



Canadian Food
Inspection Agency

Agence canadienne
d'inspection des aliments

**10-YEAR REVIEW
OF CANADA'S
PLANT BREEDERS' RIGHTS ACT**

Canada 

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EXECUTIVE SUMMARY

INTRODUCTION AND PURPOSE OF REPORT

Canada's *Plant Breeders' Rights Act* (PBR Act) came into force on August 1, 1990. As a requirement of the Act, a report was to be prepared and submitted to Parliament with respect to its administration, as soon as practical after the first ten years. This summary and the attached report are submitted for the purpose of fulfilling this requirement.

The objective of this current review of the Act is:

"To determine whether the PBR system has accomplished the intended results as set out in the PBR Act"

The intended results cross a wide spectrum of horticultural, agricultural, financial, intellectual property, quality assurance, industrial development, social, and ethical issues.

The PBR Act defines specific results to be measured and assessed. This report addressed the extent to which the operation of this Act:

- a) resulted in:
 - i) stimulation of investment in businesses involving the breeding of plant varieties in respect to the protection afforded by the Act;
 - ii) any improvement in facilities to obtain foreign varieties of plants in the interests of agriculture in Canada;
 - iii) protection abroad, for commercial purposes, of Canadian plant varieties;
 - iv) improvements of plant varieties to the public benefit, and particularly to the benefit of farmers and nurserymen; and,
 - v) any other public advantage.
- b) has some but not all of the results described in paragraph (a), above
- c) has all or any of those results but is, in any respect, not in the public interest, or
- d) is, in the total absence of those results, not in the public interest.

In summary, the objective of this review was to determine the extent to which the *Plant Breeders' Rights Act* and Regulations achieved the intended results over the 10-year review period, 1990-2000.

METHODOLOGY

The central focus of the methodology was an extensive consultation process with stakeholders from all aspects of the horticulture and agriculture industry: plant breeders, researchers, seed trade, farmers, nurserymen, industry organizations, and government agencies. Consumer and social advocacy groups were also contacted, and a web page was established seeking input from interested parties.

In the course of the consultations, approximately 76 in-person and telephone interviews were completed. Of these, 50% were with representatives of the horticulture industry (fruits, vegetables, and ornamentals which include flowers, trees, and shrubs), 40% were with representatives of the agriculture industry (grains, oilseeds and pulse crops), and 10% were of a general nature (consumer, social advocacy groups, and others).

A second major aspect of the study was the extensive review of Canadian Food Inspection Agency (CFIA) documents and other secondary research including the annual reports of industry associations, independent studies, and internet searches. Industry consultations and secondary research provided the base information for the development of industry profiles and the assessment of the achievements of intended results under the Act.

An important part of the review was two surveys conducted independently by the Canadian Seed Trade Association (CSTA) of its membership. The first survey was conducted in 1990 and the second in early 2001. The two surveys captured the changes in investment and related information provided by CSTA members during the 10-year review period.

THE FINDINGS

A decade after the *Plant Breeders' Rights Act* was enacted, it is generally accepted by the industry, researchers and government, that the scientific and economic well-being of the horticulture and agriculture seed industries has improved. There have been improvements in the yields and quality of many crops and an expansion of the area under production. Farmers and nurserymen definitely have greater access to more and better varieties. In addition, some sub-sectors of the horticulture and agriculture industries have enhanced their export capability, or have become net exporters of products; namely the floriculture, nursery, potato, and pulse industries. These changes, particularly within the horticulture sector and with respect to pulse crops, have been directly impacted by the PBR Act.

There has been an increase in investment in plant breeding, research infrastructure, and technologies in most sectors of the industries evaluated. This is evident through the member survey conducted by the CSTA and anecdotal evidence obtained about the horticulture industry. There has also been investment in secondary and tertiary processing, input suppliers and retailing, which has contributed to rural development. PBR is felt to have had an indirect impact on the industry growth of many crop kinds, and an important direct impact for ornamentals and pulses.

The private sector in both the horticulture and agriculture industries has increased its investment by almost three-fold since the passage of the legislation. At the same time, the public sector has also benefited as universities and Agriculture and Agri-Food Canada (AAFC) have received royalties from private organizations to help fund their plant breeding programs. For example, about \$2.9 million per year in royalties is collected by seed growers through sales from one organization and is reinvested into the AAFC research stations. In addition, there are numerous other agreements and initiatives that have seed companies, universities, colleges and AAFC reinvesting in and providing a positive financial contribution to research investment.

Of all the areas evaluated, the PBR Act appears to have had the most significant impacts on securing access to foreign varieties. Virtually every industry sector was unanimous in their support for the

importance of the PBR Act in enabling them to develop partnerships, links, and to improve their access to foreign varieties as a result of the legislation.

The influence of the PBR Act has not been as significant in the area of securing protection abroad for Canadian plant varieties. This has not been a major area of focus for agriculture and horticulture over the period reviewed. While there has not been as much of a focus on securing protection abroad for Canadian plant varieties as there has been for obtaining varieties to be used domestically, there has been a number of important developments, specifically in the agriculture industry. One multinational firm has made Canada the base for their global mandate in canola plant development, while another has used Canada as the base for pulse variety testing.

There is no doubt that producers now have access to a much wider selection of varieties now than in the past. While it is difficult to attach a high level of significance on the introduction of the PBR Act, the rate of varietal development and availability of new varieties in Canada has increased faster over the past 10 years, than ever before. On final analysis, the PBR Act appears to be one factor, of many, that has had a positive impact on the availability of improved varieties.

Other factors and evidence resulting from the review that impact the public interest include the following:

- Producers perceive they bear a substantial portion of the cost of intellectual property rights through increased seed/plant material costs, royalties, and variety trial costs.
- Seed costs in the cereal and oilseed industry actually increased at a slower rate between 1990 and 1999 (8.6%) than they did between 1980 and 1990 (24%) (Statistics Canada Table 328-0001-Farm Input Price Index).
- The protection offered under the PBR Act legislation has encouraged increased research and licensing arrangements, allowing the breeding community to share information and genetic material.
- The fact that not a single compulsory licensing action has been taken, or even applied for, suggests that the industry is acting responsibly

by ensuring good quality varieties are widely available to the public at reasonable prices.

- As suggested by the industry and cited herein, there is support for Parliament to update the PBR Act to meet the evolving needs of the industry. The absence of some key elements embodied in the 1991 International Union for the Protection of New Varieties of Plants (UPOV) Convention is placing Canada at a competitive disadvantage. Trading partners including the U.S., U.K., Germany, and the Netherlands have all ratified the 1991 UPOV Convention. And, as additional countries join UPOV, countries such as Canada that continue to adhere to the 1978 UPOV Convention, will increasingly be in the minority.

Before and during the introduction of the PBR Act in Canada, the primary criticisms were as follows:

- there would be potential adverse impact on seed costs;
- multinational companies would eventually dominate the seed industry;
- there would be a reduction in public plant breeding;
- there would be restrictions on the industry access to germplasm; and,
- there would be a reduction in the number of varieties available to farmers and nurserymen.

The results from this review indicate that these potentially negative impacts have not occurred. The fact that these events did not occur as anticipated, has muted the concerns of many of the original critics of the legislation.

Considerable effort was undertaken to make contact with all parties having an interest in the PBR Act and Regulations. Repeated contact was made to ensure responses represented a cross-section of industry sectors and sub-sectors. A number of advocacy groups with major concerns at the commencement of the PBR Act did not respond, which would again suggest that initial concerns with the PBR Act and Regulations, did not materialize.

1.0 INTRODUCTION

It is generally recognized that the improvement of plants contributes in many ways to social and economic well-being. The breeding of new plant varieties requires large financial investments in human resources, technology, and infrastructure. The opportunity to gain exclusive rights to new varieties and charge royalties for rights extended to others, improves the breeders' chance to obtain a return on their investment once the new variety is successfully commercialized.

Many people also recognize that Canada's ability to access international products for food, feed, fibre, and other purposes, and to market products from the horticulture and agriculture industries, depends on Canada's participation in trade and international related treaties. Canada is a member of the International Union for the Protection of new Varieties of Plants (UPOV) which is headquartered in Geneva.¹ The Canadian Food Inspection Agency's Plant Breeders' Rights Office (PBRO) represents Canada's interests in this organization.

Canada's *Plant Breeders' Rights Act* is enabling legislation. The Act serves:

- to stimulate investment in plant breeding, variety improvement and commercial propagation of plant materials by individuals, private and public breeding organizations, seed merchants, horticulturalists, and other firms in agriculture and horticulture;
- to enable greater in-bound and out-bound technology transfer and commercialization of new plant varieties which have potential to be of value to Canadians and firms conducting business in and from Canada;
- to provide breeders and owners of proprietary plant varieties with intellectual property rights and mechanisms to seek remedies for any violation of rights issued in Canada; and,
- to encourage the development of ventures and international cooperation in plant breeding, to stimulate competitive advantages, to facilitate trade in new plant varieties, and to contribute

¹ International Union for the Protection of New Varieties of Plants. <http://www.upov.int/eng/dgtext.htm>

to the underlying sufficiency, integrity, safety and quality of Canada's food supply and plant resources.

1.1 OBJECTIVES OF THE REVIEW

Canada's *Plant Breeders' Rights Act* (PBR Act) came into force on August 1, 1990. As a requirement of the Act, a report must be prepared and submitted to Parliament with respect to its administration, as soon as practical after the first ten years.

The objective of this current review of the Act is:

“To determine whether the PBR system has accomplished the intended results as set out in the PBR Act.”

The intended results cross a wide spectrum of horticultural, agricultural, financial, intellectual property, quality assurance, industrial development, social, and ethical issues.

The PBR Act defines specific results to be measured and assessed. The report is to indicate whether the operation of this Act:

- a) results in:
 - i) stimulation of investment in businesses involving the breeding of plant varieties in respect to the protection afforded by the Act;
 - ii) any improvement in facilities to obtain foreign varieties of plants in the interests of agriculture in Canada;
 - iii) protection abroad, for commercial purposes, of Canadian plant varieties;
 - iv) improvements of plant varieties to the public benefit, and particularly to the benefit of farmers and nurserymen; and,
 - v) any other public advantage.
- b) has some but not all of the results described in paragraph (a), above

- c) has all or any of those results but is, in any respect, not in the public interest, or
- d) is, in the total absence of those results, not in the public interest.

In summary, the objective of the review is to determine the extent to which the *Plant Breeders' Rights Act* and Regulations have achieved their intended results over the 10-year review period, 1990-2000.

1.2 METHODOLOGY OF REVIEW

The review of the PBR Act in the context of its intended impacts followed the methodology detailed in Figure 1.1. The central focus of the methodology was an extensive consultation process with stakeholders from all aspects of the horticulture and agriculture industry: plant breeders, researchers, seed trade, farmers, nurserymen, industry organizations, and government agencies. Consumer and social advocacy groups were also contacted, and a web page was established seeking input from interested parties.

In the course of the consultations, approximately 76 in-person and telephone interviews were completed. Of these, 50% were with representatives of the horticulture industry (fruits, vegetables, and ornamentals which include flowers, trees, and shrubs), 40% were with representatives of the agriculture industry (grains, oilseeds and pulse crops), and 10% were of a general nature (consumer, social advocacy groups, and others).

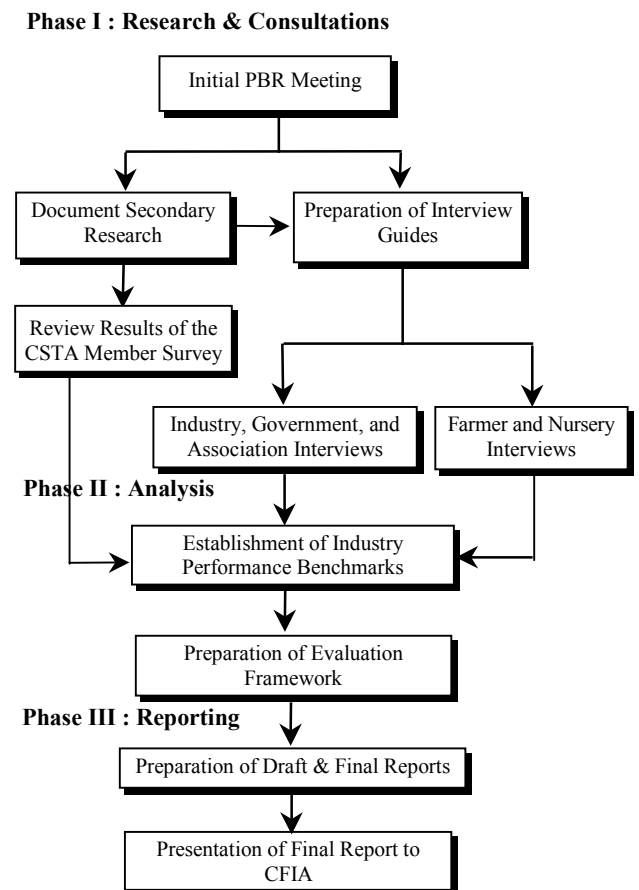
A second major aspect of the study was the extensive review of Canadian Food Inspection Agency (CFIA) documents and other secondary research including the annual reports of industry associations, independent studies, and internet searches. Industry consultations and secondary research provided the base information for the development of industry benchmarks (baseline) and our assessment of the achievements of intended results under the Act.

Considerable effort was undertaken to make contact with all parties having an interest in the PBR Act and Regulations. Repeated contact was made to ensure that responses represented a cross-section of industry sectors and sub-sectors. A number of advocacy groups with major concerns at the commencement of the PBR Act did not respond, which would suggest

that initial concerns with the PBR Act and Regulations, did not materialize.

An important part of the review was two surveys conducted independently by the Canadian Seed Trade Association (CSTA) of its membership. The first survey was conducted in 1990, the beginning of the review period, and the second in early 2001, the end of the review period. The two surveys captured the changes in investment and related information provided by CSTA members during the 10-year review period.

**Figure 1.1
Review Process**



The ultimate goal of the review was to document changes in the horticulture and agriculture industries, focusing specifically on the major results expected in the PBR Act as referenced in Section 1.1, and to assess the level of the causal relationship between the specific results and the introduction of the PBR Act.

This is a difficult task for the following two reasons: the impacts of the PBR Act do not occur in isolation from other macro and micro economic factors that impact business decisions; and there are no other countries that singularly represent a baseline scenario against which to compare Canada's experience. As a result, much of the analysis provided herein is subjective in nature. However, care was taken to ensure that the interviews and secondary data collection processes were balanced and that the opinions expressed were based on a sound theoretical process.

1.3 OUTLINE OF REPORT

The balance of this report is organized into two major sections:

- Section 2 – Background: This section provides a description of plant breeders' rights, and a review of activity in Canada during the time period the PBR Act has been in place.
- Section 3 – Findings and Analysis: This section is focused on answering the specific questions as outlined in the Act. The analysis and findings are grouped separately for the horticulture and agriculture industries. Horticulture results are categorized by vegetables, fruits, and ornamental varieties (including flowers, shrubs, and trees). Results for the agriculture industry are categorized by cereal, oilseed, and pulse crop varieties.

The findings consist of a summary of the relevant changes that have occurred in the various industry sectors. These changes are based on objective and verifiable information collected in both the primary and secondary data collection processes. Any opinions expressed as to the causal relationship between changes in the benchmarks and the PBR Act come directly from the interviewees themselves.

2.0 BACKGROUND

2.1 PLANT BREEDERS' RIGHTS AS INTELLECTUAL PROPERTY RIGHTS

Plant Breeders' Rights is a form of intellectual property rights. The PBR Act grants the breeder and/or owner of a new variety the exclusive right to produce propagating material for sale, and to sell propagating material of the variety.

UPOV was established by the agreement of founding countries in 1961. UPOV provided for the recognition of the rights of plant breeders on an international basis by means of the grant of plant breeders' rights. There have been subsequent Conventions which are identified by the date at which revisions to the terms of UPOV were made – the 1972, 1978, and 1991 Conventions. Countries which become a member of UPOV are bound by the terms of the Convention applicable at the time of acceptance to UPOV, or of subsequent Conventions which they have adopted.

As of January 2002, 50 countries are signatories to the UPOV Conventions (1961, 1972, 1978, 1991). The various UPOV Conventions result in differences in the minimum scope of protection, minimum duration of protection, farmers' privileges and breeders' exemptions.² The number of countries with Plant Breeders' Rights legislation is increasing, with China and the Russian Federation, being two of the notable countries recently becoming members. Countries that are joining now must adopt the 1991 UPOV Convention.

2.2 CANADIAN EXPERIENCE WITH PLANT BREEDERS' RIGHTS

The PBR Act was introduced to the House of Commons on three occasions before legislation was finally passed and brought into force on August 1, 1990. The first introduction was May 1980, the second January 1988, and the third in May 1989.

² Aaron Cosbey. *The Sustainable Development Effects of the WTO TRIPS Agreement: A Focus on Developing Countries*. International Institute for Sustainable Development. <http://iisd1.iisd.ca/trade/trips.htm>

Controversy surrounding the ownership of life forms delayed the introduction and assent of the PBR Act by Parliament.

The scope of the intellectual property rights under Canada's PBR Act³ include those as outlined in Section 5:

- a) to sell, and produce in Canada for the purpose of selling, propagating material, as such, of the plant variety;
- b) to make repeated use of propagating material of the plant variety in order to produce commercially another plant variety if the repetition is necessary for that purpose;
- c) where it is a plant variety to which ornamental plants or parts thereof normally marketed for purposes other than propagation belong, to use any such plants or parts commercially as propagating material in the production of ornamental plants or cut flowers; and
- d) to authorize, conditionally or unconditionally, the doing of an act described in paragraphs (a) to (c).

Under the PBR Act:

- The criteria or basis of the protection provided under the PBR Act is the establishment of plant varieties that are new, distinct, uniform, and stable (DUS);
- The property rights are granted to the breeder and owner to legally control the seed and other propagating material of a variety, meeting qualifying criteria, for 18 years. In this respect, the PBR Act is similar to other forms of intellectual property rights associated with patents and trademarks; and,
- Breeders and owners of a variety with Plant Breeders' Rights granted may charge a royalty for the propagation and sale of the variety so protected.

The PBR Act provides for the establishment of a Ministerial Advisory Committee whose function is to

³ *Plant Breeders' Rights Act* (1990, c.20). <http://canada.justice.gc.ca/en/laws/P-14.6/fulltoc.html>

assist the Commissioner in the application of the PBR Act. It is composed of breeders, seed sellers, seed growers, farmers and horticulturalists.

There are two implicit exemptions under the PBR Act. First, under the Farmers' Privilege farmers may save and use their own seed of protected varieties without infringing on the holders' rights. Second, under the Research Exemption, protected varieties may be used for breeding and developing new plant varieties.

Canada's present PBR Act adheres to the terms of the 1978 UPOV Convention. Amendments have been discussed by the PBRO, the Canadian seed industry, representatives from the horticulture and agriculture industries, and the Minister's Plant Breeders' Rights Advisory Committee, to bring the PBR Act into compliance with the 1991 UPOV Convention.⁴ The proposed changes to bring Canada's PBR Act into conformity with the 1991 UPOV Convention include the following:

- extension of the rights to include conditioning, exporting, and importing propagation material;
- allowing one year of sale prior to application;
- allowing commercial sales under interim protection while the application is pending; and,
- extension of the minimum period of protection.

2.2.1 Species Covered Under the PBR Act

Canada's PBR Act initially provided protection for only a limited number of species. The recommendation of the Plant Breeders' Rights Advisory Committee was to expand the list of eligible species as the industry and the PBRO administration gained experience with the PBR Act. The species covered under the PBR Act have been expanded during the 1990's, as outlined below:

- August 1, 1990, PBR Act came into force;
- November 6, 1991, Regulations in effect for six genera/species (Chrysanthemum, potato, rape-seed (canola), rose, soybean, wheat);
- March 10, 1993, Regulations in effect for 17 additional genera/species (African violet, alfalfa, apple, barley, bean, cherry, corn, dianthus, flax, grapevines, oats, pear, pea, poinsettia, potentilla, strawberry, yew);

⁴ Proposed Amendments to the Plant Breeders' Rights Act, <http://www.cdnseed.org/press/Nov%2017%PBR%20Amendments.htm>

- December 28, 1994, Regulations in effect for 16 additional genera/species (Begonia, blueberry, clematis, creeping red fescue, impatiens, kentucky bluegrass, lentils, maple, mustard, peach, pelargonium, plum, raspberry, spirea, timothy, viburnum); and,
- December 23, 1998, Regulations in effect for all remaining plant species excluding algae, bacteria and fungi.

2.2.2 Activity Under Canada's PBR Act

Figure 2.1 traces the activities related to Canada's PBR Act between 1990 and 2000, comparing Canadian private and public applications with the number of non-resident (foreign) applications. The number of foreign applications has remained high, and in fact has grown in proportion to Canadian applications. The relative growth of foreign applications correlates in timing with the extension of the species covered by the Act in Canada (1998). This is not surprising, as the majority of non-resident applications tend to be in the horticulture industry, and the extension of Regulations to cover all species made in 1998 greatly increased the species covered for this sector. The majority of agricultural crops were already covered by 1998, and the change to the Regulations did not have as significant an impact on this sector.

**Figure 2.1
Canadian Activity Under the PBR Act**

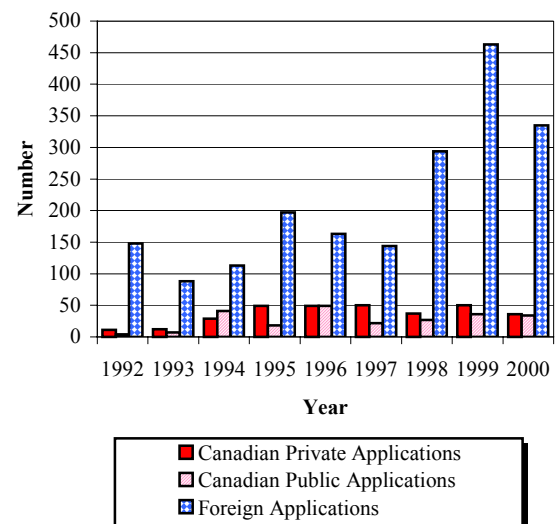
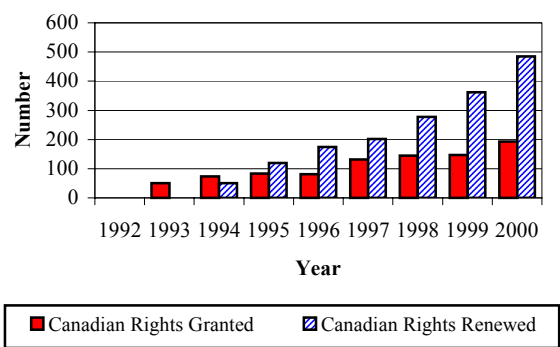


Figure 2.2 shows the number of rights granted and rights renewed in each year. The rights renewed reflect the continuing financial incentives to breeders

and companies. This information illustrates an upward trend in both categories over the ten-year period.

**Figure 2.2
Canadian Rights Granted and Renewed by Year
Under the PBR Act**



2.2.3 Activity by Industry Sector

Activities are grouped into the horticulture and agriculture industries. This review of the PBR Act maintains this distinction in its evaluation. The horticulture industry includes fruits, vegetables, potatoes, and ornamental varieties. The agriculture industry includes cereals, oilseeds, pulses, and forage varieties.

The Plant Breeders' Rights application activity has been most pronounced (as shown in Figure 2.3), within the horticulture industry which represents 72% of the total applications (1,809 of 2,505). The top four crop kinds, representing almost 41% of all applications and 57% of the horticultural applications, included roses (305), chrysanthemums (262), pelargoniums (234), and potatoes (224).

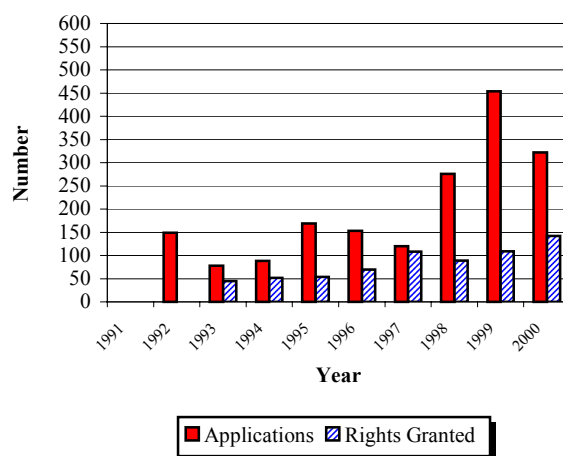
There were a total of 696 applications from the agriculture industry, of which 57% are from canola and soybeans.

The origin of applications from Canadian (private and public) and foreign sources illustrates the differences between the horticulture and agriculture industries. In the horticulture industry, almost 94% or 1,698 of the 1,809 applications were of foreign origin, while 36% of the agriculture industry applications were of foreign origin. This is not surprising given the international scope of the industry and the lack of a significant number of Canadian breeders (public or private) developing new varieties of horticulture crops. The distribution of private and public applications from Canadian

applicants versus foreign sources in the agriculture industry were relatively equal over this period.

The following figures illustrate the relationship between applications and rights granted for the two sectors over the review period. Both application numbers and rights granted have trended upward over the review period.

**Figure 2.3
Total Horticultural Applications and Rights Granted**



**Figure 2.4
Total Agricultural Applications and Rights Granted**

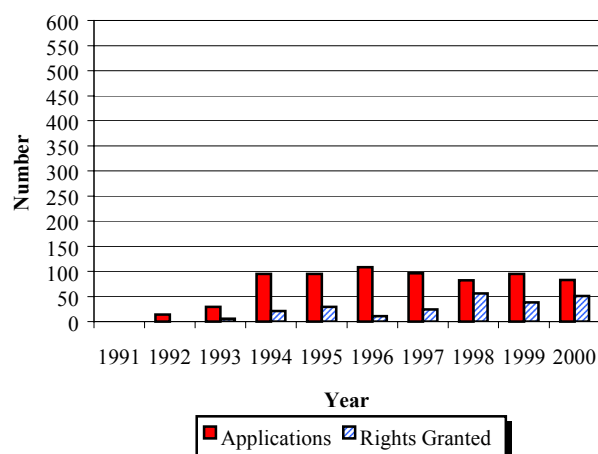
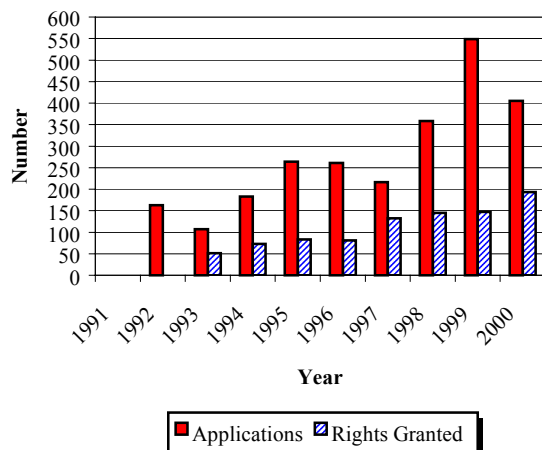


Figure 2.5
Total Horticulture and Agriculture Applications and Rights Granted



The horticulture industry has been by far, the greatest user of the protection granted by the PBR Act, as evidenced by the number of applications and rights granted. Ornamentals have dominated, accounting for 76% of horticulture rights granted. The high numbers for horticulture in 1999 represent the grandfathering period for older varieties of newly prescribed crop kinds.

Agricultural applications for protection under the PBR Act have been fairly constant: between 82 and 108 annually since 1994.

2.2.4 PBRO Revenue

PBRO is mandated to recover its costs through a schedule of administration fees on services it provides to its clients. The fee schedule was established at the introduction of the PBR Act, and has not been adjusted since that time.

Year	PBR Revenue
1992	\$102,500
1993	371,914
1994	191,067
1995	278,100
1996	303,900
1997	318,000
1998	427,000
1999	511,000
2000	627,000

There has been a consistent growth in revenue between 1992 and 2000.

2.3 RELATED INTERNATIONAL EXPERIENCE

Many current UPOV members and those preparing to join the Convention represent potentially significant markets for Canadian seed and plant material exports. Public and private organizations in these countries are also developers and suppliers of plant varieties to Canadian plant breeders and firms.

UPOV reports data on the numbers and origin of applications and protection issued in member countries.⁵ A total of 87,514 UPOV applications were received and 60,014 titles were issued between 1990 and 1999. It should be noted that the majority of these countries have had variety protection for decades, and their industries are much more accustomed to it than are the Canadian horticulture and agriculture industries.

Table 2.2
UPOV Applications and Titles Issued : 1990 – 1999: Top Countries/States and Total

	Applications	Titles Issued
Netherlands	12,066	9,134
United States	8,836	6,060
France	7,906	6,505
Germany	8,270	5,638
Japan	8,569	5,552
United Kingdom	4,006	2,992
CPVO	9,801	5,502
Canada (1991-2000)	2,505	905
Total (All Countries)	87,514	60,014

The United States data includes applications and titles issued under both the *Plant Variety Protection Act* and also the *Plant Patent Act*.

The Community Plant Variety Office (CPVO) issued 5,502 titles. The CPVO was established in the European Union (EU) in 1994. Through this office breeders can secure protection with one application across all EU Countries. The CPVO follows the terms of the UPOV 1991 Convention.

⁵ *Plant Variety Protection Statistics for the Period 1990 – 1999*. International Union for the Protection of New Varieties of Plants. C/34/7. 2000-10-24.

3.0 FINDINGS AND ANALYSIS

The review of both the horticulture and agriculture industries follows a similar format. An industry benchmark or baseline is included in the relevant section. The economic information used in this benchmark was collected from the secondary data collection process, and provides an economic comparison of industry characteristics over the ten-year review period.

The second part of the section includes a discussion of the results separated into a results measurement framework following the five evaluative parameters. While the opinions expressed herein may not have been unanimous, they do reflect statements around which the majority of interviewees concurred. The lack of an expressed opinion does not necessarily mean that interviewees did not comment on an issue, rather that there was no consensus.

3.1 HORTICULTURE INDUSTRY

The horticulture industry is comprised of three distinct sectors: ornamentals, vegetables, and fruits. One problem in assessing the impacts of the PBR Act

on the horticulture industry is the lack of good data sources on investment levels in technology and even capital growth. Discussions with the industry players indicate that the industry is currently attempting to establish more effective benchmark information, but verifiable data was not available for this study.

3.1.1 Horticulture Industry Profile

The horticulture industry profile is restricted to the main crop kinds and varieties for which protection was sought under the PBR Act. The greatest user of the PBR Act was the ornamental sector with flowers such as chrysanthemum, impatiens, pelargonium, and roses accounting for the bulk of the activity. As illustrated in Table 3.1, floriculture (greenhouses) has grown from 4.55 million square meters in 1991 to 6.91 million in 1999. Floriculture and nursery cash receipts have grown by 21.6% in real terms between 1990 and 1999 (Table 3.2). Most significantly, the trade balance in flowers and nursery products, moved from being a net importer of \$66 million in 1992, to a net exporter of \$52.2 million in 1999 (expressed in 1992 dollars) (Table 3.2).

**Table 3.1
Horticulture Industry Profiles - Production**

Production	Baseline (1991)	1999	Percent Change
Apples ('000 tonnes) ¹	564	543	-3.7
Potatoes ('000 tonnes) ²	3,567	4,204	18
Floriculture ('000 sq. meters)	4,553 ³	6,905 ⁴	52
Floriculture farms (numbers)	6,283 ³	4,340 ⁴	-31
Sod and nursery (hectares) ¹	39,845	37,920	-4.8
Sod and nursery employment (person years) ⁵	3,034	4,540	49.6

¹ Apple market review (Horticulture and Special Crops Division)

² Source: Statistics Canada Cat. No. 22-008-UIB.

³ Source: Statistics Canada (Info. Hort.).

⁴ Statistics Canada, Canadian International Merchandise Trade (65-001-XPB).

⁵ Source: Statistics Canada Cat. No. 22-202.

Table 3.2
Horticulture Industry Profiles – Economics
(*\$' millions*)

Cash Receipts ¹	1990 Values	1999 Values (Expressed in 1990 dollars)
Potatoes	399.2	588.6
Apples	172.0	157.8
Floriculture and Nursery	913.6	1,111.2
Fresh Fruits	349.1	446.2
Trade Balance - Exports less Imports	1992 Values	1999 Values (Expressed in 1992 dollars)
Fresh Fruits ²	-969.0	-1361.7
Flowers and Nursery ²	-66.0	52.2
Potatoes(Fresh) ²	12.6	83.1
Potatoes (Processed)	213 ³	440.1 ²
Apples	-60.7 ³	-56.43 ⁴

¹ Source: Statistics Canada Cat. No. 21-603E, "Agriculture Economic Statistics".
² Source: Trade Data Online.
³ Source: CITT, Reference #GC-90-001 (1991).
⁴ Statistics Canada, Canadian International Merchandise Trade (65-001-XPB).

The potato sub-sector has shown increases in production, growing by a total of 18% in output (Table 3.1). The potato sub-sector was an early user of the PBR Act to gain access to foreign varieties. The apple sub-sector experienced a decline of almost 4% in annual tonnage during the same period. (Table 3.1).

3.1.2 Horticulture Industry Results Measurement

The following summarizes the results from the secondary research, and from the industry consultations. The evidence is presented within each results criteria as defined in the 1990 PBR Act.

Intended Result: Stimulation of investment in businesses involving the breeding of plant varieties in respect of which protection is afforded by the PBR Act

Total Horticulture

- The horticulture industry was an early supporter and initial beneficiary of Plant Breeders' Rights.
- A total of 72% of total applications were made by this sector. However, the expansion

of investment and research has been modest. Respondents indicated that the PBR Act has had only a modest impact with respect to research and development investment in the horticulture industry.

- Investment by the public sector has been significantly influenced by government matching grants programs.

Ornamentals

- Floriculture area (sq. meters) increased by 52% (Table 3.1) during the review period, with respondents indicating that the PBR Act played an important role in this area. Sales (cash receipts) increased by 21.6% from 1990 to 1999 (Table 3.2).
- Employment on sod and nursery farms increased by almost 50% over the review period (Table 3.1).
- The flowers and nursery sub-sector of the ornamental sector has become a net exporter (trade surplus) of products, mostly into the United States. (Table 3.2)
- In general, the ornamental sector indicated that there had been a change in competitive advantage for Canadian researchers over the

last ten years. It was felt the PBR Act had a positive impact on the change – although the degree of impact was generally considered lower than for the agriculture industry.

Potatoes, Vegetables and Fruits

- The potato sub-sector has expanded, and has increased processing capacity (Table 3.2), particularly in western Canada, as evidenced by the construction of three major processing plants in southern Alberta.
- Processed potatoes have become a major export, with a strong trade surplus position. Processed potato net exports have increased from \$213 million in 1992, to \$440 million in 1999 (Table 3.2).
- Apple cash farm receipts, have declined by 8% in real terms (Table 3.2) over the review period. However, companies have been formed to propagate apples, as a result of the protection afforded by the PBR Act.
- The PBR Act was not felt to have had an impact on the investment in vegetable breeding, as there were many other factors that govern the ability of the industry players to invest in vegetable breeding.

Intended Result: Improvement in facilities to obtain foreign varieties of plants to the benefit of the Canadian horticulture industry

Ornamentals

- The PBR Act was felt to have played a very significant role in providing access to foreign ornamental varieties.
- Prior to the PBR Act, the ornamental sector had limited access to foreign plant varieties. It has now secured access to many new and improved varieties from outside of Canada. In fact, of rights granted to ornamental plant varieties, 97% were of foreign origin. This has allowed the sector to expand and become a significant net exporter over the review period. Sector growth had previously been constrained by the lack of access to foreign varieties.

Potatoes

- The potato sub-sector has also been a direct beneficiary of the PBR Act protection. Prior to the approval of the PBR Act, the sub-sector was unable to secure access to foreign varieties, as there was no protection afforded to foreign varieties in Canada.
- Of 91 rights granted, 82 were of foreign origin.
- There has been an increase in foreign collaborations and partnerships.
- A number of Dutch affiliations and partnerships have been developed with the PBR Act playing an important role.

Intended Result: Protection abroad for commercial purposes of Canadian plant varieties

Total Horticulture

- The horticulture industry has filed very few applications in foreign countries. The benefit to the horticulture industry has been primarily the access to foreign varieties for commercial production in Canada.

Intended Result: Improvement of plant varieties to the public benefit, particularly to benefit farmers and nurserymen

Ornamentals

- The number and diversity of plant varieties has increased dramatically.
- This diversity has resulted in the development of an export oriented ornamental sector in Canada, compared to being a net importer at the beginning of the review period (Table 3.2).
- The sector has now established itself, from the perspective of reputation, and has better control and availability of its plant breeding materials.
- The PBR Act is seen as playing a key role in this positive change.

Potatoes, Fruits and Vegetables

- Fresh fruit cash receipts increased by 27.8% over the review period (Table 3.2). However, apple production declined by 3.7% over the

review period (Table 3.1), and cash receipts fell by 8% (Table 3.2).

- Potato production increased by 18% (Table 3.1) and farm cash receipts increased by 47% in real terms between 1990 and 1999 (Table 3.2).
- There has been an increase in the number of collaborations and partnerships formed in the sector, which has improved the availability of tree fruits varieties to nurserymen.

Intended Result: Any other public advantage

Total Horticulture

- Increasing seed costs (plant stock) were of concern. Average seeds/plants costs (greenhouse and nursery) did increase much faster in the 10 years post PBR than in the 6 years pre-PBR (97% versus 15%)⁶. Interviewees suggested it was difficult to compare the two periods, as the quality and variety selection have also increased substantially over the same period.
- Stakeholders generally agreed that private investment in the development of the horticultural varieties has increased since the introduction of the PBR Act, although public sector expenditures are felt to have declined.
- In general, the ornamental sector indicated that there has been a change in the competitive advantage for Canadian researchers in the nursery and floriculture sector over the past ten years. It was felt that PBR has had a major impact on this change.

3.2 AGRICULTURE INDUSTRY

Plant breeders' rights activity in the agriculture industry has been concentrated in three primary crop groupings:

- cereal crops including wheat, barley, corn, and oats;
- oilseeds including canola, soybeans and flax; and,
- pulse crops including peas and beans.

⁶ Source: Statistics Canada, Whole Farm Data Base, Greenhouse and Nursery Seed Costs.

3.2.1 Agriculture Industry Profile

Tables 3.3 to 3.5 provide production and economic profiles for the agriculture industry. These profiles provide a comparison of changes in some key industry production, economic and other characteristics during the review period. The beginning period is a "baseline" against which sector characteristics can be benchmarked as of the end of the period. Some of the indicated changes are due to the introduction of the PBR Act in Canada, while others are due to the impacts of other economic and social forces operating within the economy.

There have been significant increases in crop yields over the review period, notably in peas (32%), canola (25%) and wheat (22%) (Table 3.3).

The introduction of new foreign varieties has had a major impact on peas, leading to increases in both yield and production. In fact, pea hectares have increased almost six-fold over this review period. Canola hectares have also experienced a significant increase (by 73%) over the review period (Table 3.3). Wheat hectares have declined over the review period, primarily impacted by reduced market opportunities, according to interviewees. Soybeans, which have shown a decline in average yield, have nevertheless shown an expansion in hectares. It is postulated the decline in average soybean yield is due to the expansion of the crop onto less productive farmlands, and issues relating to the introduction of the new varieties in the cooler climates in Canada. As well, other competitive and agronomic issues relate to this expansion.

Changes in the level of investment are also an important indication of change. The primary source of investment statistics has been the internal member survey of the CSTA, conducted by the industry in 1990, and again in 2001. This survey shows investment within the CSTA membership in research and development in plant breeding and related activities growing from approximately \$34 million to \$68 million (in 1989 dollars) over this period (Table 3.4). The most significant proportion of the investment occurred in canola, followed by corn and then soybeans.

In summary, this industry profile suggests that significant productivity gains have been made within agriculture, as measured by changes in yield, and in the expansion of area. Just as important was the

significant increase in investment in the industry. The degree of effect with respect to the impact of the PBR Act cannot directly be assessed from these tables. However, the survey results indicated that

respondents felt there was a significant relationship between the introduction of the PBR Act and the development/availability of new agricultural varieties.

**Table 3.3
Agriculture Industry Profile – Production**

Production Criteria	3 Year Average (1988-1990)	2000	Percentage Change
Yield (Tonnes/ha)¹			
Wheat	1.990	2.425	21.86
Barley	2.750	3.062	11.35
Canola	1.192	1.484	24.50
Soybeans	2.842	2.639	-7.14
Flaxseed	1.076	1.267	17.75
Corn	6.456	7.149	10.73
Peas	1.798	2.379	32.31
Beans	1.659	1.739	4.82
Area (Millions hectares)¹			
Wheat	13.810	11.410	-17.38
Barley	4.707	4.646	-1.30
Canola	3.052	5.270	72.67
Soybeans	0.521	1.014	94.63
Flaxseed	0.608	0.742	22.04
Corn	1.006	1.103	9.64
Peas	0.195	1.323	578.46
Beans	0.050	0.065	30.00

¹ Canadian Grains Industry Statistical Handbook, Various Years.

**Table 3.4
Agriculture Industry Profile – Investment (CSTA)
(\$' millions)**

Investment Criteria	1989 Values	2000 Values <i>(Expressed in 1989 dollars)</i>	Percentage Change
Industry Investment ¹			
Canola	7.12	22.47	216
Corn	2.83	5.85	107
Soybeans	0.75	1.96	162
Cereals	1.51	1.69	12
Special Crops (Pulses)	0.13	0.29	130
Forages	0.32	0.62	91
Other Agriculture Crops	1.85	0.66	-64
Investment ¹			
Buildings	12.45	13.02	5
Equipment	5.01	24.23	384
Operating (per year)	14.51	30.48	110
Government Sources	<u>1.62</u>	<u>0.23</u>	-86
Total Investment	33.59	67.96	102

¹ Canadian Seed Trade Association Survey Results.

Table 3.5
Agriculture Industry Profile – Cash Receipts and Net Exports
(*\$' millions*)

Economic Criteria	1990 Values	2000 Values <i>(Expressed in 1990 dollars)</i>	Percentage Change
Cash Receipts¹ (\$ million)			
Wheat	3,077	2,526	-18
Barley	648	467	-28
Canola	790	1,296	64
Soybeans	256	556	117
Flaxseed	118	128	8
Corn	517	560	8
Dry beans and Peas	77	319	314
Net Exports² (\$ million)			
Wheat	3829.7	3300.9	-13.8
Oilseeds	665.9	1340.8	101.4
Forage seeds	51.54	178.4	246.1
Dry beans and Peas	161.4	782.4	384.8

¹ Canadian Grain Commission, Statistical Handbooks, Various Years.

² Statistics Canada, Canadian International Merchandise Trade (65-001-XPB).

3.2.2 Agriculture Industry Results Measurement

The agriculture industry findings based on industry consultations, and secondary research, are presented within the context of the intended results criteria as specified under the PBR Act.

Intended Result: Stimulation of investment in businesses involving the breeding of plant varieties in respect of which protection is afforded by the PBR Act

Total Agriculture

- There are more plant varieties now available to farmers, especially for canola, peas, and soybeans. Canola varieties registered for sale in Canada under the *Seeds Act* increased from 36 to 231 over the 10-year period from 1990 to 2000. Similarly, pea varieties increased from 20 to 88, and soybean varieties increased from 104 to 343 (Source: List of Varieties Registered in Canada).
- Average crop yields have increased. A part of this increase in average yield can be attributed to improved plant varieties. Other factors such as changing agronomic management practices (fertilizer and plant protection input use, tillage practices, etc.) have also contributed to these yield increases. However, interviewees estimated that 65 to

75% of the yield improvements can be linked to varietal improvements.

- There has been a general increase in disease resistance, drought tolerance, and competitive-ness of crops.
- The CSTA member survey shows that investment in the seed industry for equipment, infrastructure and operating increased from \$34 million annually in 1989 to \$68 million (1989 dollars) by 2000 (Table 3.4).
- Perception about the value of PBR appears to have changed over the course of the review period, both with public sector researchers, and the agriculture industry. Overall, there is a general perception within the sector that the PBR Act has been successful in stimulating growth and development, has resulted in improved varieties and increased varietal selection, and has not had the degree of negative impacts originally anticipated by some groups.
- Public sector investment has been supported by the federal matching grants program.

Cereals

- Cereals accounted for approximately 23% of the total agricultural applications over the review period.

- Annual investment from the private sector increased from \$1.5 million in 1989 to \$1.69 million (1989 dollars) in 2000 (Table 3.4).
- Most of the cereal rights were granted to Canadian public researchers. While the change in the amount of public variety research was not available, one private organization whose focus is on marketing and research investment of public varieties, increased their royalties collected and remitted to AAFC Research Stations from \$0.5 million in 1990 to \$2.9 million in 1999.

Oilseeds

- Applications for oilseeds account for 61% of total agriculture applications over the review period.
- Oilseed research investment in the private sector expanded from \$7.9 to \$24.4 million (1989 dollars) annually over the review period (Table 3.4). The oilseed plant breeding expansion is significant, led by major multinational companies. The interviewees felt the PBR Act's involvement was moderately responsible for this expansion.
- There has been an extension of canola hectares onto land that was previously unsuitable for canola production: canola hectares have increased by 73% over the 10-year review period (Table 3.3).
- The development of new soybean varieties, more tolerant to Canadian cool conditions have contributed to the expansion of this crop, especially in Ontario. In addition, the PBR Act has contributed to the development of specialized soybean varieties for delivery to Japanese consumer markets, resulting in higher returns for central Canadian farmers.

Pulses

- Applications for pulse crops were 15% of the total agricultural applications over the review period.
- Pulse crop investment in variety development increased from \$0.13 to \$0.29 million (1989 dollars) annually over the period (Table 3.4).
- The expansion of the pulse industry, especially peas, has resulted in significant diversification in prairie agriculture. A major element of this expansion was attributed to

protection afforded by the PBR Act of foreign varieties for development within Canada.

- The increase in varieties, particularly in peas and other grain legumes has contributed to the development of the special crops sector in western Canada, leading to a greater diversification of production and market opportunities in the agriculture industry.

Intended Result: Improvement in facilities to obtain foreign varieties of plants to the benefit of the Canadian agriculture industry

Total Agriculture

- Foreign varieties constituted 36% (247) of the total agriculture applications (or 10% of total applications under the PBR Act), including Canadian subsidiaries of foreign companies.
- Eighty-eight or 37% of agriculture rights granted were to foreign companies.
- Respondents indicated that the PBR Act had a significant impact on increasing the number of international affiliations and partnerships.

Cereals

- Of 236 agriculture rights granted, 50 or 21%, were to cereal crops, of which 12 were to foreign firms.

Oilseeds

- Of the 141 rights granted for oilseed crops, 36 or 25% were granted to foreign companies or individuals, with the PBR Act playing a moderately important role in this achievement.

Pulses

- Of the 45 rights granted, 40 or 89% within the pulse industry were to foreign companies.
- The pulse sector grew in production and sales, largely due to the improved access to foreign pulse varieties. It was felt that the PBR Act played an important role in this accomplishment.

Intended Results: Protection abroad for commercial purposes of Canadian plant varieties

Total Agriculture

- The number of applications filed by Canadians in foreign countries is relatively low – ranging from 28 in 1992 to 34 in 1998 and back to 28 in 1999.
- Most Canadian bred varieties are protected in the U.S., rather than in Europe.
- In recent years Canadian companies and organizations have filed applications in a number of foreign countries. The number of applications filed by country is not significant, but the aggregate number is increasing.
- A greater proportion of agriculture respondents indicated that the PBR Act provided them increased protection abroad, and increased opportunities for foreign collaborations. However, data suggests that these relationships tended to relate to varieties entering Canada rather than originating in Canada.

Expected Results: Improvement of plant varieties to the public benefit, particularly to benefit of farmers and nurseryman

Total Agriculture

- There has been an increase in the number of varieties now available to industry. The PBR Act has had a modest overall impact, with the exception of canola, and pulse crops (peas), where there has been a greater impact by the PBR Act on the number of varieties.
- Yields of almost all agricultural crops have increased dramatically over the review period. This increase has tended to be greater than the historical increase in the rate of productivity. The PBR Act has had a role in this increase.
- There has been significant expansion of agricultural crop hectares and yield. However, only a part of these increases can be directly attributed to the PBR Act. Other factors such as changing agronomic practices also contribute to these yield and hectare increases.

Cereals

- Yields of many cereal crops have increased dramatically over the review period: for example wheat by 22%, barley by 11% (Table 3.3).
- The stability of yield has also marginally increased over the 10 year review period, as demonstrated by a slight decline in the variance in cereal yields. (The standard deviation of farm yield was compared between the 10 year period 1990-2000, and 1980-1990 – Source: Canadian Grains Industry Statistical Handbook, various years).

Oilseeds

- Development and introduction of new cool temperature soybean varieties has led to an expansion of soybean hectares, particularly in Ontario. In addition, the PBR Act has contributed to the development of food type soybeans for delivery to Japanese consumer markets, resulting in higher returns for central Canadian farmers.
- New varieties of canola have enabled the expansion of the canola industry into areas previously unsuitable for production.
- Between 1990 and 2000 canola production area increased by 73% (Table 3.3).
- Annual net exports of oilseeds increased by 101% (in real terms) over the review period. (Table 3.5)
- Cash receipts to canola producers increased (in real terms) by 64%, and for soybean producers by 117% (Table 3.5).

Pulses

- Farm cash receipts for dry beans and peas has increased (in real terms) by 314% (Table 3.5).
- Pea hectares expanded by 578%, and yields increased by 32% (Table 3.3).
- Peas represent a major success story. The stimulus for growth has been the access to foreign varieties resulting in the expansion of the Canadian sector. Interview results suggest that access to foreign varieties is directly related to the protection afforded by the PBR Act.

Intended Results: Any other public advantage

Total Agriculture

- One concern initially expressed by opponents of the PBR Act related to the potential increase in seed costs. Quantitative information suggests that this has not happened. In fact, Statistics Canada information⁷ suggests that grains and oilseeds common seed real prices increased by 24% between 1980 and 1990, and by only 8.6% between 1990 and 1999. The relative cost of seed appears to have actually declined during the review period.
- Perception about the value of the PBR Act appears to have changed over the course of the review period, both with public sector researchers and the industry. There is a general perception within the industry that the PBR Act has been successful in stimulating growth and development within the industry, has resulted in improved varieties and increased varietal selection, and has not had the negative impacts originally anticipated by some groups.
- There was concern expressed about a decline in the number of public varieties available to producers. This has occurred in canola, with most varieties owned by private companies. However, there have been 30 PBR applications for canola varieties from public agencies. The majority of soybean varieties are privately owned and marketed. Most cereal varieties continue to be publicly owned.
- The total number of varieties available to producers has increased significantly in all cereal and oilseed categories. The interviewees felt the PBR Act had a significant impact on the increase in varieties.
- A number of multinationals have their world-wide canola breeding centres in Canada.
- The only negative expressed was the centralized and privatized control of varieties. The yield increases and variety selection were cited as being very beneficial.
- The total number of Canadian seed companies and organizations that are

involved in the seed industry appears to have increased during the review period. The CSTA reports that in 1995, 51 Canadian companies and organizations were listed with the Organization for Economic Cooperative and Development (OECD) under their schemes for the varietal certification of seed moving in international trade. This has increased to 83 as of 2000.⁸

- The impact of the PBR Act has been an increase of the opportunities for, and the number of, small and medium sized seed companies in Canada. The PBR Act has likely had very little impact on the actions and corporate activities of the large international seed companies.

⁷ Table 328-0001: Farm Price Index.

⁸ The OECD defines Canadian Companies and Organizations as those that carry on business and are federally or provincially incorporated in Canada. This includes the Canadian operations of multinational firms.

4.0 REVIEW SUMMARY

4.1 SUMMARY RESULTS

A decade after the *Plant Breeders' Rights Act* was enacted, it is generally accepted by industry, researchers, and government, that the scientific and economic well-being of the horticulture and agriculture industries has improved. There have been improvements in the yields and quality of many crops and an expansion of the area under production. Farmers and nurserymen have greater access to more and better varieties. In addition, some sectors of the horticulture and agriculture industries have enhanced their export capability, or have become net exporters of products. This includes the floriculture, nursery, potatoes, and pulse sectors. The PBR Act is felt to have had a direct impact on many of these changes.

Stimulation of Investment: There has been an increase in investment in plant breeding, research infrastructure, and technologies in most sectors of the industries evaluated. This is evident through the member survey conducted by the CSTA and anecdotal evidence obtained about the horticulture industry. In addition to the direct investment, there is an added investment multiplier in secondary and tertiary processing, input suppliers and retailing, all which contribute to rural development. The PBR Act was felt to have had an indirect impact on this increase in investment in many crops, and an important direct impact for ornamentals and pulses.

The PBR Act has had positive impacts on the structure of the horticulture and agriculture industries. The PBR Act has lowered the barriers to market entry for small and medium sized enterprises by enabling them to acquire protection and establish business opportunities in plant breeding and seed propagation. It is felt that the PBR Act has had very little impact on the business strategies of multinational companies.

The private sector has increased its investment by over 100% since the passage of the PBR Act. At the same time, the public sector has benefited as universities and Agriculture and Agri-Food Canada (AAFC) have received royalties from private

organizations to help fund their plant breeding programs. For example, about \$2.9 million per year in royalties is collected by seed growers through sales from one organization, and is re-invested into AAFC. In addition, there are numerous other agreements between seed companies, universities, colleges and AAFC that provide a positive financial contribution to research investment.

Improvement in Facilities to Obtain Foreign Varieties: Of all the areas evaluated, the PBR Act appears to have had the most significant impact here. Virtually every industry sub-sector was unanimous in their support for the importance of the PBR Act in enabling them to develop partnerships, linkages, and to improve their access to foreign varieties as a result of the legislation.

Protection Abroad for Commercial Purposes of Canadian Plant Varieties: The PBR Act's influence has been moderate in this area, noting that this has not been a major area of focus for horticulture and agriculture over the period reviewed. Respondents suggested that Canada does not yet have the critical mass to be a major developer of new varieties for foreign markets, with the exception of a few crop areas.

Improvement of Plant Varieties to the Public Benefit: There is no doubt that farmers have access to a much wider selection of varieties now than in the past. While it is difficult to attribute a high level of significance to the introduction of the PBR Act, it is interesting to note that the rate of varietal development and availability of new varieties in Canada has increased faster over the past 10 years than ever before. On final analysis, it would appear that the PBR Act has been a positive factor on the availability of improved varieties.

Other Public Advantages and Factors not in the Public Interest: This is perhaps the most complex component of the analysis, as the divergence of opinions is high. Much of this confusion is a result of perceived and/or actual relationships between the introduction of the PBR Act and changes to funding for public breeding, globalization, genetic patenting, etc.

While a discussion of these issues is well beyond the scope of this review, there are a few points that can be made under this evaluation category.

- In general, producers perceive they bear a substantial portion of the cost of intellectual property rights through increased seed/plant material costs, and royalties. This has resulted in some resistance toward the PBR Act within both the horticulture and agriculture farm community. Many producers perceive that costs associated with an infringement action are also included in the cost of the seed costs/royalties, and they do not feel that this is appropriate.
- Cereal and oilseed seed costs in Canada increased by 8.6% in real terms between 1990 and 1999. This is actually slower than in the previous decade. While seed/plant costs in the horticulture industry have risen faster during the review period than in the previous decade, the quality has also increased dramatically.
- The protection offered under the PBR Act has encouraged increased research and licensing arrangements, allowing the breeding community to share information and genetic material. The fact that not a single compulsory licence has been granted, or even applied for, as allowed by the PBR Act, suggests that the industry is acting responsibly by ensuring good quality varieties are widely available to the public at a reasonable price.
- As suggested by industry and cited herein, there is support for Parliament to update the PBR Act to meet the evolving needs of the industry. The absence of some key elements embodied in the 1991 UPOV Convention is placing Canada at a competitive disadvantage. Trading partners including the U.S., U.K., Germany, and the Netherlands have all ratified

the 1991 UPOV Convention. And, as additional countries join UPOV, countries such as Canada that continue to adhere to the 1978 Convention, will increasingly be in the minority.