PATENTS AND PLANT BREEDER'S RIGHTS OVER PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE

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1 INTRODUCTION

Recognising the importance of species diversity in conserving and exploiting plant genetic resources for food and agriculture, international and domestic arrangements have attempted over the decades *in situ* conservation, *ex situ* germplasm collections and germplasm exchange mechanisms.¹ These initiatives established valuable resources for the development of new crop and forage plant varieties but there were no uniform or binding arrangements for conserving and accessing these resources. A more formal and uniform arrangement to both facilitate the conservation and exchange of some crop and forage plant genetic materials and share the benefits is now addressed in the *International Treaty on Plant Genetic Resources for Food and Agriculture* ('PGRFA Treaty').² The Food and Agriculture Organization of the United Nations

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1 For a summary of these measures see Conference of the Parties to the Convention on Biological Diversity, *Progress Under the FAO Global System for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture*, UNEP/CBD/COP/3/15 (1996); Conference of the Parties to the Convention on Biological Diversity, *FAO Global System for Plant Genetic Resources for Food and Agriculture*, UNEP/CBD/COP/2/18 (1995).

2 Opened for signature 3 November 2001, [2002] ATNIF 14 (not yet in force); '[t]he Government proposes to deposit Australia's instrument of ratification as soon as practicable after the end of the tabling period': *International Treaty on Plant Genetic Resources for Food and Agriculture, National Interest Analysis* (2002) [4] (tabled in the House of Representatives on 3 December 2002); although note that the Parliament's response has not yet been finalised: 'The committee has informed the Minister for Foreign Affairs and the Minister for Agriculture, Fisheries and Forestry that additional time is required beyond the usual 20 sitting day period to consider the proposed treaty action. The additional time will allow the committee to consider concerns raised by key industry stakeholders, such as the Grains Council and Seed Industry Association of Australia, on the detailed financial, technical and policy implications of ratifying the [PGRFA Treaty]': Commonwealth, *Parliamentary Debates*, House of Representatives, 25 March 2003, 13 474 (Julie Bishop MP).

('FAO') adopted the PGRFA Treaty in 2001, although it has not yet entered into force.³ A separate and distinct PGRFA Treaty was the culmination of the re-negotiation of the United Nations' *International Undertaking on Plant Genetic Resources for Food and Agriculture*⁴ recognising 'the special nature of agricultural biodiversity, its distinctive features and problems needing distinctive solutions'.⁵

The PGRFA Treaty followed other related legally binding international agreements dealing with plant genetic materials generally and the various rights to access these materials and importantly, the protection of potential intellectual property rights over those materials.⁶ These agreements include:

- (a) The United Nations' *Convention on Biological Diversity* ('CBD')⁷ establishing, in part, a scheme for the conservation of biological diversity,⁸ its sustainable use and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and respect for intellectual property rights;⁹ and

³ *Adoption of the International Treaty on Plant Genetic Resources for Food and Agriculture and Interim Arrangements for its Implementation*, Res 3, UN FAO, 31st sess, conf (2001); see also Conference of the United Nations Food and Agriculture Organization, *International Undertaking on Plant Genetic Resources for Food and Agriculture*, C 2001/16 (2001); the PGRFA Treaty enters into force after the fortieth instrument of ratification, acceptance, approval or accession is deposited, at least twenty being from FAO members (art 28(1)); countries have agreed to continue inviting ratification: see, eg, 'Plan of Implementation of the World Summit on Sustainable Development', UN Report of the World Summit on Sustainable Development (2002) 6, 31 [40g].

⁴ *International Undertaking on Plant Genetic Resources*, Res 8, UN FAO, 22nd sess, conf (1983); agreed interpretations were subsequently adopted in 1989 (*Agreed Interpretation of the International Undertaking*, Res 4, UN FAO, 25th sess, conf (1989) and *Farmer's Rights*, Res 5, UN FAO, 25th sess, conf (1989)) and in 1991 (Res 3, UN FAO, 26th sess, conf (1991)) and annexed to the Undertaking.

⁵ Conference of the Parties to the Convention on Biological Diversity, *FAO Global System for the Conservation and Utilization of Plant Genetic Resources for Food and Agriculture*, Decision II/15, UNEP/CBD/COP/2/19 (1995) 26.

⁶ A useful statement of the applicable laws and policy issues relating to agriculture and under consideration in international fora are discussed in Michael Blakeney, 'Access to Genetic Resources, Gene-Based Inventions and Agriculture' (Study Paper No 3b, Commission on Intellectual Property Rights, 2002); Dwijen Rangnekar, 'Access to Genetic Resources, Gene-Based Inventions and Agriculture' (Study Paper No 3a, Commission on Intellectual Property Rights, 2002).

⁷ Opened for signature 5 June 1992, [1993] ATS 32 (entered into force generally and for Australia on 29 December 1993).

⁸ Biological diversity may be considered at three levels, genetic diversity, species diversity and ecosystem diversity: see Commonwealth Department of the Environment, Sport and Territories, *National Strategy for the Conservation of Australia's Biological Diversity* (1996) 1.

⁹ Aspects of the CBD are included in domestic Australian legislation as the *Environment Protection and Biodiversity Conservation Act 1999* (Cth), with access to genetic resources addressed in s 301; although there are a number of other laws that affect various other aspects of access: see, eg, *Wildlife Protection (Regulation of Exports and Imports) Act 1982* (Cth), *Customs (Prohibited Exports) Regulations 1958* (Cth).

- (b) The World Trade Organization's ('WTO') *Agreement on Trade-Related Aspects of Intellectual Property Rights* ('TRIPS')¹⁰ setting, in part, minimum standards for patents and a sui generis scheme for plant inventions, now reflected in domestic Australian legislation as 'exclusive rights' under the *Patents Act 1990* (Cth) ('*Patents Act*')¹¹ and the *Plant Breeder's Rights Act 1994* (Cth) ('*Plant Breeder's Rights Act*').¹²

The place of intellectual property rights is central to economic theory about allocating the scarce resources necessary to both conserve and efficiently exploit plant genetic resources for food and agriculture,¹³ with an assumption of overall economic benefit while at the same time having minimal social costs.¹⁴ Theoretically these intellectual property rights compensate for the disincentive to innovate with a limited

¹⁰ Marrakesh Agreement Establishing the World Trade Organisation [1995] ATS 8, Annex 1C (entered into force generally and for Australia 1 January 1995).

¹¹ The *Patents (World Trade Organization Amendments) Act 1994* (Cth) amended the *Patents Act 1990* (Cth) to be consistent with TRIPS by extending the patent term to 20 years, onus requirements for infringement proceedings, compulsory licenses and Commonwealth and State use of a patent; the statutory 'exclusive rights' under the *Patents Act* are, 'during the term of the patent, to exploit the invention and to authorise another person to exploit the invention' (*Patents Act 1990* (Cth) s 13(1)); these rights are 'personal property' that is 'capable of assignment and of devolution by law' (*Patents Act 1990* (Cth) s 13(2)); the term 'exploit', 'in relation to an invention, includes: (a) where the invention is a product — make, hire, sell or otherwise dispose of the product, offer to make, sell, hire or otherwise dispose of it, use or import it, or keep it for the purpose of doing any of those things; or (b) where the invention is a method or process — use the method or process or do any act mentioned in paragraph (a) in respect of a product resulting from such use': *Patents Act 1990* (Cth) sch 1.

¹² The *Plant Breeder's Rights Act 1994* (Cth) implements the *International Convention for the Protection of New Varieties of Plants*, opened for signature 19 March 1991, [2000] ATS 6 (entered into force generally 24 April 1998 and for Australia 20 January 2000) (based on 2 December 1961 agreement, as revised 10 November 1972 and 23 October 1978); the statutory 'exclusive rights' under the *Plant Breeder's Rights Act 1994* (Cth) are 'to do, or to license another person to do, the following acts in relation to propagating material of the variety: (a) produce or reproduce the material; (b) condition the material for the purpose of propagation; (c) offer the material for sale; (d) sell the material; (e) import the material; (f) export the material; (g) stock the material for the purposes described in paragraph (a), (b), (c), (d), (e) or (f)' (s 11), except private and non-commercial purpose acts (s 16(a)), experimental purposes (s 16(b)), the breeding of other plant varieties (s 16(c)) and conditioning for 'reproductive purposes' or reproduction (such as farm saved seeds): s 17.

¹³ This is an ongoing debate between at least two different views about the benefits of intellectual property rights: one view emphasises the need for more intellectual property rights to encourage more innovation, and the contrary 'monopoly distortions' view emphasises the costs of intellectual property rights as extracting too high a cost through monopoly distortion in the market; see generally Peter Drahos with John Braithwaite, *Information Feudalism: Who Owns the Knowledge Economy?* (2002); Christopher May, *A Global Political Economy of Intellectual Property Rights: The New Enclosures* (2000); Jay Kesan, 'Intellectual Property Protection and Agricultural Biotechnology: A Multidisciplinary Perspective' (2000) 44 *American Behavioural Scientist* 464.

¹⁴ The social costs are higher prices, restricted outputs, subsidised foreign inventors and the administrative costs of the schemes: see, eg, Industrial Property Advisory Committee, *Patents, Innovation and Competition in Australia: A Report to the Hon Barry O Jones MP Minister for Science and Technology* (1984) 13.

period of exclusivity that enables the innovator to recover the development costs (confounding the free riders).¹⁵ This compensation therefore encourages other beneficial innovation through investment in new developments (with the added benefit of disclosure of the innovation).¹⁶ Given that the conservation and exploitation of plant genetic resources for food and agriculture are vital to Australia's agricultural and environmental circumstances¹⁷ (and ensuring future global food security),¹⁸ intellectual property rights arguably address a possible market failure and procure the investment necessary to conserve, exploit and generate the new and improved plant genetic resources for food and agriculture.¹⁹ However, the interaction between the PGRFA Treaty, the CBD and TRIPS as they apply to the plant genetic resources for food and agriculture, and the role of intellectual property rights in and between these schemes remains unsettled.

This paper sets out to examine the consequences for Australia's agricultural policy settings for intellectual property arrangements over plant genetic resources for food and agriculture under the PGRFA Treaty and the CBD. This involves examining the conflict between accessing plant genetic resources for food and agriculture (predominantly germplasm) for crop and forage plant improvement and meeting the policy objectives of intellectual property laws to promote innovation and economically useful investment that privately appropriates these resources. The international schemes for access to genetic resources and intellectual property rights set out in the PGRFA Treaty, the CBD and TRIPS, provide a complicated patchwork for domestic policy makers. In domestic Australian laws these international arrangements are reflected in patents under the *Patents Act* and plant breeder's rights ('PBR') under the *Plant Breeder's Rights Act*, and the consequences of these statutory rights schemes in setting agricultural policy that satisfies Australia's commercial and environmental circumstances, as well as meeting its obligations under the PGRFA Treaty, the CBD and TRIPS.

The paper is structured as follows:

- 15 Such as, 'the uncertainty of payoff from R&D and innovative activity' and 'the limited ability of the inventor/innovator to appropriate profits arising from the use of the new knowledge generated': see *ibid* 12; Bureau of Industry Economics, 'The Economics of Patents' (Occasional Paper No 18, 1994) 13.
- 16 Trade Practices Commission, *Application of the Trade Practices Act to Intellectual Property* (1991) 8; for a review of the policy objectives of patenting see Thomas McCarthy, 'Intellectual Property and Trade Practices Policy: Coexistence or Conflict? The American Experience' (1985) 13 *Australian Business Law Review* 198, 200-3.
- 17 This is a regularly expressed contention; see for a recent topical example *National Interest Analysis*, above n 2, [5]-[8] (tabled in the House of Representatives on 3 December 2002): 'Australian food and agriculture sectors depend almost entirely on access to overseas sources for [plant genetic resources for food and agriculture] for continued plant improvement and development': at [7].
- 18 To meet the demands of an estimated two billion more humans by 2020 and the increasing demands of enlarging populations of urbanised and wealthy consumers — there appears to be a consensus in the literature with numerous commentary on these points; see, eg, Lloyd Evans, *Feeding the Ten Billion: Plants and Population Growth* (1998).
- 19 For a recent articulation of this viewpoint that asserts and assumes public benefits see Organisation for Economic Co-operation and Development, *Genetic Inventions, Intellectual Property Rights and Licensing Practices: Evidence And Policies* (2002) 19.

Part 2 outlines the PGRFA Treaty establishing a legally binding agreement for the conservation and exchange of certain listed plant genetic resources for food and agriculture through a Multilateral System of 'facilitated access'. In essence, the plant genetic resources for food and agriculture forming the Multilateral System under the PGRFA Treaty are accessible to Contracting Parties under standard materials transfer agreements ('MTAs') subject to a number of mandatory conditions, including the restriction that any patents and PBRs cannot be claimed over materials accessed from the Multilateral System while it remains 'in the form received from the Multilateral System'.²⁰ In the negotiation of the intellectual property provisions in the PGRFA Treaty Australia's stance was that it be able to continue to exercise its existing intellectual property rights in accordance with domestic and international law, and in particular the claiming of intellectual property rights over any genetic material 'which meets relevant standards',²¹ consistent with the minimum standards required by TRIPS. The likely consequence of this stance in Australia is that materials that cease to be 'in the form received from the Multilateral System' and that were originally accessed from the Multilateral System will be privately appropriated and removed from the Multilateral System through patents and PBRs. Related materials may also be appropriated as a consequence of patenting practices that allow broader claims than just the 'invented' materials;

Part 3 reviews the likely interaction between TRIPS and the CBD's scheme for access to plant genetic resources for food and agriculture and benefit-sharing. This remains a significant interaction until the PGRFA Treaty enters into force. The CBD currently applies to *all* dealings with plant genetic resources for food and agriculture and will continue to apply to *all* other plant genetic resources for food and agriculture that have not been included in the PGRFA Treaty's Multilateral System. These analyses find that the CBD is likely to apply subject to the minimum standards required by TRIPS so that countries seeking the fair and equitable sharing of the benefits arising out of the use of their genetic resources will be required to respect minimum intellectual property standards. Again, the likely consequence for Australia is the private appropriation of the plant genetic resources for food and agriculture;

Part 4 contends that the future technological solutions in Australia's agricultural landscape will include both classical breeding techniques and the applications of modern genetic techniques. Both these technological approaches require access to plant genetic resources for food and agriculture that will be sourced primarily from existing *ex situ* collections, *in situ* crop and forage plants predominantly maintained by farmers in developing countries, and the wild relatives of domesticated plants. Intellectual property rights are likely to have a significant role in the ways these resources are exploited and conserved. The most important difference being patents privately appropriate plant genetic resources for food and agriculture for the term of the patent, while PBR provides a more limited appropriation and expressly allows the resource to be used to develop new varieties. This presents a dilemma for Australia's policy makers, as Australia's agricultural landscape requires access to these plant genetic resources for food and agriculture. Patents are likely to further confound Australia's agricultural landscape through the need for complex negotiation with private rights

²⁰ PGRFA Treaty, opened for signature 3 November 2001, [2002] ATNIF 14, art 12(3)(d) (not yet in force); see further below, text accompanying nn 33–4.

²¹ See below, text accompanying n 39.

holders to access essential patented products and processes and the potentially adverse consequences of market concentration in particular agricultural sectors. Significantly, these patents are held predominantly by non-residents that in most circumstances will have an interest in avoiding competition in their domestic and foreign markets from Australian products. These patents and PBRs are also likely to undermine the objectives of the PGRFA Treaty, which seeks to provide 'facilitated access' to its Multilateral System, and the incentive for those holding valuable plant genetic resources for food and agriculture to contribute them to the Multilateral System. With an ineffective PGRFA Treaty, through a depletion of its useful materials, a failure of Contracting Parties to contribute materials to the Multilateral System or a failure to enter into force, the CBD scheme is likely to be the default scheme requiring the more onerous process of mutually agreed terms, prior informed consent and so on for access to important plant genetic resources for food and agriculture. The paper concludes that Australia's best interests are probably in achieving a successful PGRFA Treaty and reconsidering its stance in negotiating the implementation of the PGRFA Treaty to ensure access to key plant genetic resources for food and agriculture essential to Australia's agricultural competitiveness.

2 INTELLECTUAL PROPERTY RESTRICTIONS UNDER THE PGRFA TREATY

The PGRFA Treaty establishes a Multilateral System for access to the plant genetic resources for food and agriculture,²² subject to benefit sharing arrangements,²³ and recognising the 'sovereign rights of States over their own plant genetic resources for food and agriculture'.²⁴ The objective of the PGRFA Treaty is 'the conservation and sustainable use of plant genetic resources for food and agriculture and the fair and equitable sharing of the benefits arising out of their use, in harmony with the CBD, for sustainable agriculture and food security'.²⁵ The term 'plant genetic resources for food and agriculture' is broadly defined,²⁶ although in the context of the PGRFA Treaty it is confined to materials included in the Multilateral System that are the list of food crops and forages set out in Annex 1 (see Table 1).²⁷ This is further limited as these materials must also be 'under the management and control of the Contracting Parties and in the public domain'.²⁸ The *ex situ* collections of the Consultative Group on International Agricultural Research (CGIAR) system of International Agricultural Research Centres²⁹ and contributions by other resource holders³⁰ also form part of the Multilateral System.

²² Article 10(1).

²³ Article 10(2).

²⁴ Article 10(1).

²⁵ Article 1(1).

²⁶ Meaning 'any genetic material of plant origin of actual or potential value for food and agriculture' (art 2); the term 'genetic material' is defined to mean 'any material of plant origin, including reproductive and vegetative propagating material, containing functional units of heredity': art 2.

²⁷ Article 11(1).

²⁸ Article 11(2).

²⁹ Article 11(5); according to agreements determined between the Governing Body and International Agricultural Research Centres of CGIAR (art 15(1)): see Commission on

The materials forming the Multilateral System are accessible to Contracting Parties under standard MTAs between the Governing Body and the accessing party.³¹ The PGRFA Treaty imposes a number of mandatory conditions in these MTAs,³² including restrictions on claiming intellectual property rights:

Recipients shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System.³³

However, the meaning of this provision and its effect remain uncertain, particularly the meaning of the terms 'in the form received from the Multilateral System'. This ambiguity was reflected in the draft text,³⁴ and remained despite the reservations expressed during negotiations.³⁵ Australia's stance during these negotiations is instructive about its likely effect in practice and as an indication of how the Australian government is likely to implement its obligations under the PGRFA Treaty.³⁶

During negotiations, Australia commented about the place of intellectual property rights saying:

It will be important also to ensure that an appropriate balance is maintained between guaranteeing continued access to [plant genetic resources for food and agriculture] included in the Multilateral System, and preserving the ability of those carrying out research and development to adequately protect innovations developed using resources that have been accessed under the regime. In this regard, Australia supports the language contained in the second set of square-bracketed text (*in the form received*).³⁷

Australia then expressed some concern about the uncertainty of the language of the proposed intellectual property provision and problems in interpreting the text, and proposed an alternative text qualifying the terms 'in the form received from the Multilateral System':

Genetic Resources for Food and Agriculture, *Renewal of the Agreements Between the International Agricultural Research Centres of the CGIAR and FAO and Draft Revised Material Transfer Agreement*, CGRFA-9/02/20 (2002) 1; for a review of the CGIAR centres' structures and organisation see Jock Anderson, 'Selected Policy Issues in International Agricultural Research: On Striving for International Public Goods in an Era of Donor Fatigue' (1998) 26 *World Development* 1149.

30 Article 11(2); note that Contracting Parties also agreed to 'take appropriate measures to encourage natural and legal persons within their jurisdiction who hold plant genetic resources for food and agriculture listed in Annex I' to include such materials in the Multilateral System (art 11(3)), subject to possibly excluding these persons from future access to the Multilateral System (see art 11(4)).

31 Article 12(4).

32 Article 12(4).

33 Article 12(3)(d); the MTA conditions are to apply to subsequent transfers of the Multilateral System's materials: art 12(4).

34 Commission on Genetic Resources for Food and Agriculture, *Report of the Commission on Genetic Resources for Food and Agriculture*, CGRFA-Ex 6/01/REP (2001) app B(B9).

35 Council of the Food and Agriculture Organization of the United Nations, *International Undertaking on Plant Genetic Resources Information Pursuant to Rule XXI.1 of the General Rules of the Organization*, CL 121/5-Sup.1 (2001) 7.

36 Noting that the PGRFA Treaty obliges Contracting Parties to 'ensure the conformity of its laws, regulations and procedures with its obligations as provided in the [PGRFA] Treaty': art 4.

37 CL 121/5-Sup.1, above n 35, 6.

Table 1

TABLE 1: Plants in the Annex 1 list

Crop	Genus and observations	Crop	Genus and observations
Breadfruit	<i>Artocarpus</i> breadfruit only.	Asparagus	<i>Asparagus</i>
Oat	<i>Avena</i>	Beet	<i>Beta</i>
Brassica complex	<i>Brassica et al</i> Genera included are: <i>Brassica</i> , <i>Armoracia</i> , <i>Barbarea</i> , <i>Camelina</i> , <i>Crambe</i> , <i>Diplomatix</i> , <i>Eruca</i> , <i>Isatis</i> , <i>Lepidium</i> , <i>Raphanobrassica</i> , <i>Raphanus</i> , <i>Rorippa</i> , and <i>Sinapis</i> ... The species <i>Lepidium meyenii</i> (maca) is excluded.	Pigeon Pea	<i>Cajanus</i>
Chickpea	<i>Cicer</i>	Citrus	Citrus Genera <i>Poncirus</i> and <i>Fortunella</i> are included as root stock.
Coconut	<i>Cocos</i>	Major aroids	<i>Colocasia</i> , <i>Xanthosoma</i> (Major aroids include taro, cocoyam, dasheen and tania)
Carrot	<i>Daucus</i>	Yams	<i>Dioscorea</i>
Finger Millet	<i>Elaeagnus</i>	Strawberry	<i>Fragaria</i>
Sunflower	<i>Helianthus</i>	Barley	<i>Hordeum</i>
Sweet Potato	<i>Ipomoea</i>	Grass pea	<i>Lathyrus</i>
Lentil	<i>Lens</i>	Apple	<i>Malus</i>
Cassava	<i>Manihot</i> <i>Manihot esculenta</i> only.	Banana / Plantain	<i>Musa</i> Except <i>Musa textilis</i> .
Rice	<i>Oryza</i>	Pearl Millet	<i>Pennisetum</i>
Beans	<i>Phaseolus</i> Except <i>Phaseolus polyanthus</i> .	Pea	<i>Pisum</i>
Rye	<i>Secale</i>	Potato	<i>Solanum</i> Section <i>tuberosa</i> included, except <i>Solanum phureja</i> .
Eggplant	<i>Solanum</i> Section <i>melangena</i> included.	Sorghum	<i>Sorghum</i>
Triticale	<i>Triticosecale</i>	Wheat	<i>Triticum et al</i> including <i>Agropyron</i> , <i>Elymus</i> , and <i>Secale</i> .

Table 1 cont

Crop	Genus and observations	Crop	Genus and observations
Faba Bean / Vetch	Vicia	Cowpea et al	Vigna
Maize	Zea Excluding Zea perennis, Zea diploperennis, and Zea luxurians.	Astragalus	chinensis, cicer, arenarius
Canavalia	Ensiformis	Coronilla	varia
Hedysarum	Coronarium	Lathyrus	cicera, ciliolatus, hirsutus, ochrus, odoratus, sativus
Lespedeza	cuneata, striata, stipulacea	Lotus	corniculatus, subflorus, uliginosus
Lupinus	albus, angustifolius, luteus	Medicago	arbores, falcata, sativa, scutellata, rigidula, truncatula
Melilotus	albus, officinalis	Onobrychis	vicifolia
Ornithopus	Sativus	Prosopis	affinis, alba, chilensis, nigra, pallida
Pueraria	Phaseoloides	Trifolium	alexandrinum, alpestre, ambiguum, angustifolium, arvense, agrocicerum, hybridum, incarnatum, pratense, repens, resupinatum, rueppellianum, semipilosum, subterraneum, vesiculosum
Andropogon	Gajanus	Agropyron	cristatum, desertorum
Agrostis	Stolomifera, tenuis	Alopecurus	pratensis
Arrhenatherum	Elatius	Dactylis	glomerata
Festuca	arundinacea, gigantea, heterophylla, ovina, pratensis, rubra	Lolium	hybridum, multiflorum, perenne, rigidum, temulentum
Phalaris	aquatica, arundinacea	Phleum	pratense
Poa	alpina, annua, pratensis	Tripsacum	Laxum
Atriplex	halimius, nummularia	Salsola	vermiculata

These crop and forage plants are within the PGRFA Treaty's Multilateral System of 'facilitated access' if they are 'under the management and control of the contracting parties and in the public domain' (art 11(2)), within the *ex situ* collections of the CGIAR (art 11(5)) or contributions by other resource holders (art 11(2)): see Commission on Genetic Resources for Food and Agriculture, Report of the Commission on Genetic Resources for Food and Agriculture, CGRFA-Ex 6/01/REP (2001) Appendix B.

Recipients shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, including genetic parts and components, in the form received from the Multilateral System, acknowledging that genetic parts and components that have been modified, for example through isolation and purification, may be patentable provided that the criteria for patentability are met.³⁸

The justification for these suggestions was:

Australia's primary concern is to ensure that the final formulation of this provision is clear and enables Australia to continue to exercise its existing rights in accordance with domestic and international law. From an Australian perspective, it is essential that the final text allows continuation of our domestic policy permitting [intellectual property rights] protection for genetic material which meets relevant standards.³⁹

Canada,⁴⁰ the European Union,⁴¹ Japan,⁴² and the United States⁴³ expressed similar concerns.

38 Ibid.

39 Ibid.

40 Ibid 7-8.

41 Ibid 14.

42 Ibid 15.

43 Ibid 21; as a measure of its reservations the United States had called for a majority vote on removing the intellectual property provision entirely, but this was defeated 97 votes opposed, ten votes in support and three abstentions; despite these concerns the PGRFA Treaty was adopted by 116 votes in favour and two abstentions (Japan and the United States); Japan abstained on the basis it would consult with its capital on the consistency of the PGRFA Treaty, and in particular the operation of the intellectual property provision, while the United States abstained on the bases that the intellectual property provision failed to protect intellectual property rights necessary to promote innovation, and its reservations about the ambiguous language of the PGRFA Treaty and a failure to include an essential security clause (for a report on the negotiation and voting see ETC Group, 'The Law of the Seed' (2001) 3 *Translator* 1); the proposed United States' essential security provision: '[n]othing in this Undertaking shall be construed to prevent a Contracting Party from taking any action that it considers necessary for the protection of its essential security interests': CL 121/5-Sup.1, above n 35, 22); the United States later clarified that the absence of an essential security clause 'precluded' it from ever ratifying the PGRFA Treaty (with the effect of excluding the United States from further participation in the PGRFA Treaty's interim committee, although the United States has now signed the PGRFA Treaty (see The United States Mission to the United Nations Agencies in Rome, 'U.S. Signs the International Treaty on Plant Genetic Resources for Food and Agriculture' (Statement, 1 November 2002)) saying:

As a signatory to the Treaty, the United States will actively participate in the development of a standard material transfer agreement under the aegis of the Treaty. The benefit-sharing and intellectual property rights of this material transfer agreement will likely create a *de facto* global standard for agreements on international exchanges of plant genetic resources. The United States seeks to ensure that this agreement will be simple to administer and that it will promote, not impede, international exchanges of plant genetic resources. The decision to proceed with U.S. ratification, however, will depend on the satisfactory resolution of outstanding issues related to benefit-sharing, intellectual property rights and financial responsibilities.

See also The United States Mission to the European Union, 'U.S. Signs International Plant Genetic Resources Treaty' (Press Release, 6 November 2002).

The key intellectual property issue that remains unresolved is to what extent intellectual property rights may be claimed for plant genetic resources that have been originally accessed from the Multilateral System and the quantum of change necessary for materials accessed from the Multilateral System to cease to be 'in the form received from the Multilateral System'. This however, will be influenced by the interaction between the PGRFA Treaty and the CBD, and the likely application to the PGRFA Treaty of minimum standard intellectual property rights required by TRIPS.

The relationship between the PGRFA Treaty and the CBD remains to be determined by the Governing Body⁴⁴ and the Conference of the Parties to the CBD.⁴⁵ Presumably the plant genetic resources for food and agriculture accessed from the Multilateral System will substitute, where appropriate,⁴⁶ for the CBD's obligations of prior informed consent, mutually agreed terms, and so on.⁴⁷ This interpretation would be consistent with the PGRFA Treaty's attempt at 'facilitated access' to the Multilateral System's plant genetic resources for food and agriculture.⁴⁸

The Governing Body has not directly addressed the issue of the impact of intellectual property rights on the PGRFA Treaty at this stage,⁴⁹ although this issue goes to the heart of the PGRFA Treaty and is likely to be the determining factor in its entering into force as developed countries seek to privately appropriate the plant genetic resources for food and agriculture through intellectual property rights, and developing and least developed countries and *ex situ* collection holders (such as the CGIAR centres) seek adequate benefit-sharing and remuneration.⁵⁰ While Australia (like other developed countries including Japan and the United States) appears to support an interpretation that intellectual property rights may be claimed 'for genetic material which meets relevant standards',⁵¹ other countries favour an interpretation that excludes intellectual property rights over any material obtained under the Multilateral System, even where the relevant standards in national legislation have

44 The Governing Body, composed of all the Contracting Parties, implements the PGRFA Treaty and determines the details of its policy, programs and the distribution of the financial benefits from the Multilateral System: art 19.

45 The requirement to co-operate with the Conference of the Parties ('COP') to the CBD is recognised in the PGRFA Treaty: arts 1(1) and 19(3); further the COP to the CBD has already decided to establish and maintain cooperation with the FAO's Commission on Genetic Resources for Food and Agriculture acting as the Interim Committee for the PGRFA Treaty until entry into force and then with the Governing Body: see Conference of the Parties to the Convention on Biological Diversity, *The International Treaty on Plant Genetic Resources for Food and Agriculture*, Decision VI/6, UNEP/CBD/COP/6/20 (2002) 92.

46 Noting that some of the plant genetic resources for food and agriculture forming the Multilateral System are outside the scope of the CBD, such as the collections of the CGIAR centres acquired before 29 December 1993.

47 See art 16.

48 Articles 10(2) and 12.

49 Although the Governing Body is presently negotiating a standard MTA with the CGIAR centres that puts the PGRFA Treaty provision's words directly into the proposed MTA: see CGRFA-9/02/20, above n 29, Annex 1.

50 For a recent analysis of this conflict examining genetic resources under the CBD see Charles Lawson and Susan Downing, 'It's Patently Absurd - Benefit-Sharing Genetic Resources from the Sea under UNCLOS, the CBD and TRIPs' (2002) 5 *Journal of International Wildlife Law and Policy* 211.

51 See CL 121/5-Sup.1, above n 35, 6.

been satisfied.⁵² However, it seems likely that for Contracting Parties (and the other donors such as the CGIAR centres) contributing materials to the Multilateral System, with the expectation of benefit-sharing in the Multilateral System, they will need to adopt and respect minimum standard intellectual property rights consistent with TRIPS. The PGRFA Treaty itself also appears to support this view.

During negotiation of the PGRFA Treaty text Australia expressed the view that the PGRFA Treaty should '[exist] alongside and [complement] the rights and obligations under existing international instruments'⁵³ and that the proposed text did not reflect this and therefore created uncertainty:

Australia considers also that it is necessary and appropriate for the text to be redrafted to reflect the position that the [PGRFA Treaty] would not affect the rights and obligations contained in other existing international instruments.⁵⁴

A suggested text for a separate article making the PGRFA Treaty subservient to all other obligations⁵⁵ was rejected,⁵⁶ although its key sentiment was maintained in the PGRFA Treaty's Preamble, which provides:

Affirming that nothing in the [PGRFA] Treaty shall be interpreted as implying in any way a change in the rights and obligations of the Contracting Parties under other international agreements.

That is, the PGRFA Treaty would *not* change any existing obligations under the CBD and, most importantly TRIPS, as both the CBD and TRIPS have entered into force and bind Australia. The effect of this requirement is to impose the minimum patenting standards required by TRIPS. From Australia's perspective this presumably means that any change from 'in the form received from the Multilateral System' that satisfies the threshold criteria for patenting under the *Patents Act* or PBR under the *Plant Breeder's Rights Act* would be sufficient to satisfy both the PGRFA Treaty and TRIPS obligations.

In practice, the thresholds for patenting under the *Patents Act* or PBRs under the *Plant Breeder's Rights Act* are easily satisfied for biological materials so that statutory rights may be claimed over these plant genetic resources for food and agriculture, and their parts and components, with very, very little change (whether innovation or breeding).⁵⁷ This is significant as patent claims and/or PBRs⁵⁸ over materials that cease to be 'in the form received from the Multilateral System' may in effect:

⁵² For example, Norway considers that '[g]iven the fact that the backbone of the multilateral system now is material in the public domain, it is even more important to avoid any possibilities of "leakage" of material (or options for use) from the system': *ibid* 17.

⁵³ *Ibid* 7.

⁵⁴ *Ibid*.

⁵⁵ See CGRFA-Ex 6/01/REP, above n 34, app B(B5).

⁵⁶ See ETC Group, above n 43, 3.

⁵⁷ For an assessment of this claim see the various reports about patenting biological materials: Charles Lawson, 'Patenting Genes and Gene Sequences and Competition: Patenting at the Expense of Competition' (2002) 30 *Federal Law Review* 97; Charles Lawson and Catherine Pickering, 'Patenting Genetic Materials — Failing to Reflect the Value of Variation in DNA, RNA and Amino Acids' (2000) 11 *Australian Intellectual Property Journal* 69; Charles Lawson, 'Patenting Genetic Materials — Old Rules May Be Restricting the Exploitation of a New Technology' (1999) 6 *Journal of Law and Medicine* 373; Dianne Nicol, 'Should Human Genes be Patentable Inventions under Australian Law?' (1996) 3 *Journal of Law and Medicine* 231.

- (a) Remove the patented or PBRed materials from the public domain or the management and control of the Contracting Party and so outside the PGRFA Treaty's Multilateral System. These materials will then no longer be subject to the PGRFA Treaty's 'facilitated access' scheme;
- (b) Extend to the materials accessed from the Multilateral System,⁵⁹ as well as other materials within the Multilateral System, including materials that may only be vaguely related to the accessed materials,⁶⁰ where the patent broadly claims related materials; and
- (c) Remove subsequent improvements to the materials that cease to be a part of the Multilateral System unless the patent or PBR holder (or their successors) again contributes the materials to the Multilateral System.

The consequences of these arrangements for Australia's agricultural policy settings are considered further in Part 4. However, until the PGRFA Treaty enters into force, the CBD access scheme that deals with *all* genetic resources (except the *ex situ* collections before 29 December 1993) is the binding arrangement on Australia. Further, even after the PGRFA Treaty enters into force the CBD's scheme will apply to important crop and forage plants that do not form part of the PGRFA Treaty's Multilateral System. Table 2 sets out examples of plant genetic resources for food and agriculture that were expressly excluded from the Multilateral System during negotiation of the final PGRFA Treaty text. The effects of intellectual property rights under the CBD are therefore significant and an integral part of considering Australia's agricultural policy settings.

3 INTELLECTUAL PROPERTY RESTRICTIONS UNDER THE CBD

The CBD has the objective of conserving biological diversity (which includes genetic diversity), its sustainable use and the

fair and equitable sharing of the benefits arising out of the utilization of genetic resources including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding.⁶¹

⁵⁸ The *Patents Act 1990* (Cth) and *Plant Breeder's Rights Act 1994* (Cth) co-exist leaving the inventor or breeder to determine the best scheme to approach for their innovation; see IP Australia, *Australian Patents for Plants* (2002) 1.

⁵⁹ Such as a claim to a process for using parental strains to make the invention that is the F1 progeny: see, eg, DNA Plant Technology Corporation, *New Pepper Variety*, Australian Standard Patent Application 200143267 (2001).

⁶⁰ See for examples of broad claims to genetic materials Lawson, 'Patenting Genetic Materials', above n 57, 381-4.

⁶¹ Article 1.

Table 2

TABLE 2: Valuable plants presently outside the Annex 1 list

Crop	Genus and observations	Crop	Genus and observations
Onion, garlic, et al.	Allium	Groundnut / Peanut	Arachis
Oil Palm	Elaeis	Soybean	Glycine
Tomato	Lycopersicon	Sugarcane	Saccharum
Minor millets	This crop group includes genera Digitaria, Panicum, Setaria, Echinochloa, Paspalum, and Coix	Olive	Olea
Pear	Pyrus	Vine / Grapes	Vitis
Fruit trees (Prunus)	Prunus This genus includes apricot, peach, plum, cherry and almonds. Prunus africana is excluded.	Melon, cucumber	Cucumis
Pumpkins, squashes	Cucurbita	Flax	Linum
Celery	Apium	Asparagus	Asparagus
Papaya	Carica	Chestnut	Castanea
Chickory	Cichorium	Hazelnut	Corylus
Artichoke	Cynara	Carrot	Daucus
Buckwheat	Fagopyrum	Fennel	Foeniculum
Strawberry	Fragaria	American grapevine	Muscadinia=Vitis
Watercress	Nasturtium	Parsnip	Pastinaca
Avocado	Persea	Parsley	Petroselinum
Date palm	Phoenix	Rhubarb	Rheum
Currant	Ribes	Raspberry	Rubus
Black salsify	Scorzonera	Blueberry	Vaccinium
Okra, aibika	Abelmoschus	Kiwifruit	Actinidia
Aegilops	Aegilops	Amaranth	Amaranthus
Pineapple	Ananas	Calip	Canarium
Capsicum pepper	Capsicum	Quinoa	Chenopodium

Table 2 cont

Crop	Genus and observations	Crop	Genus and observations
Watermelon, egusi	Citrullus	Job's tears	Cola
Azadirachta	Crataegus	Quince	Cydonia
Durian	Durio	Malay apple	Eugenia
Fig	Ficus	Mangosteen	Garcinia
Cotton	Gossypium	Walnut	Juglans
Lettuce	Lactuca	Mango	Mangifera
Miscanthus	Miscanthus	Rambutan	Nephelium
Karika	Pandanus	Tomatillo, Cape gooseberry	Physalis
Pistachio	Pistacia		Punica
Winged bean	Psoralea	Pomegranate	Spinacia
Sesame	Sesamum	Spinach	Theobroma
Okara	Terminalia	Cocoa	

These crop and forage plants were expressly not included in the final listing of plant genetic resources for food and agriculture within the scope of the Multilateral System of 'facilitated access' proposed by the CGRFA Treaty; see Commission on Genetic Resources for Food and Agriculture, *Report of the Commission on Genetic Resources for Food and Agriculture*, CGRFA-Ex 6/01/REP (2001) Appendix E.

The term 'genetic resources' is broadly defined to mean 'genetic material of actual or potential value' and 'genetic material' means 'any material of plant, animal, microbial or other origin containing functional units of heredity'.⁶² Access to genetic resources is according to the authority of countries⁶³ with an obligation to facilitate access for 'environmentally sound uses' without imposing restrictions counter to the CBD's objectives.⁶⁴ Further, access must be from countries of origin or countries that have acquired the genetic resources according to the CBD,⁶⁵ on mutually agreed terms,⁶⁶ with prior informed consent,⁶⁷ and most importantly, taking

legislative, administrative or policy measures, as appropriate, and in accordance with Articles 16 [access to and transfer of technology] and 19 [handling of biotechnology and distribution of its benefits] and where necessary through the financial mechanism established by Articles 20 [financial resources] and 21 [financial mechanism] with the aim of sharing in a fair and equitable way the results of research and development and the benefits arising from the commercial and other utilization of genetic resources with the Contracting Party providing such resources.⁶⁸

In dealing with the access to and transfer of technology, the CBD provides:

Each Contracting Party, recognising that technology includes biotechnology, and that both access to and transfer of technology among Contracting Parties are essential elements for the attainment of the objectives of this Convention, undertakes subject to the provisions of this Article [16] to provide and/or facilitate access for and transfer to other Contracting Parties of technologies that are relevant to the conservation and sustainable use of biological diversity or make use of genetic resources and do not cause significant damage to the environment.⁶⁹

Where access to and transfer of technology are made to developing countries,⁷⁰ and the technology is 'subject to patents and other intellectual property rights, such access and transfer shall be provided on terms which recognize and are consistent with the adequate and effective protection of intellectual property rights'.⁷¹ For other countries (presumably developed countries), the access to and transfer of technology 'protected by patents and other intellectual property rights' in exchange for access to genetic resources must be 'in accordance with international law'.⁷² In each instance however:

The Contracting Parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this [CBD], shall cooperate in this regard

62 Article 2.

63 Article 15(1).

64 Article 15(2).

65 Article 15(3).

66 Article 15(4).

67 Article 15(5).

68 Article 15(7).

69 Article 16(1).

70 It 'shall be provided and/or facilitated under fair and most favourable terms, including on concessional and preferential terms where mutually agreed, and where necessary in accordance with the financial mechanism established by Articles 20 and 21': art 16(2); presumably this also includes the developing and least developed countries as distinguished by TRIPS art 66.

71 Article 16(2).

72 Article 16(3).

subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its objectives.⁷³

The CBD Secretariat's early review of the impact of intellectual property rights on the CBD's objectives reinforced the view that intellectual property rights are a favoured mechanism for achieving access and the equitable sharing of the benefits of genetic resources.⁷⁴ However, subsequent analysis by various CBD and WTO/TRIPS emanations has been unable to articulate a coherent view about the interaction of intellectual property rights and the CBD,⁷⁵ and the analysis continues.⁷⁶ This impasse probably reflects the negotiating positions of the various member countries⁷⁷ – developing countries argued that strong patents hindered technology transfer and disregarded the contributions of family farmers and therefore these countries generally favoured restricting patents,⁷⁸ while developed countries argued that strong patents created incentives to conserve biodiversity by encouraging technology transfer, investment and development.⁷⁹ The likely outcome is that countries providing access to their genetic resources according to the CBD in exchange for access to and transfer of technology (from predominantly developed countries) will need to adopt and respect minimum standard intellectual property rights.⁸⁰ For Australia these standards are articulated as patents under the *Patents Act* and PBRs under the *Plant Breeder's Rights Act* that are consistent with the minimum standards required by TRIPS.

The internationally contested inherent conflicts between TRIPS and the CBD are that TRIPS requires genetic materials be protected by patents or sui generis plant

⁷³ Article 16(5).

⁷⁴ Conference of Parties to the Convention on Biological Diversity, *The Impact of Intellectual Property Rights Systems on the Conservation and Sustainable Use of Biological Diversity and on the Equitable Sharing of Benefits from its Use*, UNEP/CBD/COP/3/22 (1996) 4.

⁷⁵ See, eg, Conference of Parties to the Convention on Biological Diversity, *Report of the Ad Hoc Open-Ended Working Group on Access and Benefit-Sharing*, UNEP/CBD/COP/6/6 (2001); Conference of Parties to the Convention on Biological Diversity, *Access and Benefit-Sharing as Related to Genetic Resources*, UNEP/CBD/COP/6/19 (2002); Ad Hoc Open Ended Working Group on Access and Benefit-Sharing, *Report on the Role of Intellectual Property Rights in the Implementation of Access and Benefit-Sharing Arrangements*, UNEP/CBD/WG-ABS/1/4 (2001); World Trade Organization Council for Trade-Related Aspects of Intellectual Property Rights, *The Relationship Between the TRIPS Agreement and the Convention on Biological Diversity – Summary of Issues Raised and Points Made*, IP/C/W/368 (2002) (and the references therein).

⁷⁶ See, eg, UNEP/CBD/COP/6/19, above n 75.

⁷⁷ See generally UNEP/CBD/COP/3/22, above n 74.

⁷⁸ Conference of Parties to the Convention on Biological Diversity, *The Convention on Biological Diversity and the Agreement on Trade-Related Intellectual Property Rights (TRIPS): Relationships and Synergies*, UNEP/CBD/COP/3/23 (1996) 4; eg, Malaysia declared: 'My delegation wishes to state that the terms of transfer of technology referred to in Article 16(2) do not fully reflect the position of my country which requires that such transfer should be specifically on concessional and preferential terms'; World Trade Organization Committee on Trade and Environment, *Environment and TRIPS*, WT/CTE/W/8 (1995) Annex 5.

⁷⁹ UNEP/CBD/COP/3/23, above n 78, 4; eg, the United States declared: '[i]t is deeply regrettable to us that ... a number of issues of serious concern in the United States have not been adequately addressed in the course of this negotiation. As a result, in our view, the test is seriously flawed in a number of important respects'. WT/CTE/W/8, above n 78, Annex 5.

⁸⁰ For a further analysis of this claim see Lawson and Downing, above n 50, 224.

variety rights and that this privately appropriates genetic resources over which a country has sovereign rights under the CBD,⁸¹ and does not also require the additional measures set out in the CBD, such as prior informed consent and benefit-sharing.⁸² A further concern is that patents over genetic materials and their applications appropriate genetic resources independently of the access scheme proposed by the CBD and that the benefits of these genetic resources are predominantly captured by non-resident rights holders.⁸³

However, the Conference of the Parties to the CBD ('COP') continues to develop and investigate practical measures to address access and benefit-sharing despite the interaction between the CBD and TRIPS remaining unresolved.⁸⁴ For example, the COP has adopted the *Bonn Guidelines on Access to Genetic Resources and Fair and Equitable Sharing of the Benefits Arising out of their Utilization* ('Bonn Guidelines')⁸⁵ as voluntary guidelines to implementing the CBD provisions about access and benefit-sharing. These guidelines are intended to apply to all genetic resources covered by the CBD (except human genetic resources),⁸⁶ apply in a manner that is 'coherent and mutually supportive of the work of relevant international agreements and institutions'⁸⁷ and be 'without prejudice' to the PGRFA Treaty.⁸⁸ The guidelines propose the establishment of a 'competent national authority'⁸⁹ and identify the responsibilities of Contracting Parties that are the origin of genetic resources and the implementation of mutually agreed terms.⁹⁰ The guidelines also set out the steps in the access and benefit-sharing process.⁹¹ While these guidelines do not appear to favour a specific approach to intellectual property rights, they are consistent with the COP's

⁸¹ Kenya, on behalf of the African Group, see World Trade Organization Council for Trade-Related Aspects of Intellectual Property Rights, *Review of the Provisions of Article 27.3(b) - Communication from Kenya on Behalf of the African Group*, IP/C/W/163 (1999); see also IP/C/W/368, above n 75, 2.

⁸² World Trade Organization Council for Trade-Related Aspects of Intellectual Property Rights, *Minutes of Meeting Held in the Centre William Rappard on 21 and 22 September 2000*, IP/C/M/28 (2000) 43; see also IP/C/W/368, above n 75, 2.

⁸³ See Charles Lawson and Catherine Pickering, 'Controlling Access to Genetic Resources under the Environment Protection and Biodiversity Conservation Act 1999 (Cth) Requires an Assessment of the Effects of the Patents Act 1990 (Cth)' (2002) 13 *Australian Intellectual Property Journal* 109; Lawson and Downing, above n 50; Charles Lawson and Catherine Pickering, 'The Conflict for Patented Genetic Materials under the Convention on Biological Diversity and the Agreement on Trade Related Aspects of Intellectual Property Rights' (2001) 12 *Australian Intellectual Property Journal* 104.

⁸⁴ For example, the COP resolved to invite 'the World Trade Organization to acknowledge relevant provisions of the [CBD] and to take into account the fact that the provisions of the [TRIPS] and the [CBD] are interrelated and to further explore this interrelationship': Conference of Parties to the Convention on Biological Diversity, *Access to Genetic Resources*, Decision V/26B, UNEP/CBD/COP/5/23 (2000) 200.

⁸⁵ Conference of Parties to the Convention on Biological Diversity, *Access and Benefit-Sharing as Related to Genetic Resources*, Decision VI/24A, UNEP/CBD/COP/6/20 (2002) 262.

⁸⁶ Article 9.

⁸⁷ Article 10.

⁸⁸ Article 10.

⁸⁹ Article 14.

⁹⁰ Article 16.

⁹¹ Articles 22-50.

view (together with the World Intellectual Property Organization,⁹² the TRIPS Council⁹³ and the Australian government⁹⁴ among others) that contracts addressing intellectual property rights and other matters between the resource holder and the exploiter dealing with the access and benefit-sharing arrangements are preferable.⁹⁵ Despite these developments, significant concerns from the developing countries about the effect of intellectual property rights and equitably sharing the benefits remain unresolved.⁹⁶

Further, there are some significant limitations to the CBD's access scheme as it does not apply to *ex situ* collections before 29 December 1993 when the CBD entered into force⁹⁷ and it does not bind all countries (most notably the United States).⁹⁸ Thus access to these resources will require separate access negotiation with no agreed frameworks under the CBD.

The likely consequences for accessing materials under the CBD's scheme will be negotiating an access agreement with the resource holder in the country of origin according to the CBD and voluntary guidelines, an access agreement with the acquirer of those resources where access was in accordance with the CBD, or a separate access agreement with the resource holder where the resource is outside the scope of the CBD. In each instance, the use of the accessed materials and the use of subsequent improvements will be according to the terms of the access agreement. As these agreements can be expected to be predominantly between developed countries with technology that can use the genetic resources, intellectual property rights are likely to be consistent with, at least, the minimum standards required by TRIPS and favoured by the developed countries. The consequences of these arrangements for Australia's agricultural policy settings are considered further in Part 4.

⁹² See, eg, Intergovernmental Committee on Intellectual Property and Genetic Resources, Traditional Knowledge and Folklore of the World Intellectual Property Organization, *Operational Principles for Intellectual Property Clauses of Contractual Agreements Concerning Access to Genetic Resources and Benefit-Sharing*, WIPO/GRTKF/IC/2/3 (2001).

⁹³ See, eg, IP/C/W/368, above n 75.

⁹⁴ See Environment Australia, *Commonwealth Public Inquiry into Access to Biological Resources in Commonwealth Areas* (2000); regulations have been proposed to put the outcome of contracting into effect.

⁹⁵ See UNEP/CBD/COP/6/6, above n 75.

⁹⁶ See, eg, the recent Cancun Declaration by like-minded mega-diversity countries seeking to protect their particular interests as a block: Conference of Parties to the Convention on Biological Diversity, *Cancun Declaration of Like-Minded Mega-Diversity Countries*, UNEP/CBD/COP/6/INF/33 (2002).

⁹⁷ See Conference of Parties to the Convention on Biological Diversity, *Access to Genetic Resources and Benefit-Sharing: Legislation, Administrative and Policy Information*, UNEP/CBD/COP/2/13 (1995) 17.

⁹⁸ The other countries that have not ratified, accepted or approved are Albania, Andorra, Bosnia and Herzegovina, Brunei Darussalam, Cambodia, Equatorial Guinea, Eritrea, Georgia, Holy See, Iraq, Kiribati, Kyrgyzstan, Lao People's Democratic Republic, Niue, Palau, Saint Lucia, Saint Vincent and the Grenadines, Saudi Arabia, Sierra Leone, Somalia, Tajikistan, Thailand, The Former Yugoslav Republic of Macedonia, Tonga, Turkmenistan and Uzbekistan.

4 CONCLUSIONS

Patents and PBRs are a blunt economic tool to promote investment in useful innovations and address innovation market failure. Their suitability to second-order developed economies, like Australia, is still open to speculation with consequences for the policy settings that might be adopted in implementing the intellectual property requirements of the PGRFA Treaty and CBD. Thus:

There are legitimate reasons to be concerned about the highly protective [patenting] standards that have emerged recently in the United States and the European Union. These laws and judicial interpretations provide broad patent protection for ... biotechnological inventions ... It remains to be seen whether such standards tilt the balance within those jurisdictions toward the private rights of inventors and away from the needs of competitors and users. It is not too early to claim that they are inappropriate for developing economies and net technology importers.⁹⁹

Significantly, Australia is a net technology importer,¹⁰⁰ and whilst its status as a developed country is certain, its economy is of a very different order to the United States, Japan and the United Kingdom, which are the first-order developed nations.¹⁰¹ Further, analyses of patent grants between other developed countries (such as the member countries of the Organisation for Economic Co-operation and Development ('OECD'); see Table 3) and among Australia's major agricultural export destinations (see Table 4) shows that the United States and Japan patent considerably more than other countries. Significantly, of Australia's major agricultural export destinations, the United States holds the majority of non-resident patent grants (approximately 64 per cent) and non-resident PBR registration (approximately 51 per cent; see Table 5). Further, the United States holds a significant proportion of Australia's total patent grants (approximately 44 per cent of total patent grants and 49 per cent of non-resident

⁹⁹ Keith Maskus, *Intellectual Property Rights in the Global Economy* (2000) 237-8.

¹⁰⁰ See, eg, the compiled data of trade in patent-dependant goods presented in John Revesz, 'Trade-Related Aspects of Intellectual Property Rights' (Staff Research Paper, Productivity Commission, 1999) 61:

comparing the Australian data with the overseas data from 1989 reveals that in recent years, Australia has a greater proportion of imports which are patent-related than any of the other countries examined. Our share of patent-related goods in exports is lower than in most industrialised countries, and comparable to that of a semi-industrialised country like Portugal. The reason for this is Australia's traditional reliance on the exports of primary commodities and the imports of elaborately transformed manufactures. The difference between patent-related exports and imports has in fact narrowed in recent years. It is worth noting from the figures that the share of patent-related exports in trade is particularly high in the leading technology exporting countries such as the United States, Japan, United Kingdom and Germany (at 62).

¹⁰¹ For example, Gross Domestic Product ('GDP') at 1995 prices and 1995 exchange rates for 2002 in billions of United States dollars: Australia - 484.6, United States - 9186.0, Japan - 5606.5, Canada - 741.4 and United Kingdom - 1354.9; Organisation for Economic Co-operation and Development, *Main Economic Indicators* (March 2003) 247; while the value added in agriculture as a per cent of GDP (including hunting, forestry and fishing) for a similar period: Australia - 3.5, United States - 1.6, Japan - 1.3, Canada - 2.6 and United Kingdom - 0.9; Organisation for Economic Co-operation and Development, *Main Economic Indicators* (December 2002) 272-5.

Table 3

TABLE 3: Comparison of number of patent applications filed and grants made as a percentage of totals for residents and non-residents for the Organisation for Economic Co-operation and Development (OECD) countries in descending order of total patent grants

Country	Patent applications		Total applications (100%)	Patent grants		Total grants (100%)
	Resident (%)	Non-resident (%)		Resident (%)	Non-resident (%)	
United States	52.9	47.1	331,773	54.0	46.0	157,496
Japan	80.0	20.0	486,204	89.2	10.8	125,880
Germany	30.0	70.0	262,550	40.6	59.4	41,585
France	13.4	86.6	160,178	28.3	71.7	36,404
Rep of Korea	42.6	57.4	172,184	65.6	34.4	34,956
United Kingdom	14.4	85.6	233,223	12.4	87.6	33,756
Italy	7.6	92.4	151,188	23.4	76.6	24,937
Netherlands	5.2	94.8	144,341	16.5	83.5	17,052
Spain	1.9	98.1	202,439	10.9	89.1	15,809
Australia	12.8	87.2	80,721	9.3	90.7	13,916
Sweden	5.0	95.0	204,173	15.1	84.9	13,812
Switzerland	3.5	96.5	201,574	11.0	89.0	12,258
Belgium	1.3	98.7	141,766	6.2	93.8	12,122
Canada	6.4	93.5	85,926	9.2	90.8	12,125
Austria	1.5	98.5	201,030	0.4	99.6	11,266
Denmark	1.7	98.3	200,652	3.7	96.3	8,484
Portugal	0.06	99.94	198,700	0.8	99.2	6,354
Greece	0.04	99.96	140,540	0.05	99.95	6,059
Ireland	0.2	99.8	140,519	0.6	99.4	5,916
Luxembourg	0.1	99.9	198,631	1.1	98.9	5,901
New Zealand	3.3	96.7	67,938	11.9	88.1	4,587
Finland	1.5	98.5	198,293	1.0	99.0	2,557
Poland	3.7	96.3	64,873	38.1	61.9	2,463

Table 3 cont

Country	Patent applications		Patent grants	
	Resident (%)	Non-resident (%)	Resident (%)	Non-resident (%)
				Total grants (100%)
Norway	2.7	97.3	16.4	83.6
Czech Republic	0.9	99.1	16.9	83.1
Hungary	1.4	98.6	11.0	89.0
Turkey	0.4	99.6	2.2	97.8
Slovak Republic	0.4	99.6	9.3	90.7
Iceland	0.09	99.91	12.5	87.5
				Total grants (100%)
				2,412
				1,611
				1,605
				1,157
				894
				16

Data compiled from the World Intellectual Property Organization, *Intellectual Property Statistics for 2000*, IP/STAT/2000/B (2000) Table 1 Patents. The data illustrate the quantitative differences in patent grants by the United States and Japan and that the majority of patent grants are made to non-residents except in the United States, Japan and South Korea.

TABLE 4: Australia's major exports of agriculture (excluding fisheries, forestry and rubber) in 2002

Destination (**)	A\$b	Rank	% share (***)	Patent grants		Total
				Resident	Non-resident	
Japan	3.8	1	12.8	112,269	13,611	125,880
United States	3.3	2	11.1	85,071	72,425	157,496
China	2.3	3	8.0	6,475	6,881	13,356
United Kingdom	1.2	4	4.2	4,170	29,586	33,756
Rep of Korea	1.2	5	4.0	22,943	12,013	34,956
Indonesia	1.1	6	3.8	*	*	*
New Zealand	1.0	7	3.5	547	4,040	4,587
Taiwan	0.8	8	2.8	*	*	*
Saudi Arabia	0.7	9	2.4	2	6	8
Italy	0.6	10	2.2	4,726	20,211	24,937
Singapore	0.6	11	2.2	110	4,980	5,090
Philippines	0.6	12	2.1	8	558	566
Malaysia	0.6	13	2.0	*	*	*
Canada	0.6	14	1.9	1,117	11,008	12,125
Thailand	0.6	15	1.9	153	388	541

* None recorded by WIPO.

** Agricultural exports by destination and excluding fisheries, forestry and rubber.

*** Per cent share of total agricultural exports excluding fisheries, forestry and rubber.

Data compiled from the Department of Foreign Affairs and Trade (http://www.dfat.gov.au/trade/negotiations/trade_in_agriculture.html#aaebd) at 27 August 2003) and World Intellectual Property Organization, *Intellectual Property Statistics for 2000*, IP/STAT/2000/B (2000) Table I Patents. The data illustrate quantitatively that Japan and the United States are major export destinations for Australian agriculture and that those destinations are also the major patenters.

patent grants in Australia in 2000; Tables 3 and 5) and PBR registrations (approximately 16 per cent in 2000; Tables 5 and 6) compared to other countries. In contrast, Japan is marked by a majority of resident patent grants (approximately 89 per cent; Table 3) and limited non-resident patenting (approximately 13 per cent of non-resident patent grants in Australia; Table 5). The United Kingdom and other OECD countries (see Tables 3 and 5) are in a similar position to Australia with the majority of patent grants to non-residents (between approximately 60 and 99 per cent; Table 3) and United States residents holding the majority of these non-resident grants.¹⁰² In these circumstances the policy considerations about the place of intellectual property rights in Australian agriculture are different to those of the first-order developed countries (such as the United States and Japan). They are also different to those of developing and least developed countries.¹⁰³ Thus, the benefits and costs to Australia in implementing the PGRFA Treaty and the access and benefit-sharing scheme in the CBD are unlikely to be those of the first-order developed countries or the developing (or least developed) countries, but rather a compromise that reflects Australia's particular commercial and environmental interests. The particular interrelated issues that Australia faces are:

- (a) Non-residents holding the majority of patents (see Table 3) and PBRs (see Table 6) in Australia, so residents can increasingly be expected to have to negotiate with non-resident rights holders (and most probably United States residents; see Tables 3 and 5) to access and use their protected useful plant genetic resources for food and agriculture, and most importantly, the know-how and other technology to make and then use those protected genetic resources. These non-resident intellectual property rights reduce the likely economic benefit to Australia from agricultural exports as there will be further economic rents from patents and PBR royalties over accessed and used plant genetic resources for food and agriculture;
- (b) The evolving market structures for global agriculture show a consolidation of corporations,¹⁰⁴ in particular the seed market, with real increases in seed prices in recent decades compared to yields.¹⁰⁵ Further, multi-national seed corporations relying on economies of scale are likely to undertake their variety development and seed production activities in a limited number of locations.¹⁰⁶ The effect of this market concentration is likely to be higher priced seeds and germplasm and directed to a limited number of crop and forage plants suited to environments of the major high value markets in North America and Europe;

¹⁰² See World Intellectual Property Organization, *Intellectual Property Statistics for 2000*, IP/STAT/2000/B (2000) Table I Patents.

¹⁰³ For an alternative analysis of patent applications and grants among the developing and least developed countries that hold most of the world's genetic diversity see Lawson and Downing, above n 50.

¹⁰⁴ There is a considerable literature on this matter: see, eg, Richard Hindmarsh, 'Consolidating Control: Plant Variety Rights, Genes and Seeds' (1999) 44 *Journal of Australian Political Economy* 58; William Lesser, 'Intellectual Property Rights and Concentration in Agricultural Biotechnology' (1998) 1 *AgBio Forum* 56.

¹⁰⁵ See review in Rangnekar, above n 6, 13-14 (and the references therein).

- (c) As a consequence of market concentration, increasing patent holdings over plant genetic resources for food and agriculture in the earliest stages of crop and forage plant development have the potential to control the subsequent steps in the commercial exploitation of the new variety through vertical integration and restrictive contractual access practices.¹⁰⁷ Pro-competition measures that seek to limit the anti-competitive effects of vertical integration and restrictive practices are also unlikely to limit activities within the 'purpose and scope' of the patent or PBR in Australia.¹⁰⁸ Without the protection of effective pro-competition laws, Australian agriculture can expect to pay higher prices and enjoy limited access, especially where Australian agricultural products might be competing against other markets also supplied by the same (or related) intellectual property rights holders;
- (d) As a further consequence of market concentration and the increased focus of those corporations on crops amenable to appropriation and developed for exclusive agro-ecological zones, the role of research in Australia to develop plant varieties suited to Australia's environment will be vital. It is uncertain that private sector research can or will develop varieties suitable to Australia's environment and its interests. Thus, public sector research is likely to be vital to developing new plant varieties from elite germplasm and these will incur additional expense and restrictions if the plant genetic resources for food and agriculture are not freely available; and
- (e) The relatively few crop and forage plants with a high commercial value are likely to attract the major attention of those seeking to commercialise and dominate the particular commodity or niche markets of developed countries. The breeding effort undertaken by the increasingly consolidated agricultural corporations tends to be on a few high value crops amenable to appropriation and developed for exclusive agro-ecological zones.¹⁰⁹ With many and diffuse patents and PBRs over plants and plant varieties (including patent 'clustering' and 'bracketing'),¹¹⁰ potential users will be required to determine the scope of uncertain rights and then negotiate successfully with all the relevant parties for products and processes that may not be best suited to Australia. This poses significant problems for Australian breeders and exporters as they will be required to negotiate access to develop new varieties whose products are likely to compete against the original rights holders in their domestic and foreign markets. Again, it is not certain that Australia's competition laws are adequate to ensure reasonable access and use of non-resident patented and PBRed plant genetic materials for food and agriculture.

¹⁰⁶ See Frederic Scherer and David Ross, *Industrial Market Structure and Economic Performance* (3rd ed, 1990) 625-6.

¹⁰⁷ For a detailed analysis of the value chain and the role of patents see Kesan, above n 13, 466-76.

¹⁰⁸ See, eg, an analysis of the limitations of the *Trade Practices Act 1974* (Cth) applying to patented genes and gene sequences: Lawson, 'Patenting Genes and Gene Sequences and Competition', above n 57, 115-28.

¹⁰⁹ See Rangnekar, above n 6, 15.

¹¹⁰ See generally Ove Granstrand, *The Economics and Management of Intellectual Property: Towards Intellectual Capitalism* (1999).

Table 5

TABLE 5: A comparison of country of origin of non-residents receiving Australian patent grants (2000 data) and PBR registrations (2000 data) among Australia's major export destination of agriculture products (excluding fisheries, forestry and rubber) in 2002

Australia's agricultural exports by destination	Rank	% share of total agricultural exports (***)	PATENT GRANTS IN AUSTRALIA		PBR REGISTRATIONS IN AUSTRALIA	
			Number	% Total (approximate)	Number	% Total (approximate)
Japan	1	12.8	1,231	13	12	15
United States	2	11.1	6,072	64	41	51
China	3	8.0	401	4	**	-
United Kingdom	4	4.2	944	10	9	11
Rep of Korea	5	4.0	114	1	**	-
Indonesia	6	3.8	*	-	**	-
New Zealand	7	3.5	108	1	14	17
Taiwan	8	2.8	*	-	**	-
Saudi Arabia	9	2.4	*	-	3	4
Italy	10	2.2	190	2	**	-
Singapore	11	2.2	*	-	**	-
Philippines	12	2.1	*	-	**	-
Malaysia	13	2.0	*	-	**	-
Canada	14	1.9	260	3	2	2
Thailand	15	1.9	*	-	**	-

* None recorded by WIPO, although these data will be included in the 'Others' that was 187 patent grants in 2000 or 2%.

** None recorded by WIPO.

*** Excluding fisheries, forestry and rubber.

This Table includes data from Tables 3, 4 and 6. The data illustrate quantitatively that Japan and the United States are major export destinations for Australian agriculture and that the United States residents hold the majority of these non-resident patents and PBRs in Australia.

Table 6

TABLE 6: Comparison of number of PBR applications and registration made as a percentage of totals for resident and non-resident for the Organisation for Economic Co-operation and Development (OECD) countries in descending order of total grants

Country	PBR APPLICATIONS			PBR REGISTRATIONS		
	Resident (%)	Non-resident (%)	Total applications (100%)	Resident (%)	Non-resident (%)	Total registrations (100%)
Japan	68.6	31.4	927	68.8	31.2	984
United States	54.2	45.8	1083	56.0	44.0	796
Netherlands	83.6	16.4	752	85.5	14.5	523
France	92.6	7.4	497	87.4	12.6	451
Poland	31.3	68.7	319	23.6	76.4	386
Australia	40.5	51.5	379	45.6	54.4	252
Canada	17.0	83.0	405	17.6	82.4	193
Germany	86.7	11.3	336	79.2	20.8	192
United Kingdom	63.1	36.9	252	67.1	32.9	155
Belgium	70.0	30.0	10	41.5	58.5	142
New Zealand	29.6	70.4	189	33.9	66.1	121
Spain	59.6	40.4	57	58.8	41.2	68
Switzerland	8.7	91.3	104	12.3	87.7	73
Czech Republic	45.2	54.8	73	28.6	71.4	49
Hungary	31.4	68.6	51	36.7	63.3	49
Slovak Republic	31.4	68.6	51	36.7	63.3	49
Denmark	47.4	52.6	38	51.3	48.7	39
Sweden	95.3	4.7	43	85.2	14.8	27
Norway	15.4	84.6	26	50.0	50.0	24
Finland	70.6	29.4	17	*	4	4

Table 6 cont

Country	PBR APPLICATIONS			PBR REGISTRATIONS		
	Resident (%)	Non-resident (%)	Total applications (100%)	Resident (%)	Non-resident (%)	Total registrations (100%)
Portugal	100.0	*	8	*	*	*
Ireland	100.0	*	6	*	*	*
Rep of Korea	*	*	*	*	*	*
Italy	*	*	*	*	*	*
Austria	*	*	*	*	*	*
Greece	*	*	*	*	*	*
Luxembourg	*	*	*	*	*	*
Turkey	*	*	*	*	*	*
Iceland	*	*	*	*	*	*

* None recorded by WIPO.

Data compiled from the World Intellectual Property Organization, *Intellectual Property Statistics for 2000*, IP/STAT/2000/B (2000) Table I Plant Varieties. The data illustrate the quantitative differences in PBR registrations by the United States and Japan and that there is no clear pattern of non-resident PBR registrations between residents and non-residents in the OECD.

Thus, the significant issue for developing new plant varieties for Australia's agricultural and environmental landscape is whether patent holders of plant varieties do in fact limit breeding, either expressly by refusing access to their invention, or in effect by breeders giving up or failing to commence new development where the plant genetic resources for food and agriculture are covered by patents. Unfortunately there is no evidence in Australia to address this issue, although there is experience in other related commercial endeavours in Australia where patents have deterred further innovation,¹¹¹ and some evidence that restricting patent scope may promote incremental, or follow-on innovation, that is beneficial for second-order economies like Australia.¹¹² Further there have been very limited policy analyses of the potential benefits of maintaining a distinction between the subject matter of patents and PBR¹¹³ and ensuring access to the plant genetic resources for food and agriculture necessary for incremental plant breeding to meet Australia's particular circumstances.¹¹⁴ The analysis of patent grants and PBR registrations in Australia by non-residents compared with Australia's major export destinations (see Table 5) also suggests Australia's interests might not favour strong patent and PBR rights unless there is proper disclosure through an adequate description and access to the necessary know-how to work the protected materials and processes to use those materials, and the patented technology does in practice improve agricultural efficiency and competitiveness. Without further analysis, the apparent assumption of Australia's negotiators of overall benefit from the intellectual property provisions in the PGRFA Treaty, and Australia's

¹¹¹ See, eg, Genentech's withdrawal from research into erythropoietin once the gene patent had been granted to Amgen: see Lawson and Pickering, 'Patenting Genetic Material', above n 57, 76.

¹¹² See Ted O'Donoghue, Suzanne Scotchmer and Jacques-François Thisse, 'Patent Breadth, Patent Life, and the Pace of Technological Progress' (1998) 7 *Journal of Economics and Management Strategy* 1; Suzanne Scotchmer and Jerry Green, 'Novelty and Disclosure in Patent Law' (1990) 21 *RAND Journal of Economics* 131; Intellectual Property and Competition Review Committee, *Review of Intellectual Property Legislation Under the Competition Principles Agreement* (2000) 138-9; further, the Industry Commission concluded empirical data from Australia and overseas showed patents had limited commercial importance, had limited effectiveness, delayed imitation, failed to provide adequate disclosure and that innovation spill over was limited: see Nicholas Gruen, Ian Bruce and Gerard Prior, 'Extending Patent Life: Is it in Australia's Economic Interests?' (Staff Information Paper, Industry Commission, 1996).

¹¹³ For examples, the Rural Industries Research and Development Corporation deals with PBR as if they were the same as patents and attempts no separate analysis: John Asker and Andrew Stoeckel, 'Intellectual Property in Agricultural Trade' (Rural Industries Research and Development Corporation, 1999); the House of Representatives Standing Committee on Primary Industries and Regional Services, Parliament of Australia, *Work in Progress: Proceed with Caution - Inquiry into Primary Producer Access to Gene Technology* (2000), said in considering patents and plant breeder's rights over genetically modified organisms 'it would not be in the interests of Australian agriculture overall to change the current arrangements' (at 114), although there was no analysis of the interaction between patents and plant breeder's rights and the reasons for this conclusion were not presented.

¹¹⁴ A notable exception has been the Expert Panel on Breeding, *Clarification of Plant Breeding Issues Under the Plant Breeder's Rights Act 1994* (2002) 26-8, although this analysis was brief and inconclusive: '[t]he effect of the [Plant Breeder's Rights Act] should be to encourage breeders and biotechnologists to work cooperatively to [their] mutual benefit, and should not alienate the parties by polarising their efforts': at 28.

adoption of the same stance as first-order developed countries, is open to question. This stance is also reflected in Australia's participation in the COP to the CBD and their implementations of the CBD's access requirements.¹¹⁵ However, there is sufficient evidence available to suggest that the assumed benefits of plant and plant variety patenting may be interfering with plant breeding to warrant further policy analysis.¹¹⁶ For example, an informal survey of public plant breeders in the United States showed significant difficulty in obtaining genetic stocks from private companies, impeded research, impeded release of new plant varieties and impeded student training,¹¹⁷ and an econometric analysis of United States PBR legislation concluded the statutory rights served primarily as a marketing tool with little impact on excludability or appropriability, with no increase in private sector investment and no increase in experimental or commercial yields.¹¹⁸ Australia's PGRFA Treaty stance might in fact lead to unnecessary costs on Australian agriculture and the failure to generate useful new varieties suited to Australia and its particular agricultural landscape.¹¹⁹

Perhaps, most importantly, Australia's future agricultural landscape requires access to plant genetic resources for food and agriculture including both inter-specific and intra-specific species diversity,¹²⁰ and the genetic diversity that may be accessed using modern genetic techniques.¹²¹ These useful resources might be categorised for the purposes of crop and forage plant improvement by the techniques used to exploit the diversity:

- (a) Modern genetic (or molecular biology) techniques -- where there is the introduction of new genetic materials (from all sources) into an existing crop or forage plant variety.¹²² This variety has often been classically (or conventionally)

¹¹⁵ For an analysis and criticism of Australia's implementation of the CBD's access scheme in the *Environmental Protection and Biodiversity Conservation Act 1999* (Cth) s 301 see Lawson and Downing, above n 50, 228-30.

¹¹⁶ For analyses of the patenting activity in key crops in the United States see Peter Philips and Dan Dierker, 'Public Good and Private Greed: Realising Public Benefits from Privatised Global Agrifood Research' in Philip Pardey (ed), *The Future of Food: Biotechnology Markets and Policies in an International Setting* (2001) 129, 131.

¹¹⁷ Steven Price, 'Public and Private Plant Breeding' (1999) 17 *Nature Biotechnology* 938.

¹¹⁸ Julian Alston and Raymond Venner, 'The Effects of the US Plant Variety Protection Act on Wheat Genetic Improvement' (EPTD Discussion Paper No 62, International Food Policy Research Institute, 2000); see also Rangnekar, above n 6, 9-12; for a contrasting view see Greg Traxler, 'Balancing Basic Genetic Enhancement and Cultivar Development Research in an Evolving US Plant Germplasm System' (1999) 2 *AgBio Forum* 43, although this latter paper, like many others promoting the benefits of plant intellectual property rights, fails to provide empirical data or analysis in support of its assertions.

¹¹⁹ See, eg, the critique of James Boyle, *Shamans, Software and Spleens - Law and the Construction of the Information Society* (1996) 197: '[t]he blandishments of the international information industries notwithstanding, more intellectual property rights may actually mean less innovation, less heterogeneity in culture and environment and a less informed world of public debate' (emphasis in original).

¹²⁰ See Food and Agriculture Organization of the United Nations, *The State of the World's Plant Genetic Resources for Food and Agriculture* (1998) ch 1.

¹²¹ See, eg, Gordon Conway and Gary Toenniessen, 'Feeding the World in the Twenty-First Century' (1999) 402 *Nature* C55.

¹²² Current plant transformation techniques always introduce genetic material, although in future, techniques such as homologous allelic recombination should enable the

bred for desirable traits that are not presently susceptible to modern genetic techniques, such as increasing water use efficiency. This may also include the introduction of a desirable trait into crop and forage plants using modern genetic techniques followed by classical breeding techniques to exchange the introduced material into other (more favourable) background germplasms; and

- (b) Classical (or conventional) breeding techniques¹²³ — where there is genetic exchange between the germplasm (including the entire plant genome) of true biological species including all cultivated, wild and weedy forms of the crop and forage plant species. Hybrids are selected for desirable inherited traits that are often uncharacterised gene complexes that are not presently amenable to modern genetic techniques. While modern genetic techniques in this context are not used to exchange genetic materials, these techniques can assist in identifying and selecting desirable inherited traits (sometimes called assisted classical (or conventional) breeding).

These useful plant genetic resources for food and agriculture reside in existing *ex situ* collections, where much of the elite germplasm of commercially valuable crop and forage plants has already been identified and enhanced for favourable characteristics through classical breeding techniques, and in the *in situ* high level intra-specific diversity that is predominantly maintained by farmers continuing to crop broad-ranging germplasm in developing countries.¹²⁴ Modern genetic techniques are also likely to be applied to these plant genetic resources for food and agriculture to reduce input agricultural costs (such as herbicide resistance, and so on) and confer specific desirable characters for high value markets (such as extended shelf-life, and so on). Put another way, the landscape is likely to require:

- (a) Bulk commodity crops that compete in the international arena on price — where developing plant varieties with increased yield (including maintaining yields in adverse environments, such as salt-degraded farm lands) and reduced input costs (such as pesticide and herbicide resistance) will depend on access to plant

replacement of genetic materials: see for a discussion Richard Jefferson, 'Transcending Transgenics: Are There "Babies in the Bathwater" or is That a Dorsal Fin?' in Philip Pardey (ed), *The Future of Food: Biotechnology Markets and Policies in an International Setting* (2001) 75, 83–6.

- ¹²³ See Clive Stannard, 'Genetic Resources: Adding Value or Biopiracy?' (Paper presented at the WIPO Conference on the International Patent System, Geneva, 25–7 March 2002):

Classical plant breeding involves the incremental improvement of crop varieties. It is employed at intra-specific level, not at species level, and crosses and selects from a very wide range of varieties to create an improved genome. Characteristically, some tens of parent varieties are involved, over many years, each of which is itself the result of earlier generations of formal or informal breeding, and which already share most of their genomes. The product is again a variety, either released without intellectual property protection by the public sector, or when produced in the private sector, most frequently released under plant varietal protection (such as the UPOV system), where the object of protection is the variety, not the gene, and where, in fact, the so-called 'breeder's exemption' allows anyone — farmer or breeder — to use the genes within a protected variety. Individual resources infrequently provide large-scale appropriate benefits.

- ¹²⁴ See, eg, *National Interest Analysis*, above n 2, [5]–[8].

genetic resources for food and agriculture to suit Australia's particular environment;

- (b) Niche crops that compete on distinctiveness and quality -- where developing new varieties (often minor crops targeted to identifiable high-value markets) will depend on access to plant genetic resources for food and agriculture that exhibits diversity and market specific characteristics (such as colour, smell, exoticness, and so on); and
- (c) Forage plants suited to Australia's agro-ecological zones -- where developing improved forages that deal specifically with Australia's climate extremes, poor and degraded soils and pests will require access to plant genetic resources for food and agriculture to suit Australia's particular environment.

The challenge for Australia in negotiating intellectual property measures in agreements is to achieve an internationally agreed outcome that ensures access to these key genetic resources for food and agriculture. The options at their most basic are now:

- (a) The CBD has established an internationally agreed scheme, to which Australia is already bound, for access to *all* genetic resources except that some significant *ex situ* collections made before 29 December 1993 are excluded; and
- (b) The PGRFA Treaty proposes to modify this scheme directed to particular plant genetic resources for food and agriculture and includes some significant *ex situ* collections made before 29 December 1993.

The key issues are to determine whether a separate access scheme proposed by the PGRFA Treaty is beneficial to Australia and then whether Australia's best interests are in negotiating intellectual property restrictions on access to the plant genetic resources for food and agriculture within the Multilateral System. There seems little doubt that the PGRFA Treaty is beneficial. It provides a simple and guaranteed scheme to access important *ex situ* collections (such as the CGIAR collections and their elite germplasm stocks) and other important *in situ* resources without the unregulated commercial negotiation, or complex regulation provided for in the CBD. This is likely to assist countries like Australia to avoid many of the negotiation complexes over privately appropriated plant genetic resources for food and agriculture held by non-residents. However, the likely benefit from Australia's stance in the negotiated intellectual property provisions is unclear, and has the potential to impose significant costs on Australian agriculture in the future.

As a result of the intellectual property provisions presently favoured by Australia, much of the useful plant genetic resources for food and agriculture that would have been freely available is likely to be subject to broadly claimed patents and PBRs held by non-residents and no longer freely available. The stark effect of the patent's and PBR's 'exclusive rights' is to remove that material from the public domain and so from the PGRFA Treaty's Multilateral System, for the term of the patent or PBR with very minimal changes. For PBRs this is ameliorated to some extent by an experimental use and breeding new variety exemptions.¹²⁵ These 'exclusive rights', and in particular the patent's 'exclusive rights', have significant consequences for Australia as the possible market failure for Australia's agricultural future is that private firms in the first-order developed countries (in particular the United States, see Tables 3-6) will seek to commercialise their protected developed plants and plant varieties with minimal

¹²⁵ *Plant Breeder's Rights Act 1994* (Cth) s 16(b), (c).

changes and broad claims. This is likely to prevent or impede (through commercial barriers such as high costs, refusals to supply, and so on) the essential use and development of plant genetic resources for food and agriculture that are best suited to Australia's commercial interests and environment. Further, potential contributors of new plant genetic resources for food and agriculture to the Multilateral System are unlikely to have confidence in a scheme that appropriates their resources.¹²⁶ If these analyses are correct, then Australia's stance in negotiating the implementation of the PGRFA Treaty is probably best served by seeking to make the plant genetic resources for food and agriculture accessed from the Multilateral System, and subsequent developments of those materials, continue to be freely available. In other words, Australia should seek to keep plant genetic resources for food and agriculture accessed from the Multilateral System and subsequent improvements of those materials free from the privately appropriating effects of the patent's and PBR's 'exclusive rights'. Without this access, in second-order economies like Australia, where the majority of technology is imported, this is likely to undermine the needs of competitors and technology users¹²⁷ and promote under-investment in necessary innovation to suit Australia's particular commercial and environmental circumstances.¹²⁸

¹²⁶ This has already surfaced as a problem and accounts for the reluctance of some Contracting Parties to include certain plant genetic resources for food and agriculture within the Annex 1 list (see Table 1), and as a consequence these materials were included in negotiations but left off the list (see Table 2): see CGRFA-Ex 6/01/REP, above n 34.

¹²⁷ See, eg, Maskus, above n 99, 238.

¹²⁸ See generally Per Pinstrup-Andersen and Marc Cohen, 'Achieving Sustainable Food Security for All: The Role of Policy, Global Public Goods, Property Rights, and Collective Action' in Japan Bank for International Cooperation, *Development Assistance Strategies in the 21st Century: Global and Regional Issues* (JBIC Research Paper No 16, July 2002) vol 1, 57.