Protecting Plant Varieties under TRIPS and NAFTA: Should Utility Patents Be Available for Plants?

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I. INTRODUCTION

Plant breeding has been practiced for centuries to achieve superior agricultural products. Before the advent of genetic engineering, plants were mainly propagated by either sexual reproduction or asexual, seedless reproduction. Even today, new plant varieties with desired characteristics may sometimes be created by these traditional methods.[1] However, since the advent of genetic engineering, new methods of creating new plant varieties have emerged, enabling scientists to isolate and modify the genes of living organisms to create these new plant varieties.[2] The gene with the desired traits can be introduced into a target plant to induce desirable characteristics, such as a higher rate of reproduction or an enhanced disease resistance.[3] Due to this capacity to create new "super" plant varieties and considering the huge

1. *See* 2 IVER P. COOPER, BIOTECHNOLOGY AND THE LAW § 8.01 (Aug. 1996).
2. *See* JOHN A. BARDEN ET AL., PLANT SCIENCE 299–308 (1987).
3. *See Interest Rising in Research into Designer Vegetables*, RALEIGH EXTRA, Nov. 20, 1994, at 32; Sandra Sugawara, *For the Next Course, 'Engineered' Entrees?: 'Genetic' Tomato May Launch an Industry*, WASH. POST, June 10, 1992, at F1; Andrew K. Weegar, *Fishy Tomatoes and Hot Potatoes: The Tomato in Your Supermarket May Have Genes in it from a Flounder. Wouldn't You Like to Know That?*, MAINE TIMES, Mar. 31, 1995, at 11,

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agricultural market worldwide, enormous financial opportunities might conceivably emerge in the agricultural-biotechnology industry.[4]

Because of this potential for enormous financial opportunities, patent protection of plant varieties has become increasingly more necessary. However, although plant breeding dates back to the earliest days of civilization, plant variety protection was not thought appropriate as recently as the nineteenth century.[5] Today, however, depending on the country where protection is sought, different forms of legal protection may be available to the breeder of a new variety. At the international level, the International Convention for the Protection of New Varieties of Plants (UPOV), adopted in 1961, provides plant breeders with *sui generis* protection[6] of new plant varieties.[7] Only a few countries like the United States and Italy make patents available to new plant varieties, provided that the statutory requirements for patentability are met.[8]

Two other international agreements dealing with the protection of plant varieties are the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), part of the Uruguay Round of the General Agreement on Tariffs and Trade (GATT) and the North American Free Trade Agreement (NAFTA).[9] These two agreements represent major accomplishments in efforts to harmonize substantive patent laws worldwide by multilateral trade negotiations.

Article 27 of TRIPS, which defines patentable subject matter, allows member states to freely exclude plant varieties from patent protection, despite the Article's mandate that countries provide *sui generis* protection, such as UPOV, for plant varieties.[10]

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available in LEXIS, News Library, Busdtl File (antifreeze tomatoes with flounder genes are ready for marketing in Maine).

4. *See* Peter Fritsch, *Biotech Boosts Monsanto Stock to Record Height*, WALL ST. J., Oct. 4, 1996, at A3.

5. *See* Klaus Bosslemann, *Plants and Politics: The International Legal Regime Concerning Biotechnology and Biodiversity*, 7 COLO. J. INT'L ENVTL. L. & POL'Y 111, 122–23 (1996).

6. Other examples of *sui generis* protection laws of plant varieties include the U.S. Plant Variety Protection Act and the U.S. Plant Patent Act. *See infra* Part III A & B.

7. International Convention for the Protection of New Varieties of Plants, Oct. 23, 1978, art. 2, 33 U.S.T. 2703, 2708 (revised Nov. 10, 1972, and Oct. 23, 1978, and entered into force Nov. 8, 1981) [hereinafter UPOV Convention]. As of January 15, 1996, UPOV comprises these member states: Argentina, Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Japan, Netherlands, New Zealand, Norway, Poland, Portugal, Slovakia, South Africa, Spain, Sweden, Switzerland, United Kingdom, United States of America, and Uruguay. *See* UPOV news in 78 J. PAT. & TRADEMARK OFF. SOC. 220, 220 (1996).

8. *See* 35 U.S.C. §§ 161–164 (1994); Ministerial Decree of Oct. 22, 1976, Gazz. Uff. No. 15, Jan. 3, 1977, Le Leggi 88–92 (1977) (Italy), *translated in* 2F JOHN SINNOT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE ITALY 113–25 (Ing. A. Giambrocono & C.S.R.L. trans., 1991).

9. Agreement on Trade-Related Aspects of Intellectual Property Rights, 33 I.L.M. 1125, 1197 (1994) [hereinafter TRIPS Agreement], *reprinted in* THE RESULTS OF THE URUGUAY ROUND OF MULTILATERAL TRADE NEGOTIATIONS: THE LEGAL TEXT 365–403 (GATT Secretariat ed., 1994); North American Free Trade Agreement, Dec. 17, 1992, 32 I.L.M. 605 (1993) (entered into force Jan. 1, 1994) [hereinafter NAFTA]. The TRIPS Agreement is Annex 1C to the Agreement Establishing the World Trade Organization, 33 I.L.M. 1125, 1144 (1994), which is itself annexed to the Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations, Apr. 15, 1994, 33 I.L.M. at 1143.

10. TRIPS Agreement, *supra* note 9, art. 27(3)(b), 33 I.L.M. at 1208. The text of the TRIPS provision states that:

> Members may also exclude from patentability:
>
> > (b) plants and animals other than micro-organisms, and essentially biological processes for the production of plants or animals other than non-biological and microbiological processes. However, Members shall provide for the protection of plant varieties either by patents or by an effective sui generis system or by any combination thereof. The provisions of this subparagraph shall be reviewed four years after the date of entry into force of the WTO Agreement.
>
> *Id.*

. Article 1709(3) of NAFTA, which was modeled after Article 27 of TRIPS, contains almost identical language regarding the exclusion of plants from patentable subject matter.[11] Under these exclusionary provisions, developing countries which do not currently provide legal protection for plant varieties would most likely opt for a *sui generis* system, and the countries that currently exclude plant varieties from patent protection will continue to do so. Unfortunately, as will be discussed later, a *sui generis* system such as UPOV does not provide sufficient protection for plant varieties. Furthermore, allowing member countries the choice of excluding plant varieties from patentable subject matter undermines efforts to harmonize patent laws, one of the fundamental objectives of international intellectual property law reform.

Responsibility for problems created by the exclusion of plant varieties in TRIPS from mandatory patent protection can be laid, at least in part, at the European Community's door. An examination of the TRIPS negotiation history reveals that the European Community (EC), which has traditionally excluded plant varieties from patents, played a significant role in formulating the exclusionary clause of Article 27 of TRIPS. Because of the significant role played by the EC in formulating Article 27, this comment will focus on European legal systems for protecting plant varieties. This paper first explores the historical reasons why plant breeders in Europe resorted to a *sui generis* system of protecting plant varieties instead of using patents to protect their rights. Following this exploration, the adequacy of protection for plant varieties under a *sui generis* system, such as the UPOV system, will be discussed. In this discussion, comparisons will be made between the *sui generis* system in Europe and the plant protection available in the United States through its three-tiered system. The policy reasons advanced against granting patent protection in Europe will then be examined. Finally, following this discussion, the circumvention and the reality of excluding plants from patentability in major industrialized nations will be analyzed. Acknowledging the need to protect plant biotechnological inventions worldwide while recognizing that food supply shortages in some developing countries may hinder patent protection efforts for a variety of reasons, this comment proposes a more desirable compromise than TRIPS or the *sui generis* system—mandating that plant varieties be patentable as an international minimum standard but granting a grace period for compliance to some developing nations.

II. THE ADOPTION AND ORIGIN OF THE EXCLUSIONARY PROVISION IN TRIPS

A. Negotiation History of TRIPS Article 27

The negotiations on patentable subject matter represent a microcosm of the GATT treaty negotiations—confrontations and compromises between developed countries' desire to provide broad intellectual property protection and developing countries' concern for increasing inaccessibility of modern technology through overprotection.[12] Thus, in conformity with this pattern, the United States urged broad coverage of patentable subject matter, including plants and living organisms.[13] The developing nations, on the other hand, not surprisingly proposed

11. NAFTA, *supra* note 9, art. 1709(3)(b)–(c), 32 I.L.M. at 673. Since Article 1709 of NAFTA was modeled after Article 27 of the TRIPS Agreement, this article will focus the discussion on Article 27 of TRIPS. *See* Neil D. Hamilton, *Who Owns Dinner: Evolving Legal Mechanisms for Ownership of Plant Genetic Resources*, 28 TULSA L.J. 587, 616–18 (1993). The same conclusion logically applies to Article 1709 of NAFTA.

12. *See* Bosslemann, *supra* note 5, at 126–27. For a full account of the GATT negotiation history, see generally THE GATT URUGUAY ROUND, A NEGOTIATING HISTORY (1986–1992) (Terence P. Stewart ed., 1993).

13. *See* GATT Secretariat, *Draft Agreement on the Trade-Related Aspects of Intellectual Property Rights*, pt. 2, art. 23, MTN.GNG/NG11/W/70 (May 11, 1990) (communication from the United States).

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the exclusion of plants from patent protection.[14] During the first phase of the negotiations in 1987, the EC proposed that TRIPS cover plant varieties.[15] However, the EC changed its position on plant varieties when it introduced its draft text into the 1990 TRIPS negotiations, allowing for contracting nations to exclude most plant varieties from protection.[16] This change of position proved to be significant. With three draft proposals in favor of granting patents to new plant varieties (one against and one compromising), the negotiators were unable to agree on whether plant varieties should be protected.[17] Consequently, the Brussels Draft of TRIPS (which resulted from the negotiations but indicated that no agreement was reached) provided that parties may exclude plants from patent protection.[18] After the breakdown of the negotiations in December 1990, the June 1991 negotiations, aimed at reaching a final agreement, focused on political tradeoffs and compromise.[19] As a result, during these negotiations, the TRIPS negotiating group generally agreed to use the Brussels draft text as the basis for further negotiations.[20] The differences on the issue of plant patentability were, thus, finally resolved by seeking a middle ground (that is, by allowing plants to be excluded from patent protection, but also requiring those who chose to exclude plants to provide a *sui generis* system to protect new plant varieties).[21] Retrospectively, the EC's change of position on the issue of plant patentability was probably critical in affecting the final incorporation of the exclusionary provision into the TRIPS agreement.

B. *The UPOV Convention and the Exclusionary Provision in European Patent Convention (EPC)*

One of the factors that may have contributed to the EC's change in position is the historical and systematic exclusion of plant varieties in most European countries from patent protection. In order to understand the reasons for this systematic exclusion in most European countries, it is helpful to study the historical impetus for the negotiation and adoption of the UPOV system.

1. The Development of the UPOV *Sui Generis* System

The United States introduced the Plant Patent Act as early as 1930, and it is still in effect today. Under this Act, the breeder of any new and distinct variety of asexually reproduced plant (including cultivated sports, mutants, hybrids, and newly found seedlings) may apply for a plant patent for the variety if the invention, discovery, or reproduction of the variety is not

14. *See* GATT Secretariat, *Communication from Argentina, Brazil, Chile, China, Colombia, Cuba, Egypt, India, Nigeria, Peru, Tanzania and Uruguay*, pt. 2, art. 4(1)(ii), MTN.GNG/NG11/W/71 (May 14, 1990).

15. *See* GATT Secretariat, *Guidelines Proposed by the European Community for the Negotiations on Trade-Related Aspects of Intellectual Property Rights*, at 2, MTN.GNG/NG11/W/16 (Nov. 20, 1987).

16. GATT Secretariat, *Draft Agreement on Trade-Related Aspects of Intellectual Property*, pt. 2, art. 23(2)–23(3), MTN.GNG/NG11/W/68 (Mar. 29, 1990) (communication from the European Community).

17. *See* Julie Chasen Ross, *Trade-Related Aspects of Intellectual Property Rights*, *in* 2 THE GATT URUGUAY ROUND, A NEGOTIATING HISTORY (1986–1992), *supra* note 12, at 2241, 2273–74.

18. GATT Secretariat, *Agreement on Trade Related Aspects of Intellectual Property Rights, Including Trade in Counterfeit Goods, in Draft Final Act Embodying the Results of the Uruguay Round of Multilateral Trade Negotiations*, art. 30(3), MTN.TNC/W/35/Rev.1 (Dec. 3, 1990), *reprinted in* 3 THE GATT URUGUAY ROUND, A NEGOTIATING HISTORY (1986–1992), *supra* note 12, at 257, 261, 272.

19. *See* Ross, *supra* note 17, at 2276–77.

20. *See* GATT Secretariat, *Meeting of Negotiating Group of 27 and 28 June 1991*, at 5, MTN.GNG/TRIPS/1 (July 25, 1991).

21. *See* TRIPS Agreement, *supra* note 9, art. 27(3)(b), 33 I.L.M. at 1208.

obvious.[22] Although the Plant Patent Act of 1930 encouraged plant breeders in other countries to seek similar protection for plant varieties, the United Kingdom did not follow suit. This occurred because commercial interests at the time failed to generate enough political pressure on the national governments to force the governments to extend patents to plants.[23] From the late 1940s to mid-1950s, plant breeders started to exert more pressure on their national governments to provide legal protection for new varieties of plants.[24] However, this effort was impeded by patent lawyers, who doubted whether a valid patent could be granted for a plant variety and felt that the pure waters of the patent system should not be tarnished by gardening niceties.[25] This attitude and misunderstanding was exemplified in a speech by William Henry Ballantyne on behalf of the British group at the International Association for the Protection of Industrial Property (AIPPI) Congress held in London in 1932.[26] When addressing the suitability of patents to plant protection, he "received thunderous applause when he had pointed out that, if one were to start advocating amendments to the Paris Convention to cover plants, clothes and everything else imaginable, the result would be the complete ruin of all patent legislation."[27]

This pompous view, maintained by influential British patent specialists for a significant period of time, was not totally devoid of reason. Two obstacles to granting a plant patent were thought to exist during that period. First, before the advent of recombinant DNA technology, traditional plant breeding methods were perceived to lack an inventive step required for patent protection. Second, plant breeders could not meet the disclosure requirement in patent law, which requires the inventor to describe the invention sufficiently enough to enable a person skilled in the art to reproduce the invention.[28] Faced with seemingly insurmountable obstacles and frustrated by the unhelpful attitude of patent lawyers, it is little wonder that plant breeders abandoned their hope of securing patents for new plant varieties and opted instead for a less desirable *sui generis* form of legal protection.

In 1956, the French Government invited the governments of Western Europe to send representatives to a diplomatic conference on the protection of new plant varieties.[29] After four years of preparatory work, an international convention was finalized and signed by the member states.[30] The UPOV Convention was the result of this conference.

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22. 35 U.S.C. § 161 (1988). The Plant Patent Act of 1930 is now incorporated into the U.S. Patent Code.

23. *See* NOEL BYRNE, COMMENTARY ON THE SUBSTANTIVE LAW OF THE 1991 UPOV CONVENTION FOR THE PROTECTION OF PLANT VARIETIES 9–10 (1991). Before World War II, there was little private investment by British companies in the breeding of agricultural crop. At that time, plant breeding was largely done at public expense. *See id.* at 10.

24. *See id.*

25. *See id.*

26. *See* International Union for the Protection of New Varieties of Plants, *The History of Plant Variety Protection, in* THE FIRST TWENTY-FIVE YEARS OF THE INTERNATIONAL CONVENTION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS 53, 78 (1987).

27. *See id.*

28. *See* BYRNE, *supra* note 23, at 14–15. The first obstacle was a mistaken perception which is slowly losing validity. Especially when one views an "inventive step" as involving substantial human intervention in a natural process, some traditional breeding techniques can be viewed as involving an inventive step. *See* BARDEN, *supra* note 2, at 292–99 (describing the complicated subjective steps involved in traditional breeding techniques). As far as the second obstacle is concerned, it turned out that the disclosure requirement could not be met by other biotechnological inventions either. *See* Akim F. Czmus, *Biotechnology Protection in Japan, the European Community, and the United States*, 8 TEMPLE INT'L AND COMP. L.J. 435, 440–41 (1994) (additional references cited therein). In order to allow patents on biotechnological inventions, many countries modified the disclosure requirement, requiring in addition a sample to be deposited in a publicly accessible place. *See id.* With the sample deposit solution, the second obstacle is no longer a valid reason for rejecting plant patents. *See id.*

29. *See* BYRNE, *supra* note 23, at 11.

30. *See id.*

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2. The UPOV System of Plant Variety Protection

Before one engages in debates about the wisdom of excluding plant varieties from patent protection, it is necessary to examine the scope of plant breeder's rights under the UPOV Convention. Only upon a finding of inadequate protection can one conclude that the exclusion may be undesirable. In order to provide a useful predicate, the rights conferred to plant breeders under the U.S. patent system are compared with those available under the 1991 UPOV Convention.[31]

To qualify for protection under the 1991 UPOV Convention, a variety must be new, distinct, uniform, and stable.[32] Under Article 14 of the Convention, the right-holder has exclusive rights in the "whole plant kingdom," which includes the propagating material, the harvested material, the products directly made from the protected variety, and any plant varieties which are essentially derived from the protected variety.[33] With respect to the "whole plant kingdom," acts that are prohibited without the right-holder's authorization include: 1) production or reproduction, 2) conditioning for the purpose of propagation, 3) offering for sale, 4) selling or other marketing, 5) exporting, 6) importing, and 7) stocking for any of the aforementioned purposes.[34]

Consequently, the 1991 UPOV Convention seems to offer patent-like protection to plant varieties. However, the exclusive rights of a plant breeder are subject to several significant exemptions.[35] These broad exemptions, having no counterpart in the patent law, significantly dilute the exclusive rights granted in Article 14 of the Convention. For example, under the dependent varieties exemption, it is possible for anyone to use a protected variety for the purposes of breeding "other varieties."[36] Were the variety protected by a utility patent, this act would clearly have constituted infringement.[37] Consequently, these exemptions weaken UPOV's effectiveness, causing it to inadequately protect the interests of plant breeders. Furthermore, the nonexistence of the doctrine of equivalents[38] in a *sui generis* system makes plant breeders' rights even less extensive than those of patent holders.[39]

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31. International Convention for the Protection of New Varieties of Plants, *opened for signature* Mar. 19, 1991, *reprinted in* CHARTERED INST. OF PATENT AGENTS, EUROPEAN PATENT HANDBOOK, ch. 90.1 (2d ed. 1996), *on file with* the World Intellectual Property Organization. The 1991 Amendment narrowed the scope of varieties protectable but significantly broadened the scope of protection. *See* John Richards, *International Aspects of Patent Protection for Biotechnology*, 4 FORDHAM INTELL. PROP. MEDIA & ENT. L.J. 433, 441–43 (1993). Comparisons here focus on the rights available under the amended Convention.

32. International Convention for the Protection of New Varieties of Plants, *supra* note 31, art. 5.

33. *Id.* art. 14 (1)–(5).

34. *Id.* art. 14 (1)–(4).

35. *Id.* art. 15. Under Article 15(1), infringement does not include acts done privately and for non-commercial purposes or for experimental purposes with regard to protected varieties. Under Article 15(2), commercial farmers may use farm-saved seed for propagation purposes with no infringement liability.

36. *Id.* art. 15(iii).

37. Under 35 U.S.C. § 271, unauthorized use of a patented article constitutes infringement. *See also generally* 4 DONALD CHISUM, PATENTS § 16.02[4] (Oct. 1991).

38. The judicial doctrine of equivalents permits a utility patent claim to be construed, in some circumstances, to cover articles which do not literally infringe the claim language. *See generally* 4 DONALD CHISUM, PATENTS § 18.04 (Nov. 1993) (discussing the doctrine of equivalents).

39. *See* J.H. Reichman, *Legal Hybrids Between the Patent and Copyright Paradigms*, 94 COLUM. L. REV. 2432, 2468–69.

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3. The UPOV Roadblock

Intuitively and logically, the adoption of a *sui generis* protection system should not render patent protection unavailable to plant varieties. However, Article 2(1) of the 1961 UPOV Convention contained a provision which prohibited "double protection" of plant varieties:

> Each member State of the Union may recognise the right of the breeder provided for in this Convention by the grant either of a special title of protection or of a patent. Nevertheless, a member State of the Union whose national law admits of protection under both these forms may provide only one of them for one and the same botanical genus or species.[40]

This provision was meant to prevent a conflict between rights granted under the UPOV system and rights granted under a patent system. Put differently, this provision only prohibited a plant variety from receiving protection rights under both systems; it neither suggested nor required a prohibition on granting patents to plant varieties.[41]

Unfortunately, the drafters of the 1963 Convention on the Unification of Certain Points of Substantive Law on Patents for Inventions (the Strasbourg Convention) mistakenly interpreted the double protection clause as a ban against patent protection of plant varieties; therefore the drafters believed that they were obligated to exclude plants from patent protection in the Strasbourg Convention.[42] This was because the member states of the Council of Europe, which created the Strasbourg Convention, were also the leading participants in the UPOV Convention. The language in the Strasbourg Convention which resulted from this confusion, however, was discretionary rather than mandatory regarding the exclusion of plant varieties from patent protection.[43] Therefore, it was not the intent of the Strasbourg Convention to make patent protection completely unavailable to new plant varieties. Although the Strasbourg Convention has never had any real significance on its own, it did provide a basis for the formulation of the Convention on the Grant of European Patents (commonly known as the European Patent Convention).[44] With respect to patentable subject matter, the provisions in the Strasbourg Convention were incorporated into the European Patent Convention (EPC) with a major modification. Unlike the discretionary exclusion of plant varieties in the Strasbourg Convention, the EPC mandated the exclusion of plant varieties from patent protection.[45] The Convention states that "European patents shall not be granted... [for] plant or animal varieties or essentially biological processes for the production of plants or animals...."[46]

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40. UPOV Convention, *supra* note 7, art. 2(1), 33 U.S.T. at 2708. Article 2(1) of the UPOV Convention had been subjected to attack from the international patent community regarding its legal rationale, exact meaning and scope. *See* Rainer Moufang, *Protection for Plant Breeding and Plant Varieties—A Frontier of Patent Law*, 23 INT'L REV. OF INDUSTRIAL PROP. AND COPYRIGHT L. 328, 346 (1992). This criticism ultimately led to a complete abolishment of the prohibition against dual protection during UPOV's revision conference in March 1991. *See id.*

41. *See* BYRNE, *supra* note 23, at 13 (1991).

42. Convention on the Unification of Certain Points of Substantive Law on Patents for Invention, art. 2(b), Nov. 27, 1963, 1249 U.N.T.S. 369 [hereinafter Strasbourg Convention].

43. "The Contracting States *shall not be bound* to provide for the grant of patents in respect of... (b) plant or animal varieties or essentially biological processes for the production of plants or animals...." *Id.* art. 2 (emphasis added).

44. Convention on the Grant of European Patents, *opened for signature* Oct. 5, 1973, *reprinted in* 13 I.L.M. 270 [hereinafter EPC]. *See* Richards, *supra* note 31, at 439.

45. *Compare* Strasbourg Convention, *supra* note 42, art. 2(b), 1249 U.N.T.S. at 369, *with* EPC, *supra* note 44, art. 53(b), 13 I.L.M. at 286.

46. EPC, *supra* note 44, art. 53(b), 13 I.L.M. at 286.

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It is unclear why the drafters of the EPC changed the wording in the exclusionary provision to make it binding on all member states. The EPC patent examination manual does state that one reason for the exclusion is that plant varieties may be protected by other means in most countries.[47] These other means referred to those which have already received protection under the UPOV Convention. From this statement, it appears that the drafters of the EPC not only perpetrated, but also aggravated, the mistaken interpretation of the double protection prohibition in the UPOV Convention. Recognizing the undesirability of the double protection prohibition clause in the UPOV Convention, drafters of the 1991 Amendment of the Convention abolished the clause, signaling the plant breeders' desire to receive patent protection.[48] In light of this, it is amazing that the exclusionary provision still made its way into the TRIPS Agreement.

III. THE SCOPE OF PROTECTION: THE U.S. THREE-TIERED SYSTEM VS. UPOV

The United States has a three-tiered system available to protect plant varieties: protection under the Plant Variety Protection Act (PVPA),[49] plant patents,[50] and utility patents.[51]

A. Plant Variety Protection Act (PVPA)

The PVPA provides *sui generis* protection for plants that are sexually reproduced, that is, plants reproduced by seeds.[52] Seed-bearing plants are eligible for protection, provided that they meet the statutory requirements of novelty, distinctness, uniformity, and stability.[53] Protection under the PVPA gives plant breeders the right *inter alia* to prohibit others from selling or offering the protected cultivar for sale, importing or exporting the cultivar,[54] and sexually or asexually multiplying the cultivar.[55] However, the statute expressly provides four exemptions: a grandfather exemption,[56] a farmer's exemption,[57] a research exemption,[58] and an exemption for carriers and advertising businesses.[59] Under the exemptions, it is not an infringement when sexual reproduction occurs in the context of developing a new inbred line and when asexual reproduction occurs in pursuance of a valid U.S. plant patent.

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47. EUROPEAN PATENT OFFICE, GUIDELINES FOR EXAMINATION IN THE EUROPEAN PATENT OFFICE, pt. C, ch. IV, § 3.4 (effective as of June 1, 1978), *reprinted in* 2K JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE EPC 120.200 (1994).

48. *Compare* UPOV Convention, *supra* note 7, art. 2(1), 33 U.S.T. at 2708, *with* International Convention for the Protection of New Varieties of Plants, *supra* note 31, art. 2.

49. 7 U.S.C. §§ 2321–2583 (1994) [hereinafter PVPA].

50. 35 U.S.C. §§ 161–64 (1994) (commonly known as the Plant Patent Act).

51. 35 U.S.C. §§ 100–03 (1994).

52. 7 U.S.C. §§ 2401–02 (1994). The Plant Variety Protection Act was promulgated in 1970. At the time the U.S. signed the UPOV Convention, the PVPA was in full accord with the UPOV Convention. The 1991 Amendment to the UPOV Convention significantly broadened the scope of protection. The U.S. amended the PVPA to conform to the 1991 revision of the UPOV Convention. *See* H.R. Rep. No. 103-699, at 2425 (1994).

53. *See* 7 U.S.C. § 2402(a) (1994).

54. A cultivar is a cultivated variety or species of organism for which there is no known wild ancestor. *See* MCGRAW-HILL DICTIONARY OF SCIENTIFIC AND TECHNICAL TERMS 465 (4th ed. 1989).

55. *See* 7 U.S.C. § 2541(a) (1994).

56. 7 U.S.C. § 2542 (1994) (no infringement liability for persons with a grandfather right).

57. 7 U.S.C. § 2543 (1994) (no infringement liability for farmers to save seeds of a protected variety for use in crop production).

58. 7 U.S.C. § 2544 (1994) (no infringement liability for use and reproduction of a protected variety for plant breeding or other bona fide research).

59. 7 U.S.C. §§ 2542–45 (1994) (no infringement liability for transportation or delivery by a carrier or advertising by a person in the ordinary course of business).

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B. *Plant Patents*

Plant patents, the second type of plant protection in the United States and provided for under the Plant Patent Act of 1930, are available only for asexually reproduced plants.[60] To be protected, a plant variety must be novel and distinct, and the invention, discovery, or reproduction of the plant variety must not be obvious.[61] The grant of a plant patent gives the patent owner the right to exclude others from "asexually reproducing the plant or selling or using the plant so reproduced."[62] Plant patents are therefore available only for a single asexually reproduced variety. Each plant patent application is permitted only one claim that is specifically drawn to the plant shown and described.[63] Additionally, the doctrine of equivalents is not available for plant patents.[64]

C. *Utility Patents*

A third type of protection, utility patents, have been issued on plant cultivars and hybrids in the United States since 1980.[65] To receive a plant utility patent, the invention must be new, useful, and nonobvious.[66] The patent specification must contain a full disclosure of the invention, which enables an ordinary person skilled in the art of plant breeding to reproduce the invention.[67]

Patent protection is available for biotechnology processes, genes, seeds, plant parts, cultivars, and hybrids.[68] The granting of a utility patent entitles the patentee to exclude others from making, using, or selling the invention throughout the United States.[69] The subject matter of the invention is contained in one or more claims distinctly indicating the subject matter which the inventor regards as his invention. The scope of protection afforded by a patent granted in respect to an invention concerning plant material can, for example, cover a broadly described category of plants or parts of plants, of plant material, and of one or more plant varieties. Furthermore, utility patents have no farmer's exemption and only a limited experimental use exception.[70] Consequently, during the protected period, the seed deposits accessible to the public can be used for testing purposes but not in breeding programs to develop new commercial lines. For nonliteral infringement, the doctrine of equivalents is available.[71]

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60. 35 U.S.C. §§ 161–64 (1994).
61. *See* 35 U.S.C. § 161 (1994).
62. 35 U.S.C. § 163 (1994).
63. *See* 37 C.F.R. § 1.164 (1994).
64. *See* Reichman, *supra* note 39, at 2468. *See also* 2 IVER P. COOPER, BIOTECHNOLOGY AND THE LAW § 9.05 (Aug. 1985) (pointing out distinctions between the three patent statutes).
65. *See* 1 IVER P. COOPER, BIOTECHNOLOGY AND THE LAW § 6.01 (Oct. 1988).
66. *See* 35 U.S.C. §§ 101–03 (1994).
67. *See* 35 U.S.C. § 112 (1994).
68. *See* 1 IVER P. COOPER, BIOTECHNOLOGY AND THE LAW § 2.01–.13 (1982).
69. *See* 35 U.S.C. § 271 (1988 & Supp. 1996).
70. *See* 2 COOPER, *supra* note 64, § 9.05. In the United States, apart from a statutory exception relating to the development and submission of information under federal regulation laws, any use of a patented plant during the patent term, including the use of a plant variety as a parent in a breeding program will, in theory, constitute an infringement. There is, however, an experimental use exception established by judicial precedent. *See* Roche Prods., Inc. v. Bolar Pharm. Co., 733 F.2d 858, 862–63 (Fed. Cir. 1984); Chesterfield v. United States, 159 F. Supp. 371, 375–76 (Ct. Cl. 1958); Ruth v. Stearns-Rogers Mfg. Co., 13 F. Supp. 697, 703 (D. Colo. 1935), *rev'd on other grounds*, 87 F.2d 35 (10th Cir. 1936); Peppenhausen v. Falke, 19 Fed. Cas. 1048, 1049 (C.C.S.D.N.Y. 1861). *See also generally* 4 DONALD S. CHISUM, PATENTS, § 16.03[1] (Oct. 1991).
71. *See* 2 COOPER, *supra* note 64, § 9.05.

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Taken as a whole, the three-tiered system in the United States indeed offers plant breeders comprehensive protection of their plant varieties, although it is doubtful that such a three-tiered system, in which three types of patent protection are available, is inherently necessary to achieve this level of protection.[72] In comparison, the 1991 UPOV Convention falls short of adequate protection for those plant varieties worthy of patent protection (hereinafter "inventive plant varieties") because of the existence of the many enumerated exemptions mentioned above and because of the unavailability of the doctrine of equivalents.[73] As a result, the inventive plant varieties are more likely to be exploited, without compensation to the right-holder, under the current UPOV Convention than under the U.S. three-tiered patent protection system.

IV. POLICY CONSIDERATIONS: SHOULD UTILITY PATENTS BE AVAILABLE FOR PLANTS?

It is true that many new plant varieties lack the inventiveness to be eligible for patent protection, but the creation of many new varieties does involve an inventive step. These inventive plant varieties, in principle, should be patentable. Having found that the UPOV Convention does not adequately protect inventive plant varieties, the legitimacy of excluding plant varieties from patent protection, while making such protection available to other biotechnological inventions, like pharmaceuticals, needs to be addressed.

A. Lack of Justification for Exclusion in Patent Law

In patent law, it is widely accepted that biotechnological inventions involving microbiological processes are patentable.[74] For example, TRIPS, while providing patent protection for microbiological processes, permits signatories to exclude macrobiological processes and higher life forms from patent protection.[75] The traditional dichotomy between macrobiological and microbiological processes in deciding patentability is legally unsound.[76] Although plant propagation is highly complex in nature, it is clear that the characteristics of a plant are controlled by the genes it carries.[77] Genes can be readily affected by direct physical or chemical processes, which are the essence of genetic engineering on a microbiological level.[78] In macrobiological research, genes are altered, through microbiological processes, by changing external conditions.[79] When macrobiological and microbiological research happen to affect the genes in a plant in the same manner, it is the microbiological process used in both kinds of research that produces the identical variety with the same characteristics.[80] In essence, there is no difference between the two methods of research at the microbiological or genetic level. The only difference is that macrobiological research involves more physical and

72. In light of the heightened level of protection under the 1991 UPOV Convention, the existence of plant patents seems to be unnecessary. In fact, rights granted under the 1991 UPOV Convention are broader than those under the Plant Patent Act.

73. *See supra* Part II.B.2.

74. *See* Diamond v. Chakrabarty, 447 U.S. 303, 317–18 (1980); EPC, *supra* note 44, art. 53(b), 13 I.L.M. at 286.

75. TRIPS Agreement, *supra* note 9, art. 27(3)(b), 33 I.L.M. at 1208.

76. *See* R.S. CRESPI, PATENTS: A BASIC GUIDE TO PATENTING IN BIOTECHNOLOGY 75–82, 102–11, 152–54 (1988); Rainer Moufang, *Protections for Plant Breeding and Plant Varieties—A Frontier of Patent Law*, 23 INT'L REV. OF INDUS. PROP. AND COPYRIGHT L. 328, 335–36 (1992).

77. *See* BARDEN, *supra* note 2, at 113–37.

78. *See id.* at 299–308.

79. *See id.* at 300–01.

80. *See id.*

chemical steps than microbiological research.[81] The involvement of additional physical and chemical steps should not make a process discovered through macrobiological research unpatentable. Were it otherwise, all macrochemical engineering processes should, by analogy, also be excluded from patents—a ridiculous result. Hence, the exclusion of macrobiological inventions that meet statutory patent requirements constitutes a distinction without sensible legal grounds. Therefore, denying patent protection to inventive plants can only be justified by extrinsic policy considerations outside patent law, since no justification for the denial can be found within patent law.

B. Lack of Justification Outside Patent Law

The first policy reason asserted against granting patents to new plant varieties lies in the belief that plants are living matter which should not be patentable.[82] However, this argument that living organisms should not be patentable saw its demise, at least in the United States, in the landmark 1980 U.S. Supreme Court case *Diamond v. Chakrabarty*.[83] The action was initiated by a microbiologist challenging a ruling by the U.S. Patent and Trademark Office which denied his application for a patent on a genetically engineered strain of bacteria capable of breaking down multiple components of crude oil.[84] The Supreme Court granted review on the issue of whether the biologist's micro-organism constituted a manufacture or composition of matter within the meaning of 35 U.S.C. § 101.[85] After examining the meaning of "manufacture" and "compositions of matter" in light of the existing case law and congressional intent, the Court concluded that the statutory subject matter included "anything under the sun that is made by man."[86] This ruling dispelled the notion that living matter is not patentable. This view echoed and expanded the German Federal Supreme Court's decision in *Red Dove* which held that the living character of an invention is irrelevant as regards the issue of patentability.[87] A similar statement can also be found in Canadian case law. In *Pioneer Hi-Bred v. Commissioner of Patents*, the Court of Appeals, albeit refusing to grant a patent on a soybean variety on the ground of inadequate disclosure of the invention, conceded that Canadian patent law "does not support the assumption that life forms are definitely not patentable."[88] This view has subsequently become the prevailing view in Europe. In fact, by the early 1990s, the notion that living matter is patentable had become such a prevailing position in Europe that the view was expressly included in the Proposed Directive on the Legal Protection of Biotechnological Inventions.[89] Therefore, living matter is no less patentable than nonliving matter.

If the living nature of an invention cannot be a barrier to patentability, plants must be so distinguishable from other biological forms as to justify any policy reasons for excluding them from patent protection. In a sense, plants are special since humans depend upon plants for food

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81. *See id.* at 300–04.

82. *See* Bosslemann, *supra* note 5, at 126.

83. Diamond v. Chakrabarty, 447 U.S. 303, 309 (1980).

84. *See id.* at 305–06.

85. *See id.* at 307.

86. *Id.* at 309.

87. Entscheidungen des Bundesgerichtshofes [BGHZ] [Federal Supreme Court] 52, 74 (1969) (F.R.G.), *translated in* 1 INT'L REV. OF INDUS. PROP. AND COPYRIGHT L. 136, 138 (1970).

88. Pioneer Hi-Bred v. Commissioner of Patents, [1987] 14 C.P.R. (3d) 491, 495 (Fed. Ct.) (Can.). *See also* Re Application of Abitibi Co., [1982] 62 C.P.R. (2d) 81, 88–90 (Pat. App. Bd.) (Can.) (accepting an application for a patent of a yeast culture engineered to digest certain waste products, and indicating that life forms higher than micro-organisms might also be patented).

89. Proposal for a Council Directive on the Legal Protection of Biotechnological Inventions, art. 2, 1989 O.J. (C 10) 32 ("A subject matter of an invention shall not be considered unpatentable for the reason only that it is composed of living matter.").

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and medicine. However, pharmaceuticals are patentable under TRIPS and NAFTA.[90] Given the fact that plants are the source of many types of medicine, it is logically inconsistent to grant patents to the drugs derived from plants, while denying plants the same protection for fear that plant patents may make medicine or food unavailable.

Furthermore, the argument that plants, as a source of food, should not be patentable is also inadequate. Patent protection can only be granted to new plants. As a corollary, existing plants are not affected. New plants do provide additional sources of food, but the same result can also be achieved by new food technology without involving the development of a new plant variety. If people can accept the idea of patenting food technology, it seems utterly arbitrary to reject new plants for patent protection on the ground that food sources should not be monopolized.

Another major argument against granting patents to plant varieties is based on the fear that the public will be deprived of access to genetic resources if plants can be patented.[91] Many countries, especially developing nations, have advanced the notion that genetic resources are the common heritage of mankind and should be freely available.[92] A corollary is that plants are the carriers of genes and, therefore, should not be monopolized by patents. This argument, although having some superficial appeal, ignores an important relationship between plants and plant genes. Plant genes are the building blocks of a plant, and patenting plant genes has raised controversial ethical and legal debates.[93] However, regardless of whether patenting genes should be permissible and whether genes are the common heritage of mankind, granting plant patents will not lead to the monopolization of genetic materials. Assuming, arguendo, that genes are the common heritage of mankind and should be freely accessible to the public, it does not logically follow that plants should not be patentable. An analogy to patenting new chemical compounds may add some insight, since the relationship between genes and a plant parallels closely the relationship between chemical elements and a compound. Chemical elements are the basic building blocks of a chemical compound, and none of the naturally occurring elements are patented.[94] It is a truism that chemical elements are the common heritage of mankind. However, patents concerning a new composition of matter are granted in virtually every country. Such patents are never thought to raise any ethical issues. Millions of patents granted to new chemical compounds have not led to the monopolization of a single element, nor has the public been denied access to any element. By analogy, the mere availability of patents for a unique combination of plant genes (as in the case of a unique chemical compound) does not mean that any monopolization of the individual genes themselves will result from such protection—especially considering that there are slightly over one hundred chemical elements available to mankind, whereas there are millions of genes with more to be discovered.

90. *See* The Uruguay Round Agreements Act Statement of Administrative Action, 1994 WL 761796, at *5 (Off. of the U.S. Trade Rep. Exec. Off. of the Pres., Sept. 27, 1994) (when commenting on the scope of patentable technology under TRIPS, the report states that "WTO countries must make patent protection available for essentially all fields of technology, including *pharmaceuticals*, micro-organisms, and non-biological and microbiological processes" (emphasis added)); NAFTA, *supra* note 9, art. 1709(4), 32 I.L.M. at 673.

91. *See* S.K. Verma, *TRIPS and Plant Variety Protection in Developing Countries*, 17 EUR. INTELL. PROP. REV. 281, 286 (1995).

92. *See* James O. Odek, *Bio-Piracy: Creating Proprietary Rights in Plant Genetic Resources*, 2 J. INTELL. PROP. L. 141, 150 (1994).

93. *See generally* Hamilton, *supra* note 11, at 646–55 (highlighting some legal and ethical issues raised by patenting genes).

94. This is because patenting a naturally occurring element is prohibited by the doctrine of product of nature. *See* Bradford Chancer, *Life, the Patent Office and Everything: Patentability of Lifeforms Created Through Bioengineering Techniques*, 9 U. BRIDGEPORT L. REV. 413, 434 (1988) (references omitted).

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A final argument advanced to oppose granting patents for plant varieties concerns the plight of developing countries.[95] It is true that some developing countries either face starvation or simply do not have the financial resources to license modern technologies. Although these arguments express valid concerns, they are not unique reasons to justify exclusion of plants from patent protection, while granting patents to other areas of technologies. Furthermore, economic conditions in the developing countries should not serve as a justification for developed countries to exclude plants from patent protection. Although patent law is not the appropriate mechanism to address the dire economic situation in some developing countries, a wise patent policy can certainly facilitate economic development in these countries. To balance the need for protecting intellectual property rights in plants and the altruistic concern for developing countries, it seems sensible to require that patent protection be provided to plant varieties but to grant a grace period for compliance to countries facing economic hardship.[96] But, when attempting to help the developing countries, one should not lose sight of the fact that a patent law system adds "the fuel of *interest* to the *fire* of genius, in the discovery and production of new and useful things."[97] If the developing nations are to conquer poverty and advance economically, the need for a sophisticated patent law system is inevitable. Hence, concerns for the current economic situation in some developing countries should not overshadow the long-term benefits patent protection might provide for these countries.

V. PATENTING PLANT VARIETIES: THE REALITY OF CIRCUMVENTION

In addition to lacking justification for excluding plants from patent protection, the patent practice in many countries indicates that excluding plants from patent protection is no longer a realistic possibility because the exclusion can easily be circumvented. A close look at the current patent practices in a number of major countries reveals this reality.

Besides the United States, several countries' patent laws explicitly grant patent protection to plant varieties. These include Italy,[98] Hungary,[99] Mongolia,[100] and Korea.[101] In addition, the People's Republic of China, which currently excludes plant varieties from patentable

95. *See, e.g.*, Verma, *supra* note 91, at 286 (arguing that even requiring developing countries like India to comply with the UPOV Convention could hurt farmers in these countries).

96. The limited exemptions should be carefully structured so that multinational companies should not be allowed to exploit plant patents in exempt countries for economic gains.

97. Abraham Lincoln, Second Lecture on Discoveries and Inventions, *in* 3 THE COLLECTED WORKS OF ABRAHAM LINCOLN 356, 363 (R.P. Basler et al. eds., 1953) (italics in the original).

98. *See* Ministerial Decree of Oct. 22, 1976, Gazz. Uff. No. 15, Jan. 3, 1977, Le Leggi 88–92 (1977) (Italy), *translated in* 2F JOHN SINNOT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE ITALY 113–25 (Ing. A. Giambrocono & C.S.R.L. trans., 1991).

99. *See* Law and Rules on the Protection of Inventions by Patents (No. II of 1969), Decree on the Execution of Law No. II of 1969 on the Protection of Inventions by Patents, Decree on Deposit of Microorganisms for Purposes of Patent Procedure, Decree No. 11/1986 (IX.11.) Modifying Joint Decreed No. 4/1969. (XII.28.) on Executing Law No. 11 of 1969, and Act XXXVIII of 1991 on Registered Design Patents Passed by Parliament on September 2, 1991, arts. 67–68 (Hung.), *translated in* 2E JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE HUNGARY 49 (Drs. T. Sasvari & A. Szentpeteri trans., 1992). The Hungarian law was amended in 1984 to comply with the UPOV Convention. The new Article 67 reads, "A plant variety is patentable if it is distinguishable, novel, homogeneous and stable and if it has been given a variety denomination apt for registration." *Id.*

100. *See* Statute on Discoveries, Inventions and Rationalization Proposals, art. 21 (Mong.), *translated in* 2G JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE MONGOLIA 7 (providing that "new and improved breeds of farm animals and poultry and new varieties of agricultural plants and other flora" are patentable) (Prof. Karl J. Jorda trans., 1991).

101. *See* Patent Act, Law No. 3566 of Dec. 31, 1986, art. 31 (S. Korea), *translated in* 2G JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE KOREA 145 (granting patents for the invention of new plant varieties) (Man Kyu Suh trans., 1990).

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subject matter,[102] is considering the possibility of extending special protection to plant varieties.[103] The laws in Australia[104] and New Zealand[105] provide that a patent shall be granted for a "manner of new manufacture," a term which might allow plant patents.[106] Belgium,[107] France,[108] Germany,[109] and Spain[110] exclude from patent protection plant varieties protected under other plant protection laws, but those varieties not protected under any plant protection laws are arguably eligible for patents in these countries. In addition, other countries (such as Canada and Japan) have patent laws which do not explicitly exclude plant varieties from patents.[111] Consequently, plant patents are at least theoretically possible if the statutory requirements for patents are met.[112]

Regardless of statutory provisions on patentability, plant varieties may nevertheless be protected by patents with proper claim drafting.[113] This result occurs because a patent law can grant protection to the product of a patented process.[114] Therefore, hypothetically, in a country whose patent law excludes plant varieties but provides protection for the product of a patented

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102. *See* Patent Law of the People's Republic of China, *translated in* 2C JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE CHINA 16.8–.9 (Patent Office of the People's Republic of China trans., 1993).

103. *See* Qiao Dexi, *On the Second Revision of the Chinese Patent Law*, CHINA PATENTS & TRADEMARKS, July 1996, at 6, 7.

104. Patent Act of 1990, ch. 2, § 18(1)(a) (Austl.), *reprinted in* 2B JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE AUSTRALIA 160.2(26) (1992).

105. Patents Act, 1953, § 2 (N.Z.), *reprinted in* 2G JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE NEW ZEALAND 8 (1993) (defining "invention").

106. *See* Richards, *supra* note 31, at 458.

107. *See* I Les Codes Belges 558/2/1, ch. II, pt. 1, § 4(1) (Belg.), *translated in* 2C JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE BELGIUM 12 (G.C. Plucker trans., 1985).

108. *See* Law No. 79-822 of Sept. 19, 1979, J.O., Sept. 23, 1979, p. 2370; B.L.D. 1979, No. 16, 331 (Fr.), *translated in* 2D JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE FRANCE 111 (Marc Hirsch trans., 1992).

109. *See* Neufassung des Patentgesetzes (Pantentgesetz) [Patent Law], v. 3.1.1981 (BGBI. I S.2) (W. Ger.), *translated in* 2D JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE WEST GERMANY 78.21 (Max Planck Institute for Foreign and International Patent, Copyright and Competition Law trans., 1983).

110. *See* PATENTES DE INVENCION Y MODELOS DE UTILIDAD [Patent Law] (Repertorio Aranzadi Cronológico de Legislación [R.C.L.] 1986, 939) (Spain), *translated in* 2H JOHN SINNOTT & WILLIAM JOSEPH COTREAU, WORLD PATENT LAW AND PRACTICE SPAIN 95 (Sres. Elzaburu trans., 1986).

111. *See* Patent Act, R.S.C., ch. P-4, § 27(3) (1985) (Can.); Tokkyoho [Patent Law], Law No. 121 of 1959, art. 32, *amended by* Law No. 30 of 1990 (Japan), *translated in* 4 WORLD INTELLECTUAL PROPERTY ORGANIZATION, INDUSTRIAL PROPERTY LAWS AND TREATIES, JAPAN – Text 2-001, at 11 (June 1994). In 1975 the Japanese Patent Office published standards for the examination of new plant varieties, which provided for the patentability of inventions of bred varieties and inventions of processes of producing the plants of said bred varieties. *See* Sadanao Amemiya & Kikuo Nishimoto, *Patents and Utility Models*, *in* 4 KITAGAWA, DOING BUSINESS IN JAPAN, § 2.01[8] (1991). To be patentable, new plants have to be morphologically or physiologically different from the prior plants as a result of differences in the genes. *See id.*

112. For comments on the possibility of plant patents in Canada, see Patricia A. Rae, *Patentability of Living Subject Matter*, 10 CAN. INTELL. PROP. L. REV., 41, 46–48 (1993) and Jennifer McKay, *The Relationship between Plant Breeders' Rights and Patents for Biotechnological Inventions*, 10 CAN. INTELL. PROP. L. REV. 221, 224 (1993). In fact, the question of the patentability of hybrid plants arose in Canada in *Pioneer Hi-Bred Ltd. v. Commissioner* decided by the Canadian Supreme Court. Pioneer Hi-Bred v. Commissioner, 60 D.L.R. (4th) 223, 228 (1989). The court ruled against the patent applicant who sought to patent a new variety of soy bean produced by cross-breeding. *See id.* In reaching its decision, the court affirmed the rejection of the application on the ground of inadequate disclosure of the invention without addressing the issue of the patentability of plant varieties. *See id.* at 236, 238. The fact that the court did not rule that plant varieties are *per se* unpatentable indicates that they may be patentable if the disclosure requirement is met, at least for genetically engineered plant varieties.

113. *See* R. Stephen Crespi, *Patents and Plant Variety Rights: Is There an Interface Problem?*, 23 INT'L REV. OF INDUS. PROP. AND COPYRIGHT L. 168, 176–77 (1992).

114. *See, e.g.*, 35 U.S.C. § 271(g) (1994) (providing such protection). *See also* 4 DONALD CHISUM, PATENTS § 16.02[6] (1995).

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process, it is possible to obtain the benefit of patent protection as long as the plant variety covered by the claims is not in any sense being patented as a variety but is rather the product of a patented process embodying an inventive step. This practice makes patent protection available to virtually all genetically engineered plant varieties. This strange result originates from the nonsensical definition of patentable subject matter, which grants patent protection to microbiological processes (even including processes involving plant varieties) but denies patents for plant varieties themselves. If such an exclusion of plant varieties from patentability can be so easily circumvented, it may be a good indication that the exclusionary provision has outlived its historical justification.

VI. CONCLUSION

The exclusion of plant varieties from patent protection was based on the perception that traditional plant breeding methods did not involve the inventive step required to be patentable. Patentability of plant varieties was further eroded by the fact that the description of the plant breeding method would often not enable a person of ordinary skill in the art of plant breeding to reproduce it. The unwillingness of the patent law community in Europe to extend patent protection to plant varieties prompted plant breeders to opt for a *sui generis* protection system. This gave rise to the adoption of the UPOV in 1961. The double protection prohibition in the UPOV against granting conflicting rights for the same variety under the Convention and under a patent law system was mistakenly interpreted by the drafters of the Strasbourg Convention to forbid the granting of patents. This resulted in the exclusionary provision which precluded plant varieties from patent protection. This historical mistake was then propagated through major European conventions and finally made its way into TRIPS and NAFTA—both of which contain a provision to allow member states to exclude plants from patent protection.

When the exclusionary provision is examined in light of the current state of plant technology and the legal climate for patenting biotechnological inventions, no sound justifications can be found for singling out plant varieties from patent protection. First, the demarcation line in determining patentability between macrobiological and microbiological processes makes no legal sense in light of the current understanding of biological science. Second, the patentability of inventions embodying living matter has been widely accepted. Therefore, denying patent protection to plant varieties cannot be based on the living nature of plants. Furthermore, granting exclusive rights in new plant varieties is unlikely to lead to the monopolization of genetic resources. Finally, concerns for the plight of some developing countries should not serve as justification for weakening the protection of intellectual property rights. Instead, making plant varieties patentable while granting limited exemptions to some developing countries will further the goal of harmonization in the long run.

Realizing that the policy to exclude plant varieties from patent protection is unsound, some countries have provided explicit patent protection to plant varieties. Other countries do not explicitly exclude plant varieties from patentable subject matter in their patent laws. Even in countries where their patent laws explicitly exclude plant varieties, it is possible to obtain patent protection of a plant variety by drafting claims in such a way that the variety is merely the embodiment of the invention rather than the object of the invention.

Since no sound policies can be found to justify the exclusion of plant varieties from a patent system, and the exclusion can be effectively circumvented by skillful claim drafting, it seems absurd to allow such a toothless provision in multinational treaties to hinder the noble

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effort to harmonize the intellectual property laws of the world. Therefore, member nations should consider abolishing the exclusionary provision to further the goal of harmonization when they reconvene in the near future.

J. Benjamin Bai[*]

* J.D. candidate, The University of Texas School of Law, 1997; Ph.D., Chemistry, Rice University, 1992; M.A., Chemistry, Rice University, 1990; B S., Chemistry, University of Science and Technology of China, 1987. Associate at Fish & Richardson, P.C., Houston, Texas. The author thanks Dr. Mark J. Gatschet for helpful discussions on plant varieties. The author is extremely grateful to Ms. Karen Lee and Mr. John R. Thomas for the procurement of the GATT documents cited in this note.

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