ARE PLANT BREEDER'S RIGHTS OUTDATED? A DESCRIPTIVE AND EMPIRICAL ASSESSMENT OF PLANT BREEDER'S RIGHTS IN AUSTRALIA, 1987–2007

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[Taking the Plant Breeder's Rights Act 1994 *(Cth) as its focus, this article explores the notion that plant breeder's rights are out-of-date and unnecessary. To do so, this article adopts both descriptive and empirical approaches to examining a number of issues including: the nature of, and investment in, Australian plant breeding; biopiracy and enforcement; legal disputes and processes; and the use of the Australian plant breeder's rights system. This review shows that the Australian plant breeder's rights scheme is well used, has been progressively amended and extended, and is just one element in a suite of measures geared to stimulate plant-related innovation. As a consequence, future research needs to take into account the heterogeneous character of plant breeding and complementary government initiatives, identify the many reasons why the plant breeder's rights scheme is seen as viable (or why not) and consider the interrelationships between these elements.]*

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I INTRODUCTION

The plant breeder's rights[1] scheme has been criticised by some commentators as being out-of-date and unnecessary.[2] A recurring theme in these criticisms is that advances in science, as well as the availability of alternative forms of protection (notably, patents and trade marks), mean that a sui generis scheme of plant breeder's rights is no longer effective.[3] Most recently, it has been argued that plant breeder's rights have become ill-suited to plant innovation because the scheme is temporally situated within a phenotypic paradigm.[4] In particular, Professor Mark Janis and Dr Stephen Smith argue that the requirements of grant (which generally relate to 'characteristics' and 'features')[5] are no longer relevant as plant breeding moves towards a genotypic approach, utilising genetic modification and molecular breeding techniques.[6]

In addition to the concerns over advances in science and technology, there have been a number of other criticisms levelled at the plant breeder's rights scheme. Central to this dissatisfaction is the idea that the natural copying mechanism inherent in plants poses a major protective risk for those involved with developing new plant varieties.[7] As a consequence, it has been suggested that the plant breeder's rights scheme does not provide adequate incentive for the development of new plant varieties.[8] Tension and controversy also exist over

1 In some jurisdictions (including the United Kingdom and United States), these rights are referred to as 'plant variety rights'. Throughout this article, the phrase 'plant breeder's rights' will be used unless specific reference is made to the *Plant Variety Rights Act 1987* (Cth), which was in force from 1 May 1987 until 10 November 1994. It is the practice in Australia to refer to breeder's rights (instead of breeders' rights).

2 William Cornish, *Intellectual Property: Patents, Copyright, Trade Marks and Allied Rights* (2nd ed, 1989) 148, 148 fn 37 (stating that the scheme was 'outmoded' and questioning 'whether the regime has a viable future'); Cary Fowler, *Unnatural Selection: Technology, Politics, and Plant Evolution* (1994) 152 (suggesting that the plant breeder's rights scheme may become, 'in the words of critic Pat Mooney, "the Neanderthal of intellectual property systems"').

3 In contrast, a proponent of plant breeder's rights, Margaret Llewelyn, has argued that the sui generis scheme is well adapted. First, Llewelyn points to the substantive amendments made by the *International Convention for the Protection of New Varieties of Plants*, opened for signature 2 December 1961, 815 UNTS 89 (entered into force 24 April 1968), as revised on 19 March 1991 ('UPOV 1991'), as evidence that plant breeder's rights have dealt with technological advances. Secondly, Llewelyn considers the 'image' of plant breeder's rights and suggests that changes to this image have 'served to modernise the plant variety protection ensuring it can no longer be dismissed as "outmoded"': see Margaret Llewelyn, 'From "Outmoded Impediment" to Global Player: The Evolution of Plant Variety Rights' in David Vaver and Lionel Bently (eds), *Intellectual Property in the New Millennium* (2005) 137, 149.

4 Mark Janis and Stephen Smith, 'Technological Change and the Design of Plant Variety Protection Regimes' (2007) 82 *Chicago Kent Law Review* 1557, 1566–70.

5 See *Plant Breeder's Rights Act 1994* (Cth) s 3 ('expression' of characteristics).

6 Instead of plant breeder's rights, the authors argue for the reconceptualisation of plants as datasets that breeders manipulate to express particular characteristics: Janis and Smith, above n 4, 1577–9. The authors conclude by suggesting that these datasets could be better regulated by general unfair competition laws rather than a sui generis plant breeder's rights scheme: at 1607–14. For further elaboration of the claims of Janis and Smith, see Laurence Helfer, 'The Demise and Rebirth of Plant Variety Protection: A Comment on Technological Change and the Design of Plant Variety Protection Regimes' (2007) 82 *Chicago Kent Law Review* 1619.

7 Once released, a new plant variety can be easily reproduced by others who harvest the seeds and then duplicate the plant innovation: see generally Jack Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology* (1988); Fowler, above n 2.

8 Generally, it is felt that leakage adversely affects breeders' ability to generate economic reward for their efforts: see, eg, Submission to the Australian Advisory Council on Intellectual Property

issues such as biopiracy, compliance and enforcement. Furthermore, the practice of farm-saved seed (whereby farmers retain propagating material from one harvest for the purpose of replanting, trading or exchanging) has been a persistent concern for the owners of plant breeder's rights.[9]

While such criticisms may seem axiomatic, they are based on the suppositions that law cannot keep pace with science and that plant breeding is a homogeneous activity. They neglect to consider plant breeder's rights in detail and are therefore problematic since this approach is disconnected from the practice of plant breeding and the use of plant breeder's rights. The truth is that the impact of plant breeder's rights has proven difficult to ascertain. This is particularly the case when attempting to determine ramifications for farming practices, plant breeding and economic development.[10]

The difficulty arises primarily because of the problem of proof. It is impossible to analyse the impact of a scheme such as the plant breeder's rights scheme as there is no 'control' to measure what would have happened if the system had not been introduced.[11] Also, it is difficult to separate out the effects of other economic and policy considerations such as alternative protection mechanisms, market size, profitability and other government initiatives geared to stimulate plant industries by encouraging research and development.

That said, in 2005 the International Union for the Protection of New Varieties of Plants ('UPOV') published a report on the quantitative impacts of plant breeder's rights in Argentina, China, Kenya, Poland and the Republic of Korea ('*UPOV Report*').[12] The *UPOV Report* showed an increase in the total number of

('ACIP'), *Review of Enforcement of Plant Breeder's Rights*, 8 May 2007 (Australian Seed Federation); Submission to ACIP, *Review of Enforcement of Plant Breeder's Rights*, 4 April 2007 (Crop and Food Research Australia Pty Ltd).

9 See further Jay Sanderson, 'Back to the Future: Possible Mechanisms for the Management of Plant Varieties in Australia' (2007) 30 *University of New South Wales Law Journal* 686, 690–6.

10 Attempts to assess the qualitative impacts of intellectual property have been made in the area of patents, copyright and trade marks: see, eg, Arnold Plant, 'The Economics of Copyright' (1934) *Economica* 167; Edmund Kitch, 'An Economic Review of the Patent System' (1977) 20 *Journal of Law and Economics* 265; William Landes and Richard Posner, 'The Economics of Trademark Law' (1988) 78 *Trademark Reporter* 267; William Landes and Richard Posner, 'An Economic Analysis of Copyright Law' (1989) 18 *Journal of Legal Studies* 325.

11 Currently there are 65 members of the International Union for the Protection of New Varieties of Plants ('UPOV'): see UPOV, *Members of the International Union for the Protection of New Varieties of Plants* (1 September 2008) <http://www.upov.int/export/sites/upov/en/about/members/pdf/pub423.pdf>. One member acceded to the *International Convention for the Protection of New Varieties of Plants*, opened for signature 2 December 1961, 815 UNTS 89 (entered into force 24 April 1968) ('UPOV 1961'), later revised on 10 November 1972; 23 members acceded to the Convention, as revised on 23 October 1978 ('UPOV 1978'); and 41 members acceded to UPOV 1991.

12 UPOV, *Report on the Impact of Plant Variety Protection* (2005). For other attempts at assessing plant breeder's rights, see Tirtha Dhar and Jeremy Foltz, 'The Impact of Intellectual Property Rights in the Plant and Seed Industry' in Jay Kesan (ed), *Agricultural Biotechnology and Intellectual Property: Seeds of Change* (2007); Robert Tripp, Niels Louwaars and Derek Eaton, 'Plant Variety Protection in Developing Countries: A Report from the Field' (2007) 32 *Food Policy* 354; William Lesser, 'Assessing the Implications of Intellectual Property Rights on Plant and Animal Agriculture' (1997) 79 *American Journal of Agricultural Economics* 1584; Julian Alston and Raymond Venner, 'The Effects of the US *Plant Variety Protection Act* on Wheat Genetic Improvement' (2002) 31 *Research Policy* 527; L J Butler and B W Marion, 'The Impacts of Patent Protection on the US Seed Industry and Public Plant Breeding' (North Central Regional Research Bulletin No 304, University of Wisconsin-Madison College of Agricultural and Life Sciences (Research Division), 1985).

applications, as well as an increase in the number of applications for foreign plant varieties, particularly in ornamental flowers.[13] Importantly, though, the *UPOV Report* concluded that the impact of plant breeder's rights varies on a country-by-country and crop-by-crop basis. The aim of this article, therefore, is to examine the operation of the plant breeder's rights scheme in Australia, a demographic different to those examined in the *UPOV Report* and one which, despite the social and economic importance of plant breeding to Australia, has received very little attention.[14]

To address this deficit, both a descriptive and empirical approach is adopted in the assessment of the Australian plant breeder's rights scheme.[15] This affords a basis for debate about the scheme, rather than relying on the anecdotal and piecemeal accounts that have tended to pass for analysis in this area.[16] Part II begins by describing the emergence of plant breeder's rights in Australia. By examining the history of plant breeder's rights, we are able to clearly set out the scheme's aims and objectives as well as identify the major forces behind its development and implementation. In so doing, the context for assessing the plant breeder's rights system is provided.

Part III responds to a number of criticisms levelled at the plant breeder's rights scheme by descriptively and empirically examining a range of issues: first, the nature of, and investment in, Australian plant breeding; secondly, public tensions and controversies; thirdly, legal disputes and processes related to plant breeder's rights; and, fourthly, the use of the Australian plant breeder's rights system. By graphically presenting the number of applications, the types of industries seeking plant breeder's rights protection, the number of domestic and foreign applications, and the number of private and public applications, we can begin to assess trends in the use of plant breeder's rights in Australia and start to offer possible grounds for these trends.

In Part IV, the article concludes that the criticisms directed at plant breeder's rights are problematic or, at the very least, oversimplified. A careful analysis of the scheme's aims and objectives — combined with an examination of the nature of plant breeding, public controversies, legal process and the number (and type) of applications as a whole — begins to reveal the true impact of plant breeder's rights. Future research must acknowledge the heterogeneous character of plant

[13] A general trend towards increased applications can also be seen in UPOV, *Plant Variety Protection Statistics for the Period 2002–2006* (25 October 2007) <http://www.upov.int/export/sites/upov/en/documents/c/41/c_41_07.pdf>.

[14] However, there has been some work done examining specific issues in relation to plant breeder's rights in Australia: see Matthew Rimmer, 'Franklin Barley: Patent Law and Plant Breeders' Rights' (2003) 10(4) *E Law — Murdoch University Electronic Journal of Law* <http://www.murdoch.edu.au/elaw/issues/v10n4/rimmer104.html>; Charles Lawson, 'Patents and Plant Breeder's Rights over Plant Genetic Resources for Food and Agriculture' (2004) 32 *Federal Law Review* 107; Jay Sanderson, 'Essential Derivation, Law and the Limits of Science' (2006) 24(1) *Law in Context* 34; Sanderson, 'Back to the Future', above n 9.

[15] The methodology for the empirical analysis is explained in Part V. Replication of such research offers an opportunity to advance discussion and evaluation of plant breeder's rights.

[16] This is exemplified by recent submissions to the *Review of Enforcement of Plant Breeder's Rights* conducted by the ACIP which tend to assume that enforcement is ineffective, but without providing any analysis for such claims: see *Written Submissions on the Enforcement of Plant Breeder's Rights (PBR)* (2007) Australian Advisory Council on Intellectual Property <http://www.acip.gov.au/pbrsubs.html>.

breeding, the availability of conjunctive (not necessarily alternative) protection strategies, as well as other market considerations and government incentives. Finally, the methodology for the empirical analysis is briefly explained in Part V (the Appendix).[17]

II THE EMERGENCE OF PLANT BREEDER'S RIGHTS IN AUSTRALIA

Since 1987, plant breeders have been able to protect new varieties of plants under Australian plant breeder's rights legislation.[18] However, in the 1970s it was suggested that a plant breeder's rights scheme was outside the legislative power of the federal government, and that the implementation of such a scheme should be left to the states.[19] This view gained momentum in 1972 when the Australian Agricultural Council's Standing Committee on Agriculture decided that plant breeder's rights should, in fact, be left to the states.[20] Along with this apparent hurdle, there was political, social and economic debate as to whether Australia needed a plant breeder's rights scheme.[21]

For the proponents of plant breeder's rights, there were two significant issues. First, it was argued that plant breeder's rights would facilitate access to overseas varieties by providing similar protection to that offered in other countries.[22] Secondly, the scheme was seen as a way of enhancing profits for plant breeders and therefore stimulating plant breeding in Australia, particularly by the private sector. Other proposed benefits included the stimulation of exports of Australian native plants, the development of Australia's export seed growing industry and improved quality of produce for consumers.[23]

Opponents of the scheme argued that plants, particularly food crops, were a public resource that should not be owned.[24] It was also felt that property rights

17 This provides a transparent explanation of how the data was gathered and what categories were used, helping to ensure the reliability and validity of the research.

18 Internationally, plant breeder's rights were developed to specifically meet the needs of intellectual property in plant innovation and, in 1957, a conference was held in Paris to consider the protection of new plant varieties. This led, in 1961, to UPOV 1961, which provided an internationally recognised regime of plant breeder's rights: see UPOV, *The First Twenty-Five Years of the International Convention for the Protection of New Varieties of Plants* (1987). In Australia, the debate over plant breeder's rights began sporadically in the late 1960s and gained momentum in the 1970s: see Senate Standing Committee on National Resources, Parliament of Australia, *Plant Variety Rights* (1984) 7–9.

19 Section 51(xviii) of the *Constitution* grants the federal Parliament power to make laws with respect to 'copyrights, patents of inventions and designs, and trade marks'. As we will see later, there was a long running battle between Western Australia and the Commonwealth government in relation to this issue which culminated in *Grain Pool of Western Australia v Commonwealth* (2000) 202 CLR 479 ('*Grain Pool*').

20 Senate Standing Committee on National Resources, above n 18, 7–8.

21 See Rob McQueen, 'Propagation of Growth: Agribusiness and the Seed Industry in Australia' (1980) 9 *Journal of Australian Political Economy* 59; A P Ockwell, 'Plant Variety Rights — A Review of Issues' (Occasional Paper No 65, Bureau of Agricultural Economics, 1982); Eric Edwards, 'Plant Variety Rights and the Senate Committee Report' (1985) 16 *Search* 294.

22 Senate Standing Committee on National Resources, above n 18, 43.

23 See Ockwell, above n 21; Edwards, above n 21, 296–8; Senate Standing Committee on National Resources, above n 18, 43.

24 In this way, plant breeder's rights were described as 'government intervention in the market place to create an artificial monopoly for a private interest': Pat Mooney, 'Genetic Diversity and Plant Variety Rights' (Paper presented at the Plant Variety Rights for Australia Seminar, Sydney, 23 September 1980) 14. See also Senate Standing Committee on National Resources,

over plant varieties would have a negative effect on plant breeding and that plant breeder's rights were unnecessary because overseas seed and plant material was readily available to Australian growers.[25] Furthermore, lobby groups objected to intellectual property protection for plants and seeds based on the fear of increased seed costs, as well as concerns that stocks of valuable seeds would be lost with the introduction of protected varieties (as public plant breeding research was reduced and food production was 'monopolised' by multinational companies).[26]

In addition to the social and policy considerations, there were also questions over the substance of a plant breeder's right. For many years, the debate centred on the (in)appropriateness of patent law to protect plant innovations by focusing on a number of historical reasons as to why plant breeders had their patent applications rejected. First, patent law requires an inventive step and for a long time it was felt that plant breeding did not meet this requirement because 'nearly all the procedures were well known and obvious'.[27] Secondly, it was felt that the requirements for disclosure and reproducibility were 'invalidated' by the variability of sexually reproducing varieties.[28] Thirdly, a plant variety was not considered a 'manner of manufacture' as required by the Statute of Monopolies.[29]

As the debates intensified, the Plant Variety Rights Bill 1982 (Cth) was introduced in the Senate and was referred to the Senate Standing Committee on Natural Resources, which commissioned Professor Alec Lazenby to investigate the needs of plant breeding in Australia.[30] In recommending that plant breeder's rights legislation be adopted, Lazenby was of the view that, 'on balance, the benefits for Australia stemming from a [plant breeder's rights] scheme … considerably outweigh any possible adverse effects which have been ascribed to it.'[31] It was not until 1 May 1987 that the *Plant Variety Rights Act 1987* (Cth) came into force.[32]

Broadly speaking, the aim of the new plant breeder's rights scheme was 'to provide a significant boost to Australian agricultural industries and to allow our

above n 18, 15–22; Mark Cole and Tony Belcher, *Seeds for the Taking: The Case against Seed Patenting in Australia* (1981).

25 Judy Messer, 'The Case against Plant Variety Rights' (Paper presented at the NSW Department of Agriculture Seminars, Sydney, 13 December 1981).

26 See Senate Standing Committee on National Resources, above n 18, 38–42.

27 Alec Lazenby, *Australia's Plant Breeding Needs: A Report to the Minister for Primary Industry* (1986) 122.

28 Ibid.

29 Ibid. Lazenby acknowledged, however, that in Australia plant varieties were patentable by referring to the decision of *National Research Development Corporation v Commissioner of Patents* (1959) 102 CLR 252 and the decision of the Assistant Commissioner of Patents in relation to Rank Hovis McDougall Ltd's application to the Australian Patents Office in 1976: ibid 123.

30 The Committee's report was subsequently tabled on 10 May 1984 with two Senators submitting a dissenting report: Senate Standing Committee on National Resources, above n 18.

31 Lazenby, above n 27, 135.

32 The passage of the Plant Variety Rights Bill 1987 (Cth) was far from straightforward and three Bills were prepared between 1979 and 1982, with some 229 submissions received: see Senate Standing Committee on National Resources, above n 18, 85–9.

farmers and nurserymen to compete more effectively on world markets.'[33] It was anticipated that an effective system of plant breeder's rights protection would provide an important step in encouraging the development of new varieties of plants, help keep Australian plant industries globally competitive and provide a mechanism for plant breeders to receive adequate remuneration when they marketed and sold the propagating material of those improved varieties.[34] The original policy justifications behind the scheme's introduction were:

> to stimulate plant breeding effort in Australia and to encourage the development of new varieties of plants for our domestic industries and for export. An important added benefit for Australian farmers and horticulturists is expected to be an improvement in their access to new varieties from overseas.[35]

It is also necessary to consider what plant breeder's rights were not. The plant breeder's rights scheme was to be 'complementary to the government's policies geared to promote innovation in Australia's plant industries by encouraging research and development using production levies and tax concessions.'[36] Therefore, the introduction of plant breeder's rights was part of a suite of measures to stimulate innovation in Australia's plant industries; it was not designed to do this alone. Moreover, the grant of plant breeder's rights was not restricted by the merit or quality of the cultivar, but instead was concerned with 'new' varieties.[37] Thus, in the context of this article, the key arguments in support of plant breeder's rights are that the scheme would help stimulate investment in plant breeding and facilitate access to foreign plant varieties. It was never envisaged that plant breeder's rights would achieve this single-handedly, nor was there an explicit requirement that new plant varieties be an improvement on the old.

[33] Commonwealth, *Parliamentary Debates*, House of Representatives, 8 October 1986, 1648–9 (John Kerin, Minister for Primary Industry). Traditional justifications for plant breeder's rights can be broadly stated as incentives for plant breeders to devote the resources, labour and time needed to produce new plant varieties. The primary justification for the establishment of intellectual property schemes is utilitarian, based on providing incentives: see Peter Drahos, *A Philosophy of Intellectual Property* (1996); Christopher May and Susan Sell, *Intellectual Property Rights: A Critical History* (2006).

[34] Commonwealth, *Parliamentary Debates*, Senate, 24 March 1994, 2306 (John Faulkner, Manager of Government Business in the Senate).

[35] Commonwealth, *Parliamentary Debates*, House of Representatives, 8 October 1986, 1648 (John Kerin, Minister for Primary Industry).

[36] Commonwealth, *Parliamentary Debates*, Senate, 24 March 1994, 2306 (John Faulkner, Manager of Government Business in the Senate).

[37] Senate Standing Committee on National Resources, above n 18, 22–9. It was then up to the market to decide whether the differences were sufficient to encourage customers to buy the 'new' varieties.

III A DESCRIPTIVE AND EMPIRICAL ASSESSMENT OF PLANT BREEDER'S RIGHTS

A *The Nature of, and Investment in, Australian Plant Breeding*

The nature of plant breeding has changed dramatically since the plant breeder's rights scheme was first drafted.[38] In the 1950s, the dominant plant breeding techniques used methods that deliberately and incrementally developed the desirable traits in a new plant variety by relying on physically observable characteristics.[39] Since the 1970s,[40] plant breeders have been given the means to directly manipulate aspects of the molecular level of the plant.[41] One example of this is the use of molecular markers in plant breeding, which signifies an important shift in plant breeding methodology as breeders are able to identify a DNA sequence for a particular characteristic and then attempt to transcribe and transpose that characteristic into another organism.[42]

As noted earlier, one criticism of the plant breeder's rights scheme is that it is ill-suited to these emerging molecular plant breeding techniques.[43] A shortcoming of this criticism, however, is that it decontextualises the practice of plant breeding and the use of plant breeder's rights. It does so by assuming that new plant varieties are not developed using traditional breeding methods and that plant breeders will seek plant breeder's rights protection for all of their plant-related innovations. While there is no denying that the science and technology of plant breeding has evolved, it does not automatically result in the obsolescence of the plant breeder's rights scheme — very often new technologies are used in conjunction with (rather than instead of) traditional plant breeding methods.[44]

As we saw in Part II, the plant breeder's rights scheme is not intended to provide protection for all plant-related innovation, nor does it expressly require new varieties to be 'better' than previous plant varieties. In this way, it has long

[38] Broadly speaking, plant breeding can be separated into three phases. These are domestication (which is over 10 000 years old), classical plant breeding (which began in the 1700s), and genetic engineering (which, although emerging in the 1970s, did not become a regular breeding technique until the 1990s): see generally Jack Brown and Peter D S Caligari, *An Introduction to Plant Breeding* (2008).

[39] This is known interchangeably as classical, traditional or conventional plant breeding. Classical methods rely heavily on the work of the Austrian monk Johann 'Gregor' Mendel, who by formulating the laws of heredity provided the foundation for classical plant breeding. While the laws of heredity were applied widely in a practical sense by plant breeders, it was the work of Mendel — or more accurately — its rediscovery in 1900 by Carl Correns (Germany), Erich von Tschermak (Austria) and Hugo de Vries (Netherlands) that led to widespread adoption: see generally Colin Tudge, *In Mendel's Footnotes: An Introduction to the Science and Technologies of Genes and Genetics from the Nineteenth Century to the Twenty-Second* (2000).

[40] Building upon the discoveries of James Watson and Francis Crick who, in 1952, unravelled the double helix structure of deoxyribonucleic acid, better known as DNA: Lily Kay, *Who Wrote the Book of Life? A History of the Genetic Code* (2000).

[41] This contrasts with earlier plant breeding methods which modified the plant variety at the plant and cellular level: see further Brown and Caligari, above n 38.

[42] The two main methods of producing transgenic plants are by transporting the DNA into the plant cell via the bacterium *agrobacterium tumefaciens* or by shooting the DNA through the cell wall using biolistics: see Jim M Dunwell, 'Review: Intellectual Property Aspects of Plant Transformation' (2005) 3 *Plant Biotechnology Journal* 371, 375.

[43] Janis and Smith, above n 4, 1578–9.

[44] See generally Brown and Caligari, above n 38.

been acknowledged that there are fundamental differences between plant breeder's rights and other areas of the law. For instance, a plant breeder's right 'differs from patent rights in that the [plant breeder's] right is conferred only on the end product and not on the process by which it has been produced.'[45] Because of these differences, other areas of law (such as patents) may be more suitable for certain fields of plant innovation including the protection of DNA sequences, reproductive material and cultivation methods.[46] These alternatives do not negate the importance of plant breeder's rights and, again, highlight the fact that plant breeder's rights were not intended to protect all forms of plant-related innovation.

As well as the changes to plant breeding methods, there has been a transformation in the nature of investment in plant breeding in Australia. Historically, most plant breeding in Australia was funded and carried out by public institutions, particularly for crops such as wheat and barley.[47] When the plant breeder's rights scheme was introduced in Australia, it was estimated that approximately 46 per cent of plant breeding was conducted by state organisations, 16 per cent by the Commonwealth Scientific and Industrial Research Organisation ('CSIRO'), 22 per cent by higher education institutions and 12 per cent by private enterprise.[48] Now, however, private sector investment in plant breeding programs plays a more important role in the development of new plant varieties. Most importantly, 'public and/or grower funded plant breeding … [is] under pressure to operate more commercially, and to recover at least some of the costs of the breeding program … by charging growers more for newly released varieties'.[49]

This transformation in the nature of the investment in plant breeding has been accompanied by the introduction of various research and development corporations[50] — many of which were initially statutory corporations established under the *Primary Industries and Energy Research and Development Act 1989* (Cth) — that operate as research investment bodies working in cooperation with industry sectors.[51] These bodies (and subsequent research and development) are funded

45 Senate Standing Committee on Natural Resources, above n 18, 1.

46 See generally H Phoebe Chan, 'International Patent Behaviour of Nine Major Agricultural Biotechnology Firms' (2006) 9 *AgBioForum* 59; Mark Janis, 'Supplemental Forms of Intellectual Property Protection for Plants' (2004) 6 *Minnesota Journal of Law, Science and Technology* 305.

47 In the late 19th century, propagating material was regularly sent through the post by government agencies: see generally Geoff Raby, *Making Rural Australia: An Economic History of Technical and Institutional Creativity, 1788–1860* (1996) 32–5; Robin Bromby, *The Farming of Australia* (1986) 15.

48 Lazenby, above n 27, 34–5. See also David Godden, 'Growing Plants, Evolving Rights: Plant Variety Rights in Australia' (1998) 6 *Australasian Agribusiness Review* <http:www.agrifood.info/review/1998/Godden.html>; R W Downes, *Australian Plant Breeding Requirements for Current and Future Crops in Relation to Market Forces* (1990).

49 Bob Lindner, 'Privatised Provision of Essential Plant Breeding Infrastructure' (2004) 48 *Australian Journal of Agricultural and Resource Economics* 301, 302. See also Ross Kingwell, 'Institutional Change and Plant Variety Provision in Australia' (2005) 13 *Australasian Agribusiness Review* <http://www.agrifood.info/review/2005/Kingwell.html>.

50 More research needs to be done into the relationship between plant breeder's rights, research and development corporations and the funding of plant breeding.

51 The primary objective of these corporations is to invest in research and development for the benefit of industry and community. Recently, a number of research and development corporations became companies limited by guarantee that are owned by the relevant industry and obtain

by a combination of statutory levies, Commonwealth government funding,[52] voluntary contributions and other sources such as royalties and sales.[53] This means that many plant breeding programs undertaken by 'public' research institutions are no longer funded by the taxpayer alone, but are joint ventures between governments and the plant industry.[54]

Central to the adoption of the plant breeder's rights scheme was the objective of stimulating investment in plant breeding, particularly by the private sector. While the reasons for the transformation in the funding of Australian plant breeding are complex (and include a number of other government and industry initiatives), on some level at least, the transformation being witnessed can be attributed to the availability of plant breeder's rights protection.[55] In particular, the plant breeder's rights scheme provides an important mechanism for control over how, and by whom, a new plant variety is used. In so doing, the scheme presents one way for plant breeders to manage new plant varieties.

B *Public Tensions and Controversies*

The plant breeder's rights scheme has faced public controversy, not the least of which has been in relation to the issues of biopiracy and enforcement. In fact, biopiracy was seen as the 'biggest scandal in seven decades of intellectual property "protection" of plant varieties' in the mid 1990s because it was argued that a number of newly-protected varieties were in fact traditional crops with minimal or no modification.[56] The Rural Advancement Foundation International

statutory funding (with similar levy collection provisions) from the federal government. For example, the former Horticulture Research and Development Corporation is now part of Horticulture Australia Limited ('HAL'), which works 'in partnership with the horticulture sector to invest in programs that provide benefit to Australian horticulture industries': see HAL, *About HAL Overview* (2008) <http://www.horticulture.com.au/abouthal/overview.asp>; HAL, *HAL Constitution* (2008) <http://www.horticulture.com.au/abouthal/HAL_Constitution.asp>; HAL, *HAL Deed of Agreement* (2008) <http://www.horticulture.com.au/abouthal/HAL_Deed_of_Agreement.asp>.

52 This is dollar-for-dollar funding for expenditure on research and development up to 0.5 per cent of the gross value of production for the relevant industry: *Primary Industries and Energy Research and Development Act 1989* (Cth) s 32.

53 One example in this area is the imposition of end-point royalties: see Sanderson, 'Back to the Future', above n 9, 697–702; Grains Research and Development Corporation, *PBR Agreement Fact Sheet* (March 2008) <http://www.grdc.com.au/uploads/documents/2008-03-03%20GRDC_FactSheet_PBR%20FINAL%20for%20dist.pdf>.

54 This assumes that the funds generated from royalties are being put back into breeding programs. For a discussion of the issues surrounding end-point royalties, see Sanderson, 'Back to the Future', above n 9, 697–702.

55 It is difficult to determine which came first: the move by public breeding programs to obtain more external investment, or the introduction of plant breeder's rights, which gave breeders a mechanism to operate more commercially. This is exacerbated by the increase in end-point royalty agreements being used by owners of plant breeder's rights as part of the terms of use of the new varieties. Whereas initially the breeders charged a royalty on propagating material, there has been a move to minimise the impact of farm-saved propagating material and reduce the higher up-front royalties with end-point royalties. See further ibid 697–702.

56 Rural Advancement Foundation International ('RAFI'), 'Plant Breeders Wrongs' (Press Release, 16 September 1998). See also Commonwealth, *Parliamentary Debates*, Senate, 21 October 2002, 5553 (John Cherry); RAFI, 'Australia's Unresolved Plant Piracy Problems' (Press Release, 12 April 1999).

('RAFI')[57] and the Australian Heritage Seeds Curator's Association ('HSCA') argued that at least 118 plant breeder's rights claims in Australia could be invalid because they had not been 'bred' and were not distinct.[58]

It was suggested that the threshold for breeding was too low since the term 'breeding' included discoveries and selective propagation.[59] Bill Hankin, President of the HSCA, stated that:

> The legumes, pasture grasses or grains being granted [plant breeder's rights] by Australian government agencies are mostly land race varieties. They have been brought here to Australia, grown out and selected for a couple of generations and then granted [plant breeder's rights]. Frequently the applications for [plant breeder's rights] even give the international accession number as a synonym.[60]

In 2002, an Australian Expert Panel on Breeding was asked to 'provid[e] a clearer explanation of breeding'.[61] The Expert Panel's view on 'discovery' was that the term had its normal meaning and included locating plant material to enable genetic variety to be identified, which may occur 'without human interference'.[62] However, the Panel stressed that a person could not be considered the 'discoverer' of a plant if another person provided the particulars of its existence, or if the plant was commonly known.[63] Furthermore, applicants for plant breeder's rights now must reveal the origins of the variety and identify its 'parents'.[64]

Another persistent challenge for the plant breeder's rights scheme has been the problem of compliance and enforcement, which is exemplified by 'Operation Plant Breeder's Rights'.[65] This initiative was launched in 2004 by the Australian Seed Federation in an attempt to catch 'seed pirates' who were infringing plant

[57] RAFI changed its name in 2001 to the 'Action Group on Erosion, Technology and Concentration' ('ETC Group'): ETC Group, 'International Advocacy Group Changes Name, President, and Widens Agenda' (Press Release, 5 September 2001).

[58] The controversy was (partly) resolved when the Australian Plant Breeder's Rights Office revoked the offending applications. However, further claims were made by RAFI that Australian breeders held plant breeder's rights certificates on varieties held in trust by the International Center for Agricultural Research in the Dry Areas ('ICARDA') and the Consultative Group on International Agricultural Research ('CGIAR'): Bill Hankin, 'Australia Bungles Plant Breeders' Rights' (1998) 19(2) *Australasian Science (Incorporating Search)* 43; RAFI, 'Australia's Unresolved Plant Piracy Problems', above n 56.

[59] *Plant Breeder's Rights Act 1994* (Cth) s 5. The *Plant Variety Rights Act 1987* (Cth) did not include a definition of breeding and instead the concept of 'origination' was used. Other commentators felt that biopiracy was not so much a problem of definition but of communication between researchers and seed banks: see Matthew Rimmer, 'Blame It on Rio: Biodiscovery, Native Title, and Traditional Knowledge' (2003) 7 *Southern Cross University Law Review* 1, 40.

[60] Hankin, above n 58, 44.

[61] Expert Panel on Breeding, *Clarification of Plant Breeding Issues under the Plant Breeder's Rights Act 1994* (December 2002) <http://www.anbg.gov.au/breeders/plant-breeders-rights-act-report.pdf > 2.

[62] Ibid 8. For a discussion of the history of plant inventions in the US, see Alain Pottage and Brad Sherman, 'Organisms and Manufactures: On the History of Plant Inventions' (2007) 31 *Melbourne University Law Review* 539.

[63] Expert Panel on Breeding, above n 61, 7–8.

[64] *Plant Breeder's Rights Act 1994* (Cth) s 26(2)(ga). See also Plant Breeders Rights Australia, 'Part 1 — General Information' (1998) 11(3) *Plant Varieties Journal* 2, 2–3.

[65] Australian Seed Federation, 'Peak Seed Body Set to Crack Down on PBR Cheats' (Press Release, 16 November 2004); GRAIN, *The End of Farm-Saved Seed? Industry's Wish List for the Next Revision of UPOV* (February 2007) <http://www.grain.org/briefings/?id=202>.

breeder's rights and, it was claimed, costing the Australian seed industry $300 million per year.[66]

In response to the concerns over enforcement of plant breeder's rights, the Advisory Council on Intellectual Property ('ACIP') is conducting a review on the compliance and enforcement of the *Plant Breeder's Rights Act 1994* (Cth).[67] While the outcome of the ACIP review is not yet known, a large number of the submissions lament the problem of enforcement, particularly as plant breeder's rights relate to self-replicating biological material and the difficulties of relying on small farming communities for evidence.[68] Some of the proposed changes to the scheme include reversing the burden of proof (from the breeder to the user in cases of infringement), allowing the owners of plant breeder's rights access to farmers' property, shifting jurisdiction to the Magistrates' Court, and introducing exemplary damages.[69] The recommendations of ACIP have not yet been released. While there is the potential for significant changes to the plant breeder's rights scheme in Australia, it is more likely that the effects of the ACIP review will be moderate. Nevertheless, the process shows how legal schemes (not just plant breeder's rights) are able to be examined and how industry and other stakeholders can contribute to this process.

C *Legal Disputes and Processes*

There have been a number of legal disputes under, and relating to, the Australian plant breeder's rights scheme.[70] Most significantly, the constitutional validity of the *Plant Variety Rights Act 1987* (Cth) and the *Plant Breeder's Rights Act 1994* (Cth) was challenged by the Grain Pool of Western Australia.[71] The challenge was based on a longstanding belief (of the Western Australian government) that the federal government did not have legislative power to make laws with respect to plant varieties.[72] The High Court of Australia unanimously held that both the *Plant Variety Rights Act 1987* (Cth) and the *Plant Breeder's*

66 Asa Wahlquist, 'Dirty Work by Pirates as Breeding Gets Seedy', *The Australian* (Sydney), 17 February 2005, 33.

67 See ACIP, *A Review of Enforcement of Plant Breeder's Rights: Options Paper* (June 2008) <http://www.acip.gov.au/library/ACIP%20PBR%20Enforcement%20Options%20Paper.pdf>.

68 See, eg, Submission to ACIP, *Review of Enforcement of Plant Breeder's Rights*, 31 May 2007 (Benny Browne); Submission to ACIP, *Review of Enforcement of Plant Breeder's Rights* (Department of Agriculture and Food, Government of Western Australia); Submission to ACIP, *Review of Enforcement of Plant Breeder's Rights*, 22 May 2007 (Heritage Seeds Pty Ltd).

69 ACIP, *Options Paper*, above n 67, 42–62.

70 The *Plant Variety Rights Act 1987* (Cth) was repealed and replaced by the *Plant Breeder's Rights Act 1994* (Cth) to reflect changes made by UPOV 1991. For a discussion of these changes, see Llewelyn, above n 3, 139–43. In addition, the plant breeder's rights scheme has been amended a number of times either as part of broader intellectual property reform (see, eg, *Intellectual Property Laws Amendment Act 2006* (Cth)) or as a result of more specific concerns over the plant breeder's rights system. For example, the *Plant Breeder's Rights Amendment Act 2002* (Cth) amended s 18 to 'clarify intent, remov[ing] the possibility of misinterpretation' by introducing an explicit restriction on the exercise of a plant breeder's rights owner's right of disallowance if the operation of concurrent legally enforceable legislation empowers a third party to act: Revised Explanatory Memorandum, Plant Breeder's Rights Amendment Bill 2002 (Cth) 2.

71 *Grain Pool* (2000) 202 CLR 479.

72 Western Australia argued that plant varieties were not 'inventions' under s 51(xviii) of the *Constitution*: ibid 503 (Gleeson CJ, Gaudron, McHugh, Gummow, Hayne and Callinan JJ).

Rights Act 1994 (Cth) were supported by the intellectual property power in s 51(xviii) of the *Constitution*.[73]

Another issue left to the courts to decide was what constituted a 'sale' under the *Plant Variety Rights Act 1987* (Cth). In *Sun World Inc v Registrar, Plant Variety Rights* ('*Sun World*'),[74] Sun World had made an application for the grant of plant breeder's rights under the *Plant Variety Rights Act 1987* (Cth).[75] The Registrar decided that Sun World could not be granted rights since the grapevines had been sold, with the authorisation of the breeder, more than six years before the making of the application.[76]

Sun World argued that the grapevines were exchanged as a component of a larger transaction and, as such, there was no 'sale' of the plant variety.[77] Moreover, Sun World suggested that as conditions had been placed on the sale of the fruit (and any further distribution of the vines), the general property in the vines had not been transferred.[78] The Federal Court of Australia rejected the notion that 'sale' for the purposes of the Act could only be in terms of the exchange of goods for money.[79] This confirmed the view that the supply of propagating or harvested material, in exchange for money, goods, by way of let or barter (and barter could include services), constitutes a sale under the plant breeder's rights scheme. That is, provided that the supply is done with the consent of the breeder, it is immaterial whether or not the exchange occurs privately, to the public, to wholesalers, in small numbers or below market value.

As a consequence of the *Sun World* decision, the effect of a 'sale' of plant material on the right to register a variety under the *Plant Breeder's Rights Act 1994* (Cth) was made less ambiguous.[80] Section 43 of the *Plant Breeder's Rights*

[73] In so doing, the High Court rejected 'any notion that the boundaries of the power conferred by s 51(xviii) are to be ascertained solely be identifying what in 1900 would have been treated as a copyright, patent, design or trade mark': ibid 495–6. This endorsed the dissenting judgment of Higgins J in *A-G (NSW) ex rel Tooth v Brewery Employees Union of NSW* (1908) 6 CLR 469. For a recent discussion of this topic, see Charles Lawson, 'Revisiting the Commonwealth Parliament's Legislative Authority for Patent and Patent-Like Schemes under the *Constitution*' (2006) 17 *Australian Intellectual Property Journal* 243.

[74] (1997) 75 FCR 528. This case involved interpretation of 'sale' under ss 3 and 14 of the *Plant Variety Rights Act 1987* (Cth). However, it is also applicable to ss 3 and 43 of the *Plant Breeder's Rights Act 1994* (Cth).

[75] The application related to a grapevine variety known as 'Sugraone': *Sun World* (1997) 75 FCR 528, 529 (French J).

[76] This was decided under the *Plant Variety Rights Act 1987* (Cth) s 14: ibid.

[77] This 'larger transaction' included the transfer, inter alia, of 'real estate and world wide patent rights': *Sun World* (1997) 75 FCR 528, 535 (French J). In fact, the Court considered several different transactions involving Sugraone, and had to determine whether any of these transactions amounted to a 'sale' for the purposes of s 14: at 530–2 (French J).

[78] Sun World argued that the price paid for the vines was not the real 'commercial value' and therefore no sale had occurred. It also argued that while a document evidencing one of the transactions considered by the Court was entitled 'Contract for the sales of vines' and the language used in this document was that of sale and purchase, the substance of the document extended beyond the transfer of vines, and therefore it could not be considered as conclusive evidence of sale. French J disagreed: ibid 543.

[79] Ibid 542–3. On appeal, the Full Federal Court also found that the 'sale' of Sugraone vines was not invalidated by the fact that the sale agreements placed additional restrictions on the way the vines could be used: *Sun World International Inc v Registrar, Plant Breeders' Rights* (1998) 87 FCR 405, 413 (Carr J).

[80] Sections 43(7)–(7C) of the *Plant Breeder's Rights Act 1994* (Cth) now provide that in certain circumstances the disposal of materials derived from multiplication, testing or research activities

Act 1994 (Cth) sets out the requirements for a plant variety to be registrable, including that the variety has not been exploited or has been only recently exploited.[81]

While judicial decisions have helped to clarify the plant breeder's rights scheme, courts can only consider laws in a piecemeal way because their primary function is the adjudication of individual disputes. Therefore, if an issue is not raised by the parties to a dispute, then the court generally does not consider that point. By comparison, independent reviews can provide assistance and clarification for a broad range of legal and policy considerations.[82] The first statutory review of plant breeder's rights was conducted in 1993 (the 'Watson Review') with the aim of assessing the impact and efficiency of plant breeder's rights, as well as the appropriateness of the allocation of financial resources to the scheme after five years of operation.[83]

The Watson Review found that there had been benefit in the introduction and adoption of cultivars of new and minor crops because of the 'faster rate of adoption of the results of investment in plant breeding when cultivars are licensed to private firms.'[84] However, the biggest positive impact was seen to be in the horticulture and nursery industries, which had witnessed a 'significant' increase in the number of foreign plant varieties being introduced to the Australian market. In contrast, the Watson Review stated that the impact of plant breeder's rights on agriculture was small, although there was a positive effect on attitudes towards the protection of plant varieties. The Watson Review concluded that, while the plant breeder's rights system was justified, there were 'some general and specific issues that [had] to be considered', including the 'difference between broadacre agriculture and ornamental and production horticulture'.[85]

As we saw earlier, the practice of farm-saved seed has been a recurring problem for the seed industry.[86] The nature of farming in Australia means that historically the practice was, and continues to be, entrenched and that commercial seed companies often contract farmers to 'bulk up' their seed supplies in order to have quantities sufficient for the market. Moreover, a (relatively) recent legal dispute between Cultivaust and the Grain Pool of Western Australia failed to resolve the interpretation of s 17 of the *Plant Breeder's Rights Act 1994*

is not considered a sale and therefore does not limit a variety's eligibility for plant breeder's rights registration.

81 Under s 43(6) of the *Plant Breeder's Rights Act 1994* (Cth), a plant variety is taken not to have been exploited if, at the date of lodging the application, plant material of the variety has not been sold to another person by, or with the consent of, the breeder (or successor in title) outside the specified time periods.

82 For a general discussion on law reform, see Geoffrey Sawer, 'The Legal Theory of Law Reform' (1970) 20 *University of Toronto Law Journal* 183.

83 A S Watson, *An Evaluation of the Plant Variety Rights Scheme: Final Report of a Consultancy Undertaken for the Commonwealth Department of Primary Industries and Energy* (1993).

84 Ibid i.

85 Ibid.

86 GRAIN, above n 65.

(Cth),[87] so uncertainty remains over what farmers can do with the seed that they are legally able to save.[88]

Finally, the current ACIP review asks whether the farm-saved seed exemptions are causing 'difficulties in achieving the desired level of compliance in royalty payment[s]' and whether the '*Cultivaust* judgement provided sufficient clarification on the operation of the farm saved seed exemption particularly as it relates to "reasonable opportunity" to generate a return on farm saved seed'.[89] The issue of farm-saved seed is far from resolved and submissions received to date have suggested the removal of the exception,[90] supported the right to save seed on the basis that it 'assists in the rapid uptake of varieties',[91] and acknowledged that the farm-saved seed exception serves an 'important practical and symbolic function.'[92]

In sum, the descriptive analysis of plant breeder's rights illustrates how the Australian scheme, as a legal system, has been progressively extended and amended to take into account advances in science and controversies over biopiracy and enforcement, as well as to deal with specific legal disputes. Together, this illustrates how the plant breeder's rights scheme is fluid and dynamic and is able to respond to various controversies and challenges. To think that the plant breeder's rights scheme should (or could) be immune to such challenges is not only naïve, but also expects something that other legal schemes do not provide: absolute certainty. The majority of legal systems involve an ongoing process of uncertainty, resistance and clarification, and cannot be expected to foresee all contingencies. Legal schemes should provide the means for clarification and accommodation and, as we have seen, the plant breeder's rights scheme has done (and continues to do) so.

D *An Empirical Assessment of Plant Breeder's Rights in Australia, 1987–2007*

This section offers quantitative data about the use of plant breeder's rights in Australia by providing information about overall applications, and applications of various industry sectors and plant types. In addition, the research differentiates between domestic, foreign, private and public applications.[93]

1 *Overall Trends in Australian Applications*

Trends for the total number of applications were considered for all plant varieties from 1987 to 2007. As can be seen in Figure 1, the number of applications

87 The issue of farm-saved seed was not relevant on appeal and, therefore, the Full Federal Court did not decide the issue: *Cultivaust Pty Ltd v Grain Pool Pty Ltd* (2005) 147 FCR 265, 276–7 (Finn, Emmett and Bennett JJ).

88 In particular, there is confusion over the relationship between propagating material and harvested material: see Sanderson, 'Back to the Future', above n 9, 692–6.

89 ACIP, *A Review of Enforcement of Plant Breeder's Rights: Issues Paper* (March 2007) <http://www.acip.gov.au/library/ISSUES_PAPER_v28%20print%20version.pdf> 17.

90 Submission to ACIP, *Review of Enforcement of Plant Breeder's Rights*, 8 May 2007, 5–6 (Australian Seed Federation).

91 Submission to ACIP, *Review of Enforcement of Plant Breeder's Rights*, 2 (Department of Agriculture and Food, Government of Western Australia).

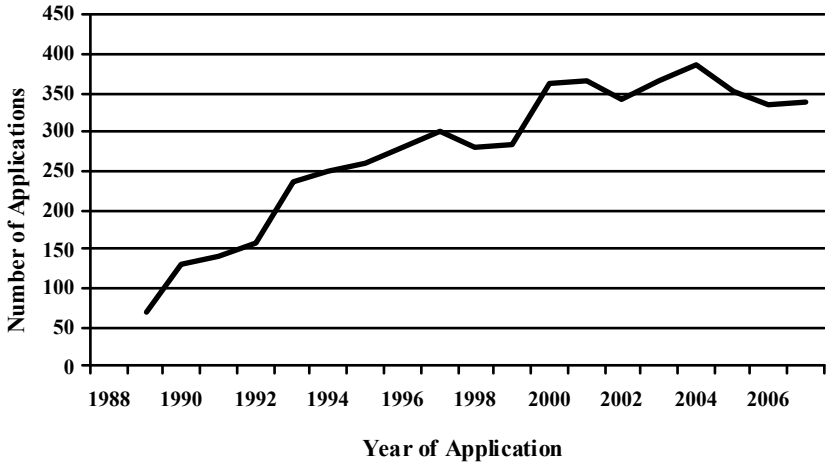
92 Submission to ACIP, *Review of Enforcement of Plant Breeder's Rights*, 3 (Dr Matthew Rimmer).

93 The methodology is set out in Part V (the 'Appendix').

increased steadily until 2003 and, while applications have remained relatively steady since the mid 1990s, there is a notable decrease in the number of applications for the period 2003 to 2007, from 400 applications (in 2003) to 322 applications (in 2007).

While it is probably too early to suggest that there is a systemic reduction taking place in the use of plant breeder's rights in Australia, there are a number of possible explanations for the decrease in applications since 2003. These figures might suggest that changing environmental conditions such as drought and increased salinity have had an effect on plant breeding investment either by reducing the level of plant breeding, or by focusing breeding programs on developing particular traits (for example, drought resistance and salinity tolerance) in new plant varieties. Furthermore, the changed climatic conditions may have affected broader commercial considerations such as a grower's ability to purchase new plant varieties and market share, making both breeders and growers more selective about the varieties that they are either protecting or purchasing.

Figure 1: Trends in the Number of Applications for Plant Breeder's Rights in Australia, 1987–2007



Another possible explanation for the reduction in applications is that plant breeders may be using other mechanisms to protect their innovation. For instance, in the United States there has been an increase in the number of patents sought for plant-related innovations including over plant varieties, method inventions and gene inventions.[94] This trend may be crop-specific and may

[94] William Lesser and Martha Mutschler, 'Lessons from the Patenting of Plants' in Max F Rothschild and Scott Newman (eds), *Intellectual Property Rights in Animal Breeding and Genetics* (2002) 103; Gregory Graff, Gordon Rausser and Arthur Small, 'Agricultural Biotechnology's Complementary Intellectual Assets' (2003) 85 *Review of Economics and Statistics* 349; Chan, above n 46.

depend on the use of genetic modification in the breeding process. Professors William Lesser and Martha Mutschler, assessing US utility patent applications from 1970 to 2000, found that the overall increase in the use of utility patents in the mid 1990s could be attributed to two crops: corn and soybeans.[95] The patenting of plants remains high in the US because the use of genetically modified crops is still on the increase. In 2006, over 80 per cent of all soybean and cotton crops grown in the US were genetically modified.[96]

2 *Plant Industry Sectors Seeking Plant Breeder's Rights*

When examining the accepted applications, it is useful to begin to differentiate overall trends based on plant industry categories, providing a clearer indication of the industries which use the plant breeder's rights scheme. The broad categories used here are agriculture, horticulture (excluding garden and flower) and nursery (including garden and flower).[97] As can be seen in Figure 2, there has been a steady increase in the number of applications over time in all sectors.

Clearly, the highest number of applications (61 per cent of total applications) has come from the nursery sector. However, the distribution of industries seeking protection appears to be changing as there has been proportionally fewer applications accepted from the nursery industry in recent years. In 1988, there were approximately 21 applications (57 per cent) from the nursery industry, nine applications (24 per cent) for horticultural varieties and five applications (19 per cent) from agricultural plant breeders.[98] By contrast, in 2007 there were 155 applications (48 per cent), 87 applications (27 per cent) and 81 applications (25 per cent) from the nursery, agriculture and horticulture industries respectively.

A possible explanation for the reduction in nursery applications may be the effects of the changing climatic conditions. Much of the nursery and garden sector has had to restructure, modify their approach or shut down as a result of the limited availability of water.[99] Similarly, people may be less inclined to purchase plants from their local nursery due to the negative attitudes towards water usage and strict water restrictions.

[95] Lesser and Mutschler, above n 94. Globally, the dominant biotechnology crops are soybean (57 per cent of the global biotechnology area), corn (25 per cent), cotton (13 per cent) and canola (5 per cent). The dominant traits are herbicide tolerance (68 per cent), insect resistance (19 per cent) and stacked traits (13 per cent): see International Service for the Acquisition of Agri-Biotech Applications, *ISAAA Brief 37-2007: Executive Summary — Global Status of Commercialized Biotech/GM Crops: 2007* (2007) <http://www.isaaa.org/resources/publications/briefs/37/executivesummary/default.html>.

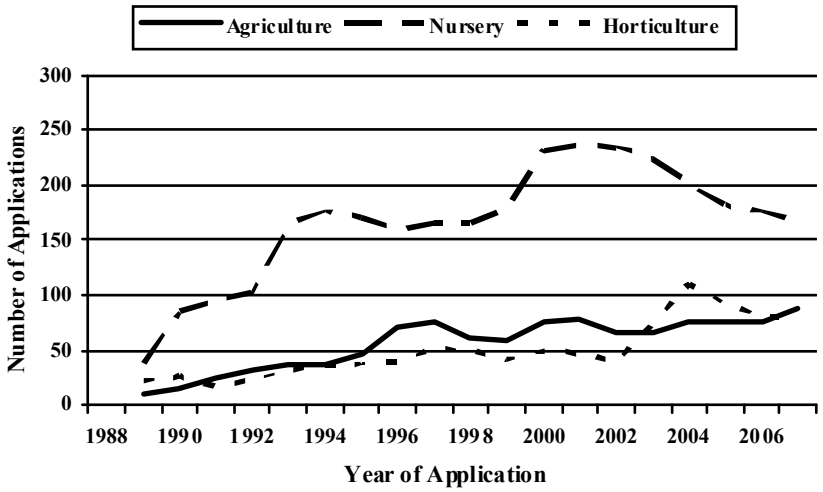
[96] Ibid.

[97] As noted in Part V, there is a small amount of overlap in these categories.

[98] As noted in Part III, the nursery industry was one of the main sectors pushing for the introduction of plant breeder's rights.

[99] See, eg, the South Australian government's Drought Response Initiative, which specifically provides assistance to the nursery industry: South Australian Government Drought Response Initiative, *SA Drought E-news* (2 August 2007) <http://www.pir.sa.gov.au/pirsa/drought/programs__and__services/e-newsletters/2007_sa_drought_e-news_archive/sa_drought_e-news,_2nd_august_2007#two>.

Figure 2: Trends in the Number of Applications for Plant Breeder's Rights in Australia by Industry Sector, 1987–2007

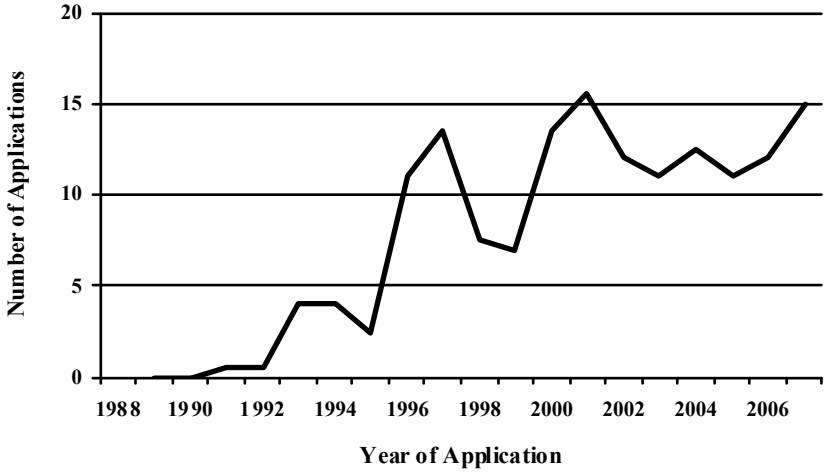


While these figures may indicate possible growth in the agricultural and horticultural sectors, it may also be indicative of a greater acceptance of the plant breeder's rights scheme, and therefore reflect increased use of the scheme rather than increased breeding activity.[100] One sector in which this may have occurred is agriculture. Figure 3 highlights a steady increase in applications for wheat. Looking more closely, two things stand out. First, there appears to be a 'peak' every couple of years which is indicative of the time lag in breeding programs for new varieties. Secondly, there has been an increase in the number of applications for new wheat varieties since the mid 1990s.

The Watson Review found that the agricultural sector was slow to adopt the plant breeder's rights scheme as the breeding programs had been predominantly in government and university breeding programs where new varieties were put into the public domain.[101] These figures, then, may indicate greater 'acceptance' of the scheme by wheat breeders, and may reflect the transformation in funding strategies discussed in Part II.

[100] See generally Llewelyn, above n 3.
[101] Watson, above n 83, iii.

Figure 3: Trends in the Number of Applications for Plant Breeder's Rights in Australia for Wheat, 1987–2007

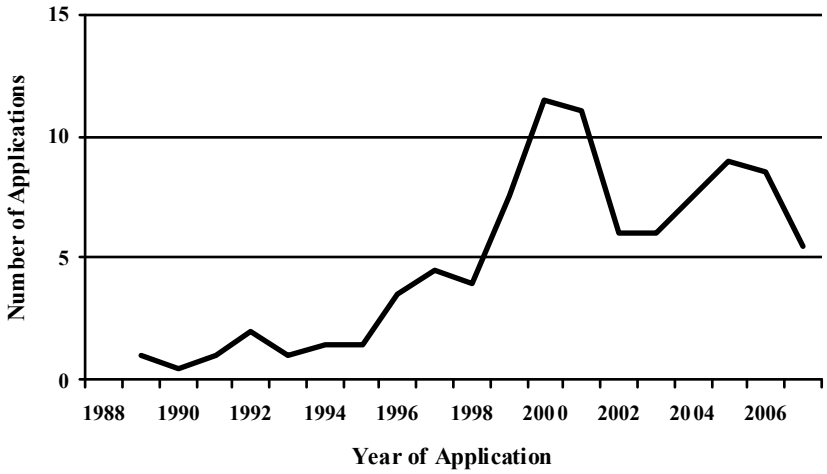


Unlike the wheat sector, the canola industry was one of the first users of the plant breeder's rights system. As can be seen in Figure 4, from 1990 onwards there was a steady flow of applications for canola varieties. Since 2000, however, there has been a reduction in canola applications. This is interesting because patents are regularly sought in the US for genetically modified crops including canola. In light of the removal of the genetically modified organism ('GMO') moratorium for the commercialisation of canola,[102] canola is likely to be Australia's first genetically modified food crop and future research may focus on canola to assess plant breeder's rights and the interrelationship between plant breeder's rights and patents.[103]

[102] In 2007, both Victoria and New South Wales decided not to extend the moratorium on growing genetically modified canola: Department of Primary Industries, Victoria, *Review of the Moratorium on GM Canola* (21 July 2008) <http://www.dpi.vic.gov.au/DPI/nrenfa.nsf/LinkView/5477226A88881F86CA2572E300074EEF89E6C67B468BD2A7CA256FB70001BAB8>; Department of Primary Industries, New South Wales, *GM Canola Moratorium Information* (2005) <http://www.dpi.nsw.gov.au/aboutus/news/recent-news/agriculture-news-releases/?a=148650>. For a brief discussion of the moratoria and the legal issues faced by farmers who grow both GM and non-GM crops, see Troy Anderson, 'Seeds of Conflict: Potential Legal Issues with Genetically Modified Crops' (2008) 44(3) *Law Society Journal* 56.

[103] The first commercial genetically modified crop was cotton in 1996: Department of Agriculture, Fisheries and Forestry, Australian Government, *A National Market Access Framework for GM Canola and Future GM Crops* (2007) 5.

Figure 4: Trends in the Number of Applications for Plant Breeder's Rights in Australia for Canola, 1987–2007

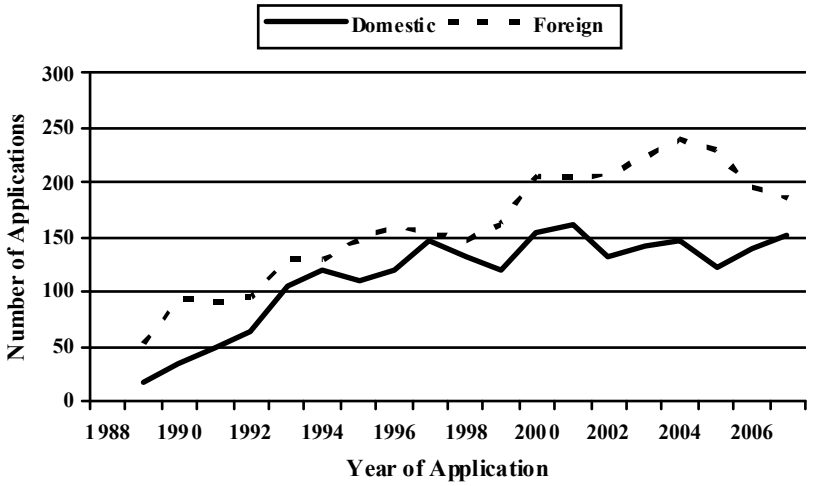


In summary, the plant breeder's rights scheme has been well used by all industries. In the early years, the nursery and garden industries were strong users of the scheme. Now, however, there has been a reduction in the number of applications from the nursery and horticultural sectors. We have begun to offer possible grounds for these trends including changed climatic conditions and the availability of alternative forms of protection. However, it is likely that these results indicate a complex interplay between changing environmental conditions, emerging science and technology and the transformation of the funding of plant breeding programs. This interaction may also be complicated depending on whether the breeding is being conducted by domestic or foreign plant breeders.

3 *Domestic and Foreign Applications*

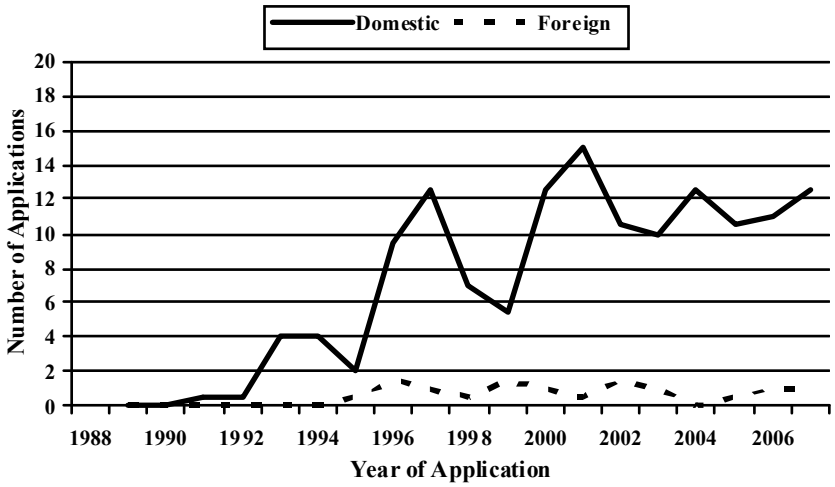
One of the proposed benefits of the plant breeder's rights scheme was to increase the availability of foreign plant varieties by providing protection to overseas plant breeders. Our research indicates that there has been a steady increase in applications from both domestic and foreign applicants (see Figure 5). More interestingly, there is a need to consider domestic and foreign applications on a crop-by-crop basis, as domestic applications may be predominant for some crops (for example, wheat) while overseas applications may be dominant for other crops (for example, roses).

Figure 5: Trends in the Number of Applications for Plant Breeder's Rights in Australia for Domestic and Foreign Breeders, 1987–2007



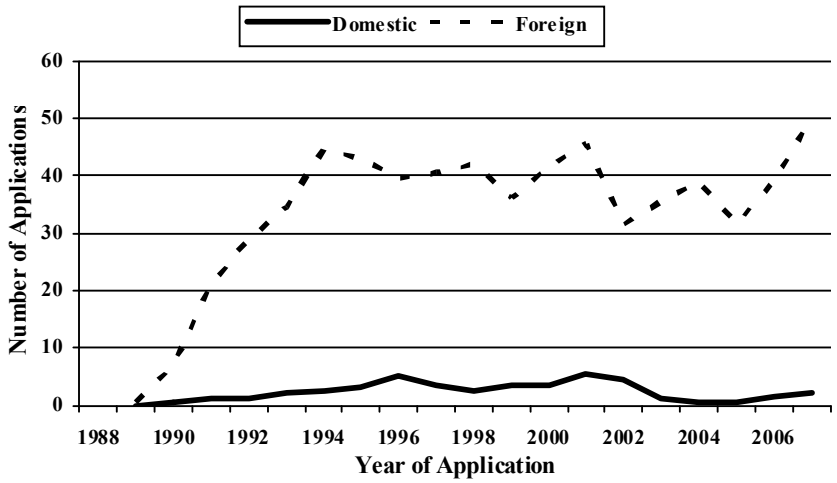
If wheat (a key agricultural crop in Australia) is considered, it can be observed that wheat varieties are generally bred by Australian breeders because it is a broadacre (generally non-irrigated) crop that must be suited to local growing conditions. As such, overseas-bred varieties of wheat are not widely used in Australia (see Figure 6).

Figure 6: Trends in the Number of Applications for Plant Breeder's Rights in Australia by Domestic and Foreign Breeders for Triticum Wheat, 1987–2007



By comparison, the research indicates that overseas applications are strongest in the nursery sector, with roses providing a good example (see Figure 7). To date, 94 per cent of rose applications have been from foreign breeders. This result demonstrates the strong history of plant breeding in the nursery industries, particularly in Europe, and the controlled nature of the environment in which they are grown commercially, allowing varieties to be transferred from one region to another without further adaptation.

Figure 7: Trends in the Number of Applications for Plant Breeder's Rights in Australia by Domestic and Foreign Breeders for Roses, 1987–2007



4 *Public and Private Sector Applications*

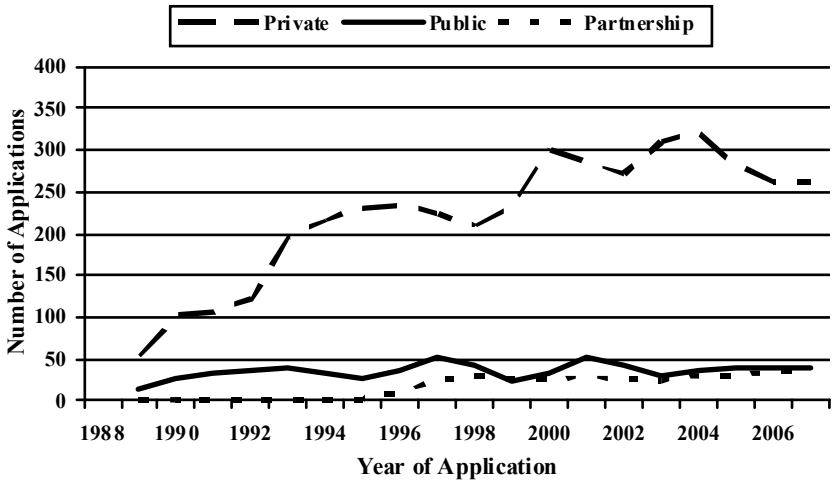
In Part II, we saw how Australia had been dependent on government plant breeding programs, especially in the agricultural and horticultural sectors. A major objective of the Australian plant breeder's rights legislation was to stimulate plant breeding (particularly by the private sector). In the context of plant breeder's rights, the view was that by providing a mechanism for breeders to obtain a return on their investment, more commercial enterprises would become involved.

Of the total applications accepted between 1987 and 2007, the government provided 12 per cent of all applications (2 per cent of which were from universities), the private sector 81 per cent and private/public partnerships provided 6 per cent of applications (see Figure 8).

While the number of applications from the public sector has remained fairly stable, the biggest change has been in the number of applications from the private sector. In addition, since the mid 1990s the role of the research and development corporations (and the government's requirement for research organisations to seek external funding) has resulted in more public/private partnerships in plant breeding. However, it was extremely difficult to separate

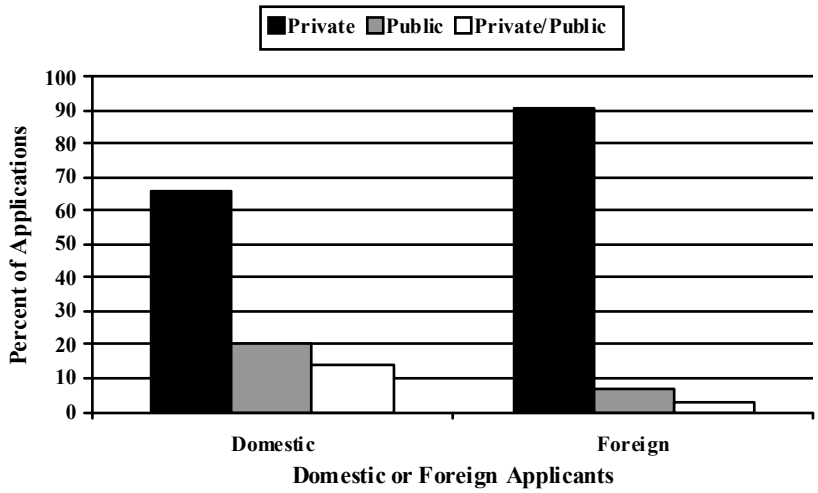
out private breeding and partnerships, as the research and development corporations may also be involved in pre-breeding (for example, identifying salt and drought tolerant genes) and not be named on the plant breeder's rights application.

Figure 8: Trends in the Number of Applications for Plant Breeder's Rights in Australia by Private and Public Applicants



In relation to private and public applications, it is also necessary to consider the relationship with domestic and foreign applications. Our research indicates that the majority of private applications are for foreign varieties (see Figure 9). Significantly, though, it is becoming increasingly common for domestic applications to come from private breeders. The transition to private plant breeder investment is an interesting one which utilises science capability in existing research institutions but with greater input and direction from the more commercially-driven farming businesses. Foreign applications, particularly in the nursery industry, are in areas in which there has traditionally been a high level of private sector interest overseas, possibly because of the smaller size of the garden and cut flower markets compared to Europe.

Figure 9: Percent of Plant Breeder's Rights Applications for Domestic and Foreign Breeders by Applicant Type



IV CONCLUSION

To suggest that plant breeder's rights are outdated and unnecessary is problematic. Such arguments are often based on a single aspect of the scheme and rely on the presumptions that law cannot keep pace with science or that plant breeding is a homogeneous activity. In so doing, these criticisms overlook the fact that the effect of plant breeder's rights cannot be considered in isolation. Instead, the assessment of plant breeder's rights needs to done within a broad framework: the plant breeder's rights system is not a stand-alone legal regime aimed at single-handedly improving plant varieties, but rather is an integral part of a suite of measures geared to stimulate innovation in Australia's primary industries.

This review shows that (to date, at least) the Australian plant breeder's rights scheme is well-used, and has been progressively amended and extended. The scheme has dealt, and continues to deal, with tensions over compliance and enforcement as well as specific legal disputes as they arise. In addition, the plant breeder's rights scheme can be seen to have contributed to the transformation of the investment arrangements for plant breeding in Australia. The scheme provides one mechanism for control over how, and by whom, a new plant variety is used. In this way, the plant breeder's rights scheme may help to control the use of new plant varieties in Australia and thus assist plant breeders to obtain a return on their investment. For example, in agriculture, where much of the investment comes from research and development corporations, controlling how (and to whom) the variety is released is important. Without the plant breeder's rights system it is possible that future funding of breeding programs could be restricted, either directly (as breeders are unable to generate a return on their

own investment) or indirectly (as the research and development corporations choose to fund other programs).

This kind of analysis, however, does not present a complete picture of the assessment of plant breeder's rights as it is difficult to separate out confounding factors such as the availability of other protection mechanisms, as well as other government initiatives and market considerations. Nevertheless, three things are clear.

First, our analysis of the Australian plant breeder's rights database indicates that overall applications have declined since 2003. Importantly, though, the trends are not uniform across all industries so that the use (and effectiveness) of plant breeder's rights is industry- and crop-specific. On the one hand, the nursery industry has shown a decrease in applications that is (possibly) because of changed climatic conditions and the impact on plant breeding and broader market considerations. On the other hand, the last five years has witnessed an increase in applications received from the agricultural industry.

Secondly, there are a number of pressures — political, technological, economic, societal and historical — impacting on plant breeder's rights which create uncertainty when evaluating the effectiveness of the scheme. Our research has shown an increase in private sector applications coupled with a transformation in the funding arrangements of plant breeding in Australia. The increasing pressure to generate a return on plant breeding investment will ensure that plant breeders continually consider how best to maximise returns; this may include plant breeder's rights, patents, trade marks or a combination thereof.

Thirdly, so that plant breeder's rights cease to be one of the 'least studied'[104] forms of intellectual property, this research needs to be the first step in a much larger process. Against the backdrop of plant breeder's rights, there are a multiplicity of reasons why plant breeders and industry use the scheme.[105] There is a complex array of factors that must be taken into account when assessing plant breeder's rights, including market share and other government initiatives geared to stimulate plant breeding research and development. Because of this, the assessment of plant breeder's rights must identify the heterogeneous character of plant breeding, acknowledge that there are many reasons why (or why not) the plant breeder's rights scheme is seen as a viable option and reflect on the interrelationships between these elements.

V APPENDIX

A *Methodology*

This article uses a mixture of descriptive and empirical methods to assess the Australian plant breeder's rights scheme. Part V provides a transparent explanation of how the data was gathered and what categories were used to improve the reliability and validity of the research. The research is empirical because IP Australia's Plant Breeders Rights database ('PBR database') was examined to

[104] Janis and Smith, above n 4, 1558.
[105] See generally Llewelyn, above n 3.

determine overall trends in applications, which plant industries were seeking plant breeder's rights, and the numbers of domestic and foreign applications and public and private applications.[106] In so doing, the analysis focuses on the use of plant breeder's rights in Australia; it does not intend to speculate on whether or not the level and quality of plant breeding would have been the same without the system or with an alternative. Instead, we focus on data that is readily available.

The study contains a number of inherent limitations and potential biases. Some of these relate to the definition of the data set, while others are inherent in reifying a large number of heterogeneous plants and industries into broad groupings. In particular, the absolute number of applications may not be reproducible as some varieties do not fall neatly into the categories we have chosen. However, this was a study about trends and indicators and we explicitly acknowledge that trends cannot point out causes, illustrate commercial viability or market regulation, or tell us anything about alternative forms of protection. In addition, the use of the plant breeder's rights scheme does not necessarily equate to increased investment but may simply indicate that the scheme is being used more (or less) often.

To reduce the effect of these potential limitations, a series of parameters (which allowed comparisons between the use of the scheme and the intended aims of the scheme) were used.[107] This was done by searching by 12 month intervals (for example, 1 January 2000 to 31 December 2000) in the 'accepted date' field. All data (except Figure 9) was presented using a moving averages trend-line in order to smooth out fluctuations, and thus to show patterns or trends of applications more clearly.[108]

1 *Overall Applications*

In this analysis of the PBR database, we used 'applications accepted' as a measure of usage. By examining the number of applications accepted, we were able to determine how, and by whom, the system was being used.[109] It was felt that the number of accepted applications was a meaningful measure of the impact of plant breeder's rights, since accepted applications indicate new plant

[106] IP Australia maintains a 'searchable database' of plant varieties registered under the plant breeder's rights scheme in Australia. The database includes 'a detailed description and image for every variety granted full rights and basic information for other PBR varieties': IP Australia, *On-Line Database for PBR Varieties* <http://www.ipaustralia.gov.au/pbr/journal_onlinedb.shtml>.

[107] Slightly different results may be obtained from the database depending on whether it is searched by common name, variety, genus or species.

[108] The trend-line was calculated using two year periods. For example, the average of the number of applications for 1988 and 1989 was used to calculate the first data point, the average of the number of applications for 1989 and 1990 was used to calculate the second data point and so on.

[109] The number of rights granted lags behind the number of applications made by approximately two years (the time taken to finalise testing data and examine the application). Not all accepted applications proceed to grant; quite a number are withdrawn (817 of the applications accepted during the period 1 January 1987 to 31 December 2006) and a smaller number have been refused (only 18 of the 5082 applications accepted during the period 1 January 1987 to 31 December 2006). This could be for a number of reasons including the cost associated with conducting field trials or paying the fees, the variety not performing as expected, or inability to demonstrate the distinctness, uniformity and stability criteria. Furthermore, successful objections may be raised.

varieties which have potential importance within Australia.[110] Accepted applications have to meet some prima facie hurdles and are therefore a more accurate measure of 'serious' applications.[111]

2 *Industry Sectors*

An analysis of industry sectors cannot be done directly from the PBR database. Instead, all 5425 applications were downloaded to a spreadsheet and were then sorted in accordance with three commonly used industry categories. The categories were: agriculture, including plant varieties that are related to the production of food, feed and fibre; horticulture, which includes fruits, vegetables and extractive crops; and the nursery industry, which includes garden and flower varieties. Specific crop types (wheat, roses and canola) were also analysed for deeper understanding of plant breeder's rights usage by searching by 'common name' or 'genus'.

3 *Domestic and Foreign Applications*

Applications were reviewed to determine their origin.[112] Where possible, this information was obtained from the summaries, although the full application was used when the summary was not available or was otherwise inconclusive. Generally, we looked at the applicant or title holder to determine whether the plant variety was of domestic or foreign origin.

4 *Private, Public or Joint Funding*

The final parameter tested relates to the funding of plant breeding. Where possible, this information was obtained from the summaries, although the full application was used when the summary was not available or was otherwise inconclusive. However, one limitation of searching applications is that it was not always clear from the 'applicant' or 'title holder' whether the investment came from the private or public sector. In many cases, the research and development investment framework in Australia is such that investment into any one breeding program comes from a number of sources — often a mixture of private and public. The primary industries research and development corporations jointly funded by the Australian government and the relevant primary producers were categorised as public/private partnerships.

110 This is assuming that breeders will protect plant varieties that have the potential to be successful, or varieties for which protection is important for some reason. The decision to protect a plant variety is likely to be determined by a number of factors.

111 To be accepted, the application has to contain certain information including, inter alia, a brief description of the variety to establish a prima facie case that it is distinct, the name of the parent variety and a brief description of the manner in which the variety was bred: *Plant Breeder's Rights Act 1994* (Cth) ss 26(2)(e), (gb).

112 A breeder can apply whether or not they are an Australian resident or citizen and whether or not the variety was bred in Australia: *Plant Breeder's Rights Act 1994* (Cth) s 24(2).