nonetheless there are some bits of information which do suggest that the presence of PBR does indeed enhance trade. Much of that information can be viewed from the perspective of access as discussed above.

A strong motivation for the recent (1990) adoption of PBR by Canada was access to improved, protected potato varieties from Holland. As well, within Canada there was a reluctance to export varieties to the USA because of the concern that they would be transported back into Canada (Cooper 1984, p. 47). Similarly, cut flower producers experiencing difficulties with accessing new varieties were major proponents of the Colombian national law and subsequent application for succession to UPOV. Uruguay adopted PBR largely to prevent trade disruptions with Argentina, to which its economy is closely tied (Jaffè and van Wijk 1995, p. 20). A different perspective can be gained by examining the percentage of certificated granted to foreign firms, recalling that PBR applies only when national protection has been granted. Foreign ownership ranges from three percent in Japan to 20 percent in Argentina to 80 percent in Belgium. In general the expectation is that the percentage rises under PBR, which is an indirect means of saying that trade increases.

D. Trade-Related Aspects of Intellectual Property Rights

The recently-completed Uruguay Round of GATT for the first time included IPR as a component of trade negotiations. The position taken by the developed countries, the initiators of this inclusion, seems to be a recognition of their evolution away from the exportation of products to the exporting of technologies. And, following their logic, technology must be accorded legal protection as it is easily copied. Without that protection, the owners face loss making then unwilling to export, thereby creating a trade barrier. The result was TRIPs, for Trade-Related Aspects of Intellectual Property Rights.

The TRIPs agreement requires signature states, including, with Indonesia, some 70 developing countries, to provide for the following protection (MTN/FA II-A1C):

- Contracting parties shall provide for the protection of plant varieties by patents and/or by an effective *sui generis* system (Section 5, Article 27(3b).
- Patents may be prohibited to protect *ordre public* or morality, provided there is a justification exceeding the mere prohibition in domestic law (Section 5, Article 27(2)).
- Plants and animals other than micro-organisms and "essentially biological processes for the production of plants and animals" may be excluded from protection (Section 5, Article 27(3b)).
- Compulsory licenses may be issued in limited cases of due diligence to make a

licensing agreement, adequate remuneration, and subject to judicial review (Section 5, Articles 30 and 31).

- For process patents, the burden of proof of infringement may in some specified circumstances be shifted to the defendant to prove that the patented process was not used (Section 5, Article 34).
- Persons shall have the option of preventing others from using without permission information of commercial value so long as reasonable efforts have been made to keep it secret (Section 7, Article 39).

Even with this legislation, restrictions will remain, for example, the five years (and up to 10 years depending on product and level of development of country, with further delays possible on approval) allowed for developing countries to adopt and implement the changes (Part VI, Articles 65 and 66). Indonesia presently excludes patents for "a new type or variety of plant or animal" as well as the process of their production (Article 7(c)). In this respect, Indonesia is in broad company; as of 1988, 44 national patent laws prohibited patenting plant varieties, but only three of these laws are from the Asia-Pacific region (China, Thailand and Sri Lanka) (WIPO 1990, Annex II). Process patents for the production of food or drinks are excluded (Article 7(b)). Additionally, note that countries may exclude patents which are contrary to "'*ordre public*' or morality", which Indonesia presently does (Article 7(a)). In these regards then, little change other than technical adjustments like duration of protection would seem to be required for Indonesia. Other than that is the adoption of some appropriate form of PBR. A committee is, I have been told, working on this, but no application is expected in the near future.

IPR, as with all laws, is only as effective as its enforcement. Yet this involves complex legal and technical matters. TRIPs does have mandates that the enforcement of laws be "fair and equitable" (Section III). Presently little systematic information exists on the status of enforcement in many countries. The US Trade Representative's Office has conducted a survey of firms in this regard, reporting that 54 countries were identified as having inadequate protection of patent rights; unreasonably slow enforcement and politically-motivated decisions being the most common complaints. Within the Asia and Pacific region, Japan, Korea, and Taiwan were most frequently cited (1988 report quoted in Gutterman 1993, p. 102). Whether Indonesia's exclusion from that list reflects the quality of its judicial process on only the fact that it is not as large a trading partner with the USA as are those identified is not clear at this time.

On the point of compulsory licenses I was quite critical in my earlier review of the Indonesian situation (Lesser and Coffman 1992). This I reserve presently for more detailed consideration in Section III following.

III. FORMS OF IPR LEGISLATION

In the preceding section it was concluded that Indonesia's current patent law appears to meet in substantiation matters the TRIPs commitments as regards patentable subject matter and enforceability, the latter conclusion a provisional one. The remaining issues then are a *sui generis* system for plants and the matter of compulsory licenses.

A. Plant Breeders' Rights

Sui generis, as required under *TRIPs,* means separate or independent, as in a distinct form of legal protection. This is widely interpreted to mean Plant Breeders' Rights as in one of the UPOV conventions. That is, UPOV membership, although no specific interpretation has to date been issued, would in all likelihood satisfy the commitment. Equally likely, acceding to either of the two currently open Acts, 1978 and 1991, would suffice. However, with the 1978 convention to close at the end of the year, any country not already far advanced in the process will have only the option of the 1991 convention. Indonesia, according to the information available to me, is in that position, so that it is important to consider the particulars of the 1991 Act.

The 1991 text incorporates several major changes compared to 1978. It allows for protecting, in addition to the entire plant, harvested materials and products made directly from harvested materials (subject to national ratification) (Article 14(2) and 14(3)). Hence, the importation of cut flowers or soybean meal produced from unauthorized planting materials could be barred, according to my interpretation. Additionally, all genera and species must be allowed protection within a ten year period. The 1991 text, finally, allows (but does not require) countries to restrict the farmers' privilege (seed saving). To date, the USA will not do so, but the European Union is proposing limits on larger farm operations.

Most significantly, the 1991 UPOV text in Article 14(5) allows for dependency. While experimental use remains unrestricted, a variety determined to be dependent on an "initial variety" can not be commercialized without the permission of the owner of the initial variety. To be dependent, a variety must be "predominately derived", which may be obtained by selection, back crossing, genetic transformation, or other specifically-identified procedures. The actual interpretation of these general concepts is, and likely will remain, unclear until there have been some actual cases (see Rasmussen 1990).

The industry would as well become involved in the implementation of "essential derivation" (Article 14(5)). The intent of the concept is the establishment of two categories of protection, one for major innovations and one for routine generational improvements. Absent the provision for derivation, there is no economic incentive for the lengthy process of background or development breeding; the market value would last only until another breeder added a further distinct feature. Dependence would change this by requiring permission of the owner of the initial variety before derived varieties could be marketed. Furthermore, dependence would not be pyramiding; if A is the initial variety and B derived from it, C from B and so on. Permission, usually secured by the payment of royalties, would always be required from A only. Moreover, if

B was created by the insertion of genetically altered genes into A, B would still be dependent. Much of the practical significance of all this is the standards required to qualify as an initial variety.

Operationally, many knowledgeable observers consider this to be a highly complex legal and technical matter (Hunter 1992). Consider for example the phrase "predominately derived" (Article 14(5.b.i)). One proposed approach is to use genetic finger printing or other scientific process to measure in a literal sense the proportion of identical genetic matter. To me this is problematic because of the close genetic similarity across species, let alone between similar varieties. Moreover, the tests will be counting, numerically, much "junk" DNA which serves no known purpose. And, from a policy perspective, that approach grants the owner of the initial variety some legal control over genetic materials he/she may have appropriated from the public domain. How this all will evolve into a workable system is not known at this time, but the current proposals are for the industry to administer and interpret these aspects, not the national PBR office.

The other option for countries is the adoption of a national PBR law, as presently exists in several countries. There would be two major considerations in planning such a step. First, TRIPs reads "an effective" *sui generis* system. Just who will be interpreting what constitutes "effective" and on what grounds is not clear at this time. Joining UPOV would be the safe approach. Second would be a national law closely following the UPOV text. Third, and problematic, would be establishing new legal precedents in PBR.

A matter for those considering a national law is the forgoing of the benefits of UPOV membership. One of the more significant is the relatively straightforward understanding of what the law allows, based on experiences of multiple other countries. Such a textural reading of course begs the question of the degree and efficiency of enforcement. The experience in Argentina, for example, was that nothing happened under the law until an enforcement mechanism was implemented (Jaffè and van Wijk 1995). More significant yet is the concept of national treatment, in short the prohibition of discrimination against non-nationals (Article 4).

B. Patents

While it has been determined Indonesia is not required under TRIPs to provide patents for plants (or animals), it may wish to consider where its national interests lie in this regard. Applications would largely apply to bioengineered plants which are now entering international markets, as well as being a specific thrust of AARD. Patents are a critical factor for access of these products. Presently Brazil, one of the largest agricultural countries worldwide, is experiencing difficulties in accessing genetically engineered plants due to limited patent protection.

PBR will not suffice to provide protection for genetically engineered traits for reasons which can readily be explained. Under UPOV 1978 text, any variety which is distinct in one (recognized) characteristic can receive protection. Thus, if a rice variety bioengineered for pest or disease

resistance had improved yield added by a different firm, the improved variety, resistance and all, would be owned by the second firm. The dependence stipulation in the UPOV 1991 Convention text would allow more ownership control by the biotechnology firm. If the disease resistant variety were accorded "initial variety" status, derivative varieties could not be commercialized without permission. However, nothing would prevent a firm from removing the responsible genes for transfer to another distinct variety. A combination of 1991 UPOV **and** patents on the genes themselves would provide sufficient control.

Hence, Indonesia may wish to consider the allowance of plant patents, or rely on a combination of PBR and gene patents. The patent law does not, to my reading, exclude gene patents, but a more authoritative opinion is needed.

C. Compulsory Licenses and Annulment

A patent may be canceled based on nonworking or use within 48 months of grant, working not to include importation of the patented product (Articles 94, 18 and 20). A compulsory license may be requested within 36 months of issue on showing of need and capacity, and with the payment of a royalty (Articles 82, 83 and 85). The decisions are to be made by the District Court. These conditions are as allowed by the Paris Convention (Article 5(A)).

These conditions would seem to meet two of the three conditions acceptable under TRIPs, judicial review and remuneration. Questionable is if the court would require the showing of a sincere effort to establish a license agreement with the patent owner. With that stipulation, Indonesia's current patent law would seem to satisfy TRIPs. I would again, though, raise the issue if that will accomplish Indonesia's objectives of incentives. Is four years sufficient to establish domestic production? Is it appropriate every product be produced domestically, as the license conditions clearly favor, or will market forces determine the best arrangement without the complexity and uncertainty of judicial review? There are no absolute answers to these questions, but they should be raised periodically.

IV. NEEDS: GENETIC RESOURCES

Indonesia is one of the richest countries in genetic resources, particularly marine resources. For millennia those resources were treated as the "common heritage of mankind", as much a world resource as an Indonesian one. Then in 1992 the Convention on Biological Diversity in Article 3 claimed the use of those resources to be the sovereign right of the country where they occur. Such rights, however, are not automatic but require specific legislation. The Philippines has adopted such a law, the Andean nations are in the process, but Indonesia to my knowledge is only at the initial stages. The purpose of this subsection is the review of the possibility of extending initial legislation to this new area. Subsection A considers traditional IPR law; Subsection B newer forms.

Presently Indonesia appears to have, under Law No. 12 of 1992, Sec. 17, authority to control the removal of plant genetic resources. That interpretation should be checked with the proper authorities. What is lacking, and the subject of this section, is the means to claim payments for authorized uses.

A. Applicability of Traditional IPR to Genetic Resources

Patents: Patents may be sought for genetic resources in the form of the entire organism (micro-organism, plant) or parts thereof, such as a gene complex, provided there is some human input. In general, the patenting of genes (except human genes) is not a legal problem; indeed, it is not entirely clear they would be treated as living organisms. Similarly, many countries allow patents for micro-organisms, and TRIPs specifies that micro-organisms may not be excluded from patent protection (see Section II). Seeds/plants are a more complex matter, and animals yet more so.

Seeds are patentable subject matter in the USA and provisionally elsewhere. There is no inherent reason why genetic materials of agricultural, pharmaceutical, and other uses would not likewise be patentable, at least in concept. The fact that the materials are identified in the wild rather than purposely invented is itself not a legal hindrance. Precedence has been established with patenting micro-organisms identified in the wild as long as the application is in a "culturally pure" form to reflect human intervention (see Bent et al. 1987). Indeed, what is really being protected is the human knowledge of how the organism is to be used. The other patent requirements must be fulfilled as well. Thus there is nothing fundamental which prevents the patenting of these materials where seeds and plants in general are patentable. Much the same conclusions can be reached for animals, although the technical issues are often more complex.

The hindrance is rather a practical matter. Patents are not granted for a plant in its entirety, but for a plant (or other product) with unique characteristics, as specified in the patent claims (US Dept. of Commerce 1983). For plants in the past, those attributes have been elevated tryptophane levels, herbicide resistance, and the like among agricultural applications, attributes introduced/induced through technological procedures. It is likely some landraces have such unique attributes — one traditional potato variety, for example, has hairy leaves which aid in aphid (and hence virus) resistance — but certainly not all. For pharmaceutical and industrial applications, generally a genetic sequence is identified and removed from the source organism. Identifying and characterizing such traits at the level required by patent offices is a significant task, certainly beyond the means of local communities and, given the particular requirements of patent applications, exceeding the expertise in many countries. A final consideration is the cost of preparing an application, about $US 20,000 for a US application and twice that in Europe (due to translation charges) (Abbott 1993). Proposals have been made for some kind of international fund and/or ombudsman role to assist with application costs (UNDP 1994); Gupta is attempting to implement the approach for India. However, while it may be possible to locate funding for processing some patent applications, that procedure would not be feasible for large numbers of materials which had not been carefully screened, implying a very low probability of commercializable products (see Weiss 1995; Principe 1988). Thus patents are not practical for protecting genetic materials in bulk, although they may be used in certain cases, where permitted.

Another category of patents with some useful attributes is petty patents (alternatively called utility models). Petty patents are, in effect, a weaker form of patent for more modest inventions. They are distinct because the duration is typically up to 10 years as opposed to around 20, and the standard for the invention (the inventive step requirement) is typically lower. Thus applying for and receiving a petty patent is generally less expensive than applying for a full patent, although the royalty rate would, as a result, be expected to be lower as well. The Japanese system has the added option of switching from a petty to a regular patent application. That provides additional flexibility. Studies of petty patent systems indicate that they are effective in encouraging investment at the local level in developing countries (Evenson, Evenson and Putnam 1987).

The principal limitation with petty patents is that they are usually designed for and specifically limited to manufacturing products. The Japanese utility model law for example reads, "shape or construction of articles or combination of articles so as to contribute to the development of industry" (Law No. 123, 1959, Section I.1). For developing countries, a plow design would be an example. Kenya is an example of an innovative system where petty patents have recently been allowed for traditional medicinal knowledge (Gollin 1993). That system should be studied for possible application elsewhere.

Plant Breeders' Rights: Plant Breeders' Rights as embodied in UPOV are a form of patent-like protection expressly for plants (see Section II). PBR are relatively easy and inexpensive to apply for, costing about one tenth the amount of a patent (Plowman 1993). Varieties discovered in the wild are protectable with PBR, although some breeding would typically be required to satisfy the homogeneity and stability requirements (Straus 1988; Juma and Ojwang 1989). Hence, PBR would seem to apply to many of the needs of protecting genetic materials in agriculture. UPOV is not intended to protect plants in general as is made evident from the list of genera to be protected under the 1961 Act (Article 4(3)). For example, it would not generally be applicable to wild plants used for pharmaceutical purposes.

Where PBR fail even for agricultural uses, or would seem to fail, is in not providing remuneration under either the 1978 (and earlier) Act or the 1991 version which introduces "dependence" (see Section III). Under the earlier versions, a variety which is bred from a protected variety is not infringing (owes no royalties) as long as the new variety is distinct according to the UPOV interpretation. If the protected variety is a landrace which is used (as is permitted under the research exemption) in a breeding program — a general case because landraces seldom are acceptable for commercial-type farming operations — the resultant new variety or varieties would get the sales with no payments owing to the owner of the landrace.

The 1991 UPOV Act rectifies that situation in part by differentiating between initial and essentially derived varieties. Interpretations however suggest the initial variety must contain a preponderance of the finished product's genetic material, which would generally not apply to landraces. Those interpretations also specify the existence of a single initial variety for any derived variety (UPOV 1992). Thus landraces would appear to be out of contention.

Trade Secrets: Trade secret legislation allows those whose industrial secrets have been improperly acquired to use the courts to stop further use and/or seek restitution. The community aspect of much knowledge regarding genetic resources makes secrecy problematic, and indeed secrecy would be contrary to the open exchange considered necessary for maximizing advances within agriculture. Thus trade secret legislation is not really applicable.

Overall then, traditional forms of IPR are not really applicable to the major forms of cooperative technologies; certainly critics of IPR are correct in that regard (UNDP 1994, Greaves 1994). Attention is directed next to alternative forms of IPR referred to here as "nontraditional".

B. Alternative Forms of IPR

Intellectual property rights, as is suggested above, are but one means (and not a very applicable means) of claiming control of and remuneration from cooperative technologies. Other possible approaches to be considered here include "Farmers' Rights", treatments of folklore, codes of conduct, and appellations of origin. For a yet broader list of possibilities see Posey (1994).

Farmers' Rights: Farmers' Rights is the term developed by the FAO under the so-called Revised Undertaking for Plant Genetic Resources. While not necessarily restricted to plants with agricultural applications, it is quite evident that is the intended focus of the undertaking. In Resolution 5/89 Farmers' Rights are defined as "rights arising from the past, present and future contributions of farmers in conserving, improving and making available plant genetic resources . . ." Farmers' Rights are to be "implemented through an international fund on plant genetic resources which will support plant genetic conservation and utilization programmes, particularly, but not exclusively, in the developing countries." (FAO Resolution 3/91, Annex 3 to the International Undertaking). No further details on the implementation and operation of this fund are included.

In concept, Farmers' Rights operate more as a moral obligation than an economic incentive. They are not connected with any specific future action but rather with a general conservation and equity objective. Thus Farmers' Rights is noted without prejudice but only to emphasize that the objectives, and hence the likely results, of the system are quite different from IPR. However one parallel which has been drawn on several occasions (e.g., UNDP 1994) is to blank recording tapes and other selected applications. There, the very reasonable presumption is drawn that individuals will make copies, denying authors and artists royalties. The fund compensates those losses on some formalized basis; presumably the nationality and residence of the recipient would make no difference. A similar approach could be used for seeds and other genetic resources.

Perhaps the major comment which can be made is the lack of action on the fund since its proposal. The time span has been relatively short, but there are few indications to date that such a fund will be constructed, at least under these specific auspices. The entire International Undertaking process received much negative attention in the developed countries early on due to the interpretation of "plant genetic resources" to refer to both unimproved and improved genetic

materials (Article 5) (see Grossman 1988). Private firms have not made their products available without charge, and while it is a matter of interpretation if that was specifically required by the Undertaking, it did poison the atmosphere. Subsequently, the proposed tax on seed sales was never supported.

Folklore: Many of the issues associated with protecting genetic materials have parallels in protecting expressions of folklore. That is particularly true of landraces which, like folkloric expressions, are the result of long term community contributions. And again like landraces, there is no system of compensating, or even acknowledging, those communities for their contributions. The applicable IPR systems, copyright and trademark, operate similarly to patents in requiring new and unique creations, which folklore is not. Perhaps, then, attempts to protect folklore will provide some insights for use with genetic materials.

Treatments of IPR for folklore culminated in the joint 1985 "Model Provisions for National Laws" by WIPO and UNESCO (WIPO 1985). There, the expressions of folklore are defined as "characteristic elements of the traditional artistic heritage developed and maintained by a community . . . or by individuals reflecting the traditional artistic expectations of such a community". These expressions may be verbal (folk tales), musical or action (dances) as well as tangible expressions like art, musical instruments and architectural forms (Model Law, Section 2). When used "with gainful intent outside their traditional or customary context" such expressions are "subject to authorization" by the competent authority of the community (Section 3). The expressions may originate from the community or elsewhere, provided they were subsequently further developed, adopted, or maintained through generations (Par. 35).

As can readily be appreciated, the issues are indeed similar to those for selected cooperative technologies like landraces. However no helpful detail is included on how to implement what can only be described as concepts. For example, in the frequent situation where neighboring communities practice slight variants of the same tradition, whose permission would be required, any one of the communities, or some/all of them? How or who would determine when an expression is different enough to be a separate form of expression? What competent authorities would be identified to represent a community? And what constitutes an "artistic heritage"? Hence, the protection of folklore has moved little beyond the conceptual stage.

Codes of Conduct: Codes of conduct refer to standardized but voluntary agreements specifying obligations. They are similar to a one-sided contract voluntarily entered (compare with, for example, Downes et al. 1993). The FAO has over several years prepared a "Code of Conduct for Plant Germplasm Collecting and Transfer", still in draft form, which could serve as a model for protecting some genetic resources (FAO 1993).

The Code, which is directed primarily to governments, has the principal objectives of promoting respect for the environment and local traditions and cultures, and establishing mechanisms for compensating local communities and farmers for their conservation and development activities (Article 1). The mechanism for achieving these goals is to require collection permits (Article 8)

subject to certain conditions, including "financial obligations", restrictions placed on the distribution or use of the germplasm or improved materials derived from it, the use of care in the collection process, and provision on request to the country of duplicate sets of the collected materials (Articles 8, 10 and 11).

Separate obligations apply to sponsors ("see to degree possible collectors abide by Code," Article 12), curators (provision of further samples, Article 13) and users ("consider providing some form of compensation", Article 14). This Code is seen as serving temporarily until national legislation is passed, or possibly a legally binding international agreement like a protocol under the Biodiversity Convention is reached. For the present, the Code can be seen in part as a model law for national governments. In its present form as a voluntary guideline, it has limited utility.

Appellations of Origin: Appellations of Origin are coordinated by the Lisbon Agreement of 1958, which, with its 17 members, is administered by WIPO. The Agreement (Article 2) defines applications of origin as the "geographical name of a country, region or locality, which serves to designate a product originating therein, the quality and characteristics of which are due exclusively or essentially to the geographical environment, including natural and human factors". The prototypical example is champagne from the region of the same name in Northeastern France.

Extensions of this approach to IPR to genetic resources is as yet untested. But the definition implies a quasi-finished product which can be identified and distinguished by users. From that perspective, the concept would not seem to apply well to much genetic material. On the other hand, living materials (as with wine grapes) are affected by growing conditions so that useful distinctions could be made for selected cooperative technologies. This would seem to apply best to such products as cosmetics which use a combination of natural products for the overall effect, as opposed to pharmaceutical products where the causal agents, genes in the case of many cooperative technologies, must be characterized in detail. Hence there may be some scope for application of appellations of origin for genetic resources.

V. APPROACHES TO PROTECTING GENETIC RESOURCES

The preceding assessment identified possible limited ways to protect genetic resources using existing mechanisms. The UPOV 1991 Act has possible applications, as does appellations of origin. But neither and nothing will serve broadly. What seems to be required is a new form of protection. In general, IPR professionals object, and for very good reasons, to new laws for specific technologies. It, however, can and has worked, witness the 1980s agreement on maskworks (computer chips), which can be described as somewhat of a hybrid of copyright and design patents.

In my estimation though IPR-type legislation is not applicable in this instance. The products are

not developed to the point of identifying even one likely use, a key aspect of IPR law. Nor is much of the material even classified beyond a description of where it was found. Hence what is being sought is really the **reservation** of a right for possible future use. That need is better served through material transfer agreements (MTA), a form of contract, as is being increasingly frequently used among researchers (see Sedjo and Simpson 1994).

An MTA should have at minimum three stipulations:

1. materials cannot be removed from a country without signing an MTA,
2. transfer to third parties is prohibited without written permission (generally the signing of another MTA), and
3. the agreement is for research purposes only; subsequent commercialization of the products, and direct or indirect products thereof, requires subsequent approval.

Beyond this, there are additional stipulations to be considered. These include indirect control over the individuals who are actually doing the collecting and inclusions on how the royalties are to be shared, especially with local/indigenous groups (e.g., Laird 1993). My own perspective is that contracts should be kept as simple as possible, and in particular it is neither appropriate or workable to include contractual obligations over which the party has little control. This says additional clauses might be reserves for other types of legislation. The discussion, however, does highlight the point that contracts, and indeed IPR, have specific objectives, but equity is not necessarily among them. Contracts are a mechanism for collecting funds; disseminating them is a separate and complex task in its own right, as McGowan and Udeinya discuss (1994).

There is certain language which in my opinion should, must, be avoided. The recent Philippines Executive Order for example states that the informed consent of indigenous cultural communities must be obtained "in accordance with the customary laws of the concerned community." How would a distant firm ever ascertain what those "customary laws" are? For national laws I would contact Biro Oktroi Roosseno, but for local laws/customs? Any legal requirement which cannot be readily satisfied is a barrier. Additionally, the Executive Order grants royalty free domestic use of anything based on an endemic species. Such a clause, it seems to me, makes it difficult for a national company which would find the home market the easiest to tap first.

There are numerous models of MTA for use by Indonesia, if that approach is chosen. That, however, is the relatively easy part, the complexities being (1) deciding how to distribute the funds generated, (2) determining how these agreements will apply to genetic materials found on private lands, and (3) encouraging other countries to harmonize their legislation along similar lines. That involves policy and political analysis for which there are no shortcuts I am aware of.

VI. SUMMARY AND CONCLUSIONS

Indonesia's economic growth can be described as surpassing the extent of its intellectual property protection. The purpose of this paper is to review and, where appropriate, make recommendations for changing existing and pending IPR legislation. This is done in two areas, for traditional forms of law for technologies, with emphasis on biotechnologies, and for the emerging interest in genetic resources, with which Indonesia is so abundantly endowed.

A. Traditional Technologies

Intellectual property rights are justified from two distinct perspectives, as a personal right or as a form of economic incentive for investment in creative activities. In general, the economic incentive role is predominant.

IPR provide incentives by prohibiting direct copying without permission (e.g., the payment of a royalty). The concept is that the inventor or other creator cannot compete with a copier who shares none of the costs. IPR legislation is national law, applying only in those countries where it is available and has been granted. For this reason, IPR is important for accessing creations made in other countries. Otherwise the creator, fearing the loss of the work, will often prevent or at least delay transfer to countries where IPR protection is weak or unavailable.

There are four major forms of IPR which can be applied to agricultural materials: patents, PBR, trade secrets, and trademarks. Detailed evidence on the actual impacts of IPR is limited and generally inconclusive for skeptics. That position is doubly true when attempting to measure the very recent impacts of protection for living organisms. Nevertheless the available evidence is in agreement with expectations, that IPR does indeed increase private investments in these areas, and that being relatively easy to copy, living material is more in need of IPR than are many areas of technology. This raises the issue of the existence of protection, a subject included in the last GATT round.

Trade-Related Aspects of Intellectual Property Rights (TRIPS), within the GATT, mandated certain levels and forms of IPR legislation. This includes some form of PBR, the details not being clear at this time. Alternatively, plant patents (or both) may be allowed, but this seems a less likely choice. Certainly membership in UPOV would seem to comply (of the two conventions now open, the 1978 version will close by the end of 1995), but what forms of national law are acceptable has not been made clear. There are several notable components in the 1991 UPOV text, including the protection of all genera and species within 10 years, the extension of protection to harvested materials and (provisionally) direct products thereof. However, the interpretation of "essential derivation" remains unclear at this time and significant input may be required to clarify the matter. Indonesia must continue the process of identifying an appropriate form of PBR.

Plant patents, unlike PBR, are not mandated, and are presently excluded in Indonesia. Authorities should recognize that PBR do not provide sufficient protection for bioengineered plants, and trade with countries not allowing patents could continue limited in the future. However, the combination of PBR and gene patents could be adequate. Indonesia should reconsider whether to exclude plant (and animal) patents.

Indonesia appears to satisfy the other TRIPs requirements in the area of compulsory licenses. Nonetheless several of the existing regulations are rather restrictive and should be reevaluated with input from industry. Compulsory licenses override the real value of IPR, the right to restrict use, and hence must be used judiciously.

B. Genetic Resources

Indonesia appears to have legislation in place to restrict the removal of plant genetic resources (Law No. 12 of 1992), but no means to profit from authorized uses. Those who complain of a double standard regarding the IPR protection of genetic materials have a legitimate position. Current legislation is applicable to improved plant varieties but is not really suited to landraces and the like, even though they are technically protectable. For other materials, patents are usable, but the costs of documenting and preparing an application make patents a prohibitive approach for the great bulk of materials of uncertain use and value, even if some funding system were established. Overall, then, traditional IPR is not broadly useful for genetic resources.

When the assessment is enlarged to include "non-traditional" forms of IPR, Farmers' Rights and folklore, while interesting concepts, are in their present forms not really fully developed for the protection of cooperative technologies. Appellations of origin have promise in some product areas, such as cosmetics, but would take creative adaptation, and would be limited at minimum. The FAO Code of Conduct is less a form of IPR and more a model contract.

For protecting Indonesia's genetic resources, contracts (Material Transfer Agreements, MTA) are proposed as more appropriate for the reservation for rights in the case of subsequent commercial potential. That is what is really being sought in most cases. MTA legislation should prohibit access without an agreement, should prohibit transfers to third parties, and be limited to research, that is, require a separate commercialization agreement. Numerous other conditions can be added, although my recommendation is to keep the legislation and agreements as simple as possible. There are multiple models for Indonesia to consider, but first key internal decisions must be made.

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