

## FOREWORD BY THE SECRETARY-GENERAL OF UPOV



It is my great pleasure to present this book. For the first time since the adoption of the International Convention for the Protection of New Varieties of Plants (UPOV Convention), in 1961, a systematic study on the effects of plant variety protection has been accomplished. The overall result is that plant variety protection according to the UPOV Convention brings about remarkable and substantial benefits.

The challenges in any study on the impact of plant variety protection are considerable, precisely because of the enormous range of ways in which plants are employed in our daily lives. Nevertheless, some very clear messages have emerged from this study, perhaps the most important being that the introduction of the UPOV system of plant variety protection and membership of the International Union for the Protection of New Varieties of Plants (UPOV) can open a door to economic development, particularly in the rural sector. An important feature of the study is that it indicates the range of ways in which plant variety protection can produce benefits and also demonstrates that the benefits differ from country to country, reflecting their specific circumstances. Similarly, alongside the use of other forms of intellectual property, the plant variety protection system has been used to underpin advances in plant breeding technologies which increase the scope for plant improvement. Thus, an important conclusion is that the UPOV system of plant variety protection provides an effective incentive for plant breeding in many different situations and in various sectors, and results in the development of new, improved varieties of benefit for farmers, growers and consumers.

I am convinced that this publication will be of interest to a wide audience and, in particular, to decision makers in countries which are reflecting on how to enhance economic development through plant variety protection. For UPOV itself, it provides an important incentive to continue its mission to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society as a whole.

A handwritten signature in black ink, consisting of a series of loops and a long horizontal stroke at the end.

Kamil Idris  
Secretary-General of UPOV

## FOREWORD BY THE PRESIDENT OF THE UPOV COUNCIL



UPOV decided to undertake a study as means of providing countries considering the introduction of a plant variety protection (PVP) system with information on the impact of PVP systems according to the UPOV Convention. It is very rewarding to see that the study has demonstrated a range of beneficial impacts. As President of the Council of UPOV, and as a representative of a developing country, it has been particularly interesting to see that, in addition to the benefits seen from the introduction of plant variety protection based on the UPOV Convention, specific positive impacts have been seen with regard to membership of UPOV. Those aspects reflect the value of the work of UPOV as an organization in providing advice and assistance to its members and future UPOV members. Whilst the main purpose of the study was to provide information to countries considering the introduction of a PVP system, an important result of the study was also to show that there have been benefits for all UPOV members as the Union has grown in membership. As the study concludes "farmers, growers and breeders have access to the best varieties produced by breeders throughout UPOV member territories."

The study has shown how effective plant variety protection can be in encouraging the development of new varieties of plants. It is perhaps worthwhile at the same time as reviewing those benefits to reflect on the importance of the plant genetic resources which form the raw material for the breeders' work. In that respect, UPOV has clarified\* that it "is of the opinion that access to genetic resources is a key requirement for sustainable and substantial progress in plant breeding. The concept of the 'breeder's exemption' in the UPOV Convention, whereby acts done for the purpose of breeding other varieties are not subject to any restriction, reflects the view of UPOV that the worldwide community of breeders needs access to all forms of breeding material to sustain greatest progress in plant breeding and, thereby, to maximize the use of genetic resources for the benefit of society." Under the UPOV system, a breeding cycle of progression can continue to maximize the benefits of plant variety protection and plant breeding for the future.

A handwritten signature in black ink, which appears to read "Enriqueta Molina Macías". The signature is written in a cursive style.

Ing. Enriqueta Molina Macías  
Director, National Service for Inspection and Seed Certification (SNICS), Mexico  
and  
President of the UPOV Council

\* [http://www.upov.int/en/news/2003/pdf/cbd\\_response\\_oct232003.pdf](http://www.upov.int/en/news/2003/pdf/cbd_response_oct232003.pdf)

# EXECUTIVE SUMMARY

## INTRODUCTION

### Background to the Report

Many countries, including developing countries and countries in transition to a market economy, are considering the introduction of a system for the protection of new varieties of plants (PVP system). Most countries which have already introduced a PVP system have chosen to base their system on the International Convention for the Protection of New Varieties of Plants (UPOV Convention) in order to provide an effective, internationally recognized system.

The International Union for the Protection of New Varieties of Plants (UPOV) decided to undertake a study (Impact Study) as a means of providing countries considering the introduction of a PVP system with information on the impact of the introduction of PVP systems according to the UPOV Convention. This report is based on the work of a UPOV *Ad hoc* Working Group to Study the Impact of Plant Variety Protection, which included members from all the countries forming the basis of the Impact Study: Argentina, China, Kenya, Poland and the Republic of Korea (see Section III of the Report "Reports on Studies Conducted in Individual Countries").

In order to provide a meaningful study on the impact of PVP it is important to understand the purpose of such a system of intellectual property rights and, equally important, aspects which are not appropriate to be included within the realms of such a system. With respect to the purpose of a PVP system, UPOV clarifies that its mission is "To provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants, for the benefit of society".

Thus, the UPOV system of PVP is designed to encourage innovation in the field of plant breeding. In that respect, the 1991 Act of the UPOV Convention recognizes that it is important to encourage breeding in all plant genera and species and not to pre-determine for which genera and species breeding would, or could, be beneficial. An important corollary to this principle is that it is inappropriate to conclude that a PVP system is not effective because it does not encourage breeding in a particular crop.

### The Role of Plant Variety Protection

In an effective system of PVP the development of new varieties of plants will be encouraged where there is commercial viability, but in cases where there is no existing, or potential, commercial market for varieties, the presence of a PVP system should not be expected to encourage the development of new varieties. Reference to a "potential" commercial market is a recognition of the fact that an effective PVP system can lead to the creation and/or increased availability of new varieties which allow a market demand to be met, which it was not possible for farmers or growers to satisfy without such new varieties.

Where there is no commercial market for a particular crop, but where plant breeding is still considered to be necessary, breeding may be supported by the public sector. Such a situation in a particular crop should, however, be seen alongside the overall benefits of the PVP system in relation to the availability of improved varieties for farmers and growers in commercially viable crops. Such benefits of the PVP system can be the key to overall economic development and, in particular in developing countries, the development of the rural economy in a way which helps farmers to break out of the cycle of subsistence farming.

With regard to matters which do not fall within the realm of an effective PVP system, it is important to note that it is not the role of a PVP system to regulate the marketplace. Thus, the 1991 Act of the UPOV Convention, Article 18, states that "The breeder's right shall be independent of any measure taken by a Contracting

Party to regulate within its territory the production, certification and marketing of material of varieties or the importing or exporting of such material. In any case, such measures shall not affect the application of the provisions of this Convention”, thereby clarifying that an effective system is one which is independent of such market regulation. For that reason, it was considered essential that any study on the impact of PVP systems should not be inter-twined with consideration of systems regulating production, certification and marketing. It is further noted that the success of PVP does not depend on the existence of systems regulating production, certification and marketing, as illustrated by the success of PVP in sectors which are not regulated by systems such as national listing and seed certification.

This clarification should not be taken to mean that UPOV believes that there should be a particular type or level of market regulation, but rather as a recognition that such regulation should be dealt with by an appropriate, dedicated and independent mechanism. It is also relevant to note that, for members of UPOV, being part of an internationally harmonized system, the introduction of a PVP system can be established without a large infrastructure, thereby facilitating the introduction of PVP for countries with limited resources (see Section II of the Report “Development of the UPOV System of Plant Variety Protection”).

### **The Benefits of Plant Variety Protection**

In relation to the impact which might be expected from an effective PVP system, it is considered important to recognize that the positive effects of a PVP system may be realized in the form of an incentive to stimulate new breeders and new breeding work and/or providing a basis for more effective breeding work at the domestic level. These positive effects could relate equally to the private breeding sector, the public breeding sector or to partnerships between the two. However, whilst recognizing that such an impact is of critical importance, it is also recognized that an effective PVP system can also provide important benefits in an international context by removing barriers to trade in varieties, thereby increasing domestic and international market scope. In short, breeders are unlikely to release valuable varieties into a country without adequate protection. With access to such valuable foreign-bred varieties, domestic growers and producers have more scope to improve their production and also have more scope to export their products. It is also recalled that, as a consequence of the breeder's exemption in the UPOV Convention, domestic breeders also gain access to valuable varieties for use in their breeding programs. This international aspect is an important means of technology transfer and effective utilization of genetic resources.

The UPOV mission statement refers to “the aim of encouraging the development of new varieties of plants, for the benefit of society”. Clearly, it is not possible to detail all the benefits, or even the range of benefits, to society of the introduction of new varieties of plants, because the scope is enormous. However, the range includes: economic benefits, for example through varieties with improved yield leading to reductions in the price of end-products for consumers, or improved quality, leading to higher value products with increased marketability; health benefits, for example through varieties with improved nutritional content; environmental benefits, for example through varieties with improved disease resistance or stress tolerance; and even pure pleasure, for example with ornamental plants. Society in this context means all society, and all members of society are consumers in some way. However, it is also recognized that farmers and growers are the deliverers of the benefits of new varieties to society and are also the first beneficiaries of new varieties which offer improved income through improved yields, improved quality and the opening-up of new market possibilities.

In recognition of the factors set out above, the study comprises two main parts. Reflecting the fact that the effectiveness of a PVP system owes much to international recognition and harmonization, Section II of the Report “Development of the UPOV System of Plant Variety Protection” reviews the development of the UPOV system at the international level. Section III of the Report “Reports on Studies Conducted in Individual Countries” reviews the impact of the introduction of a plant variety protection system in selected UPOV members (Argentina, China, Kenya, Poland and the Republic of Korea). Conclusions are drawn in Section IV and are reproduced below.

## CONCLUSIONS OF THE REPORT

It is apparent that the impact of PVP will vary country-by-country and crop-by-crop. Accordingly, although substantial benefits have been seen across the range of UPOV members and, in particular, in each of the countries in this study, the results and conclusions of the study need to be seen in the context of the individual situations. On that basis, the chapter on the conclusions starts by summarizing the impact of PVP at the country level, as reported in Section III of the Report “Reports on Studies Conducted in Individual Countries”, and then provides an overall review of the development of the UPOV system, as reported in Section II of the Report “Development of the UPOV System of Plant Variety Protection”, as a basis for identifying some general trends in the impact of PVP.

### Impact of PVP at the National Level

#### *Argentina*

In Argentina, a PVP system had been in place for a number of years before the system was amended to be in line with the 1978 Act of the UPOV Convention, with protection being offered to all plant genera and species. This situation allowed the impact of the UPOV system and UPOV membership to be considered in relation to a national, non-UPOV PVP system.

The following effects were observed in Argentina:

- Argentina introduced a PVP system in 1973. However, creation of INASE and amendment of the PVP system to be in conformity with the 1978 Act of the UPOV Convention, except for certain aspects concerning foreign applications, was accompanied by a substantial increase in the number of titles granted to domestic breeders. In the 10 year period prior to those developments (1982-1991) the average annual number of titles granted to domestic breeders was 26, which more than doubled to 70 (267%) for the subsequent 10 year period (1992-2001);
- prior to 1994, Argentina provided protection to varieties bred by non-residents on a mutual reciprocity bases (i.e. where Argentinean breeders were able to protect varieties in those other countries), resulting in bilateral agreements in some cases. In 1994, the PVP system in Argentina became fully compatible with the 1978 Act of the UPOV Convention, including with respect to foreign applications, and Argentina acceded to the UPOV Convention. The number of titles granted to non-residents increased in conjunction with those developments. In the 10year period prior to those developments (1984-1993) the average annual number of titles granted to foreign breeders was 17, which more than trebled to 62 (355%) for the subsequent 10 year period (1994-2003);
- introduction of new, protected varieties from non-resident breeders can be seen in important agricultural crops (e.g. soybean, lucerne), where improved varieties are important for competitiveness in the global market, and in horticultural crops (e.g. rose, strawberry);
- improved performance of new, protected varieties is indicated, for example, in crops such as wheat and soybean where the demand for new, protected varieties is shown by their increased proportion of the certified seed area, which has risen from 18% to 82% and 25% to 94%, respectively, since the introduction of the UPOV-based PVP law and UPOV membership;
- increase in the number of domestic breeding entities seen, for example, in soybean and wheat, most of which occurred in the private sector;
- increase of horizontal cooperation in the seed industry, involving foreign seed companies and agreements for technology transfer between national research institutes and breeding entities with other national companies (Technological Relationships Agreements), resulting in more rapid movement of germplasm.

## *China*

China introduced its PVP system, based on the 1978 Act of the UPOV Convention, in March 1997. The PVP system became operational in 1999 and China also became a member of UPOV in 1999. China has two separate PVP schemes, operated by the Ministry of Agriculture and the State Forestry Administration. The Ministry of Agriculture has gradually extended protection to 41 genera and species. The State Forestry Administration has gradually extended protection to 78 genera or species. Thus, China's PVP systems have only been in operation for 5 years and for a limited number of genera and species and it is not yet possible to evaluate their full impact. Nevertheless, the following effects have been observed:

- rapid uptake by farmers of new, protected varieties seen, for example, in maize and wheat in Henan Province: Farmers have decided to buy seed of protected varieties, the price of which includes royalties, in anticipation of a higher economic return from the use of better varieties;
- new, protected varieties have been introduced for major staple crops (e.g. rice, maize, wheat), horticultural crops (e.g. rose, Chinese cabbage, pear), including traditional flowers (e.g. peony, magnolia, camellia) and for forest trees (e.g. poplar);
- start of an introduction of new, foreign varieties, in particular ornamental varieties;
- stimulation of commercial breeding activities in domestic public research institutes and domestic seed companies, with an increase in the number of breeders (e.g. maize and wheat in Henan Province) linked to increased numbers of PVP applications;
- income generation for breeders, including public research institutions and agricultural universities, and encouragement of further investment in plant breeding.

Providing information and raising awareness of the PVP system for breeders, potential new breeders and users have been seen to be important measures for a rapid impact.

## *Kenya*

In Kenya, the PVP scheme started to operate in 1997 and Kenya acceded to the 1978 Act of the UPOV Convention in 1999. Kenya grants plant breeders' rights for all plant genera and species other than algae and bacteria. The following impacts have been observed:

- significantly higher number of varieties developed and released in the six-year period after the introduction of PVP (1997-2003), compared to the previous six-year period (1990-1996), across a number of agricultural crops and for maize in particular;
- increased introduction of foreign varieties, especially in the horticultural sector, which contribute to the diversification of the horticultural sector (for example the emergence of the flower industry) and support the competitiveness of Kenyan products (cut flowers, vegetables and industrial crops) in global markets;
- increased introduction of foreign germplasm in the form of new, protected varieties (especially of horticultural crops) which has been used by Kenyan breeders for further breeding;
- increase of the number of Kenyan-bred varieties of agricultural crops with improved performance (e.g. yield, pest and disease tolerance, nutritional qualities, early maturity and tolerance to abiotic stresses) for local farmers, including subsistence farmers. PVP titles for many Kenyan-bred varieties are in the hands of public institutions and local farmers can use the propagating material of the new, protected varieties under privileged conditions: for example, subsistence farmers have been permitted to exchange seed among themselves;
- facilitation of public / private partnerships for plant breeding, including partnership between international research institutes (CGIAR Centers) and Kenyan seed companies, and emergence of new types of breeders (university researchers, private farmer-breeders).

## *Poland*

A PVP system was introduced in 1987 and its development coincided with the reform of the Polish society from the planned economy to the market economy. Various industrial sectors, including agriculture and the seed industry, underwent a process of privatization and decentralization. Poland also suffered from hyperinflation during this period. Poland became a member of UPOV in 1989. In 1990, a series of reforms to adjust the Polish seed scheme to a market economy were implemented. The PVP Law was amended according to the provisions of the 1991 Act of the UPOV Convention in 1995. Since 2003, Poland has been party to the 1991 Act of the UPOV Convention. Poland grants plant breeders' rights to all plant genera and species. Poland joined the European Community in May 2004 and since that time, protection of new varieties of plants can be granted either through the Polish national PVP system or through the European Community PVP system, which is operated by the Community Plant Variety Office (CPVO). A PVP title granted by the CPVO is valid in all 25 member States of the European Community. All these factors make a precise analysis of the impact of the introduction of PVP in Poland difficult. Nevertheless, from the data collected under this study, the following phenomena were considered to reflect the impact of the introduction of PVP in Poland:

- the number of applications for protection has continued to increase after the introduction of PVP. UPOV membership was followed by an increase in the number of applications from non-resident breeders;
- the number of varieties filed on the National List (which must satisfy the requirement to demonstrate value for cultivation and use (VCU)) and the number of varieties granted plant variety protection demonstrate that there has been an increasing availability of improved varieties since the introduction of PVP;
- breeders have utilized the PVP system in major agricultural, horticultural and ornamental crops where it is important to support their breeding activities. PVP has not been used to protect all new varieties where protection is effected by biological means e.g. by control and/or protection of parent lines of hybrids in tomatoes, although, even in such cases, breeders have also decided to protect hybrid varieties where it is necessary to facilitate the conclusion of a commercial agreement;
- improved characteristics of varieties of certain crops important for Polish agriculture and horticulture: for example, gerbera, potato and tomato;
- increased access to foreign varieties/germplasm, especially in the ornamental sector such as gerbera, rose etc.;
- increased number of commercial breeding entities and increased number of improved varieties despite a reduction in State-funded breeding;
- the accession of Poland to the European Community in May 2004 resulted in a decrease in the number of applications for the Polish national PVP system, which already began in 2002, as breeders responded to the fact that protection titles granted under the Community PVP system extend to all members of the European Community.

## *Republic of Korea*

In 1997, the Republic of Korea introduced a system of PVP which conformed with the provisions of the 1991 Act of the UPOV Convention and became a member of UPOV in 2002. Protection has gradually been extended and in 2004, 155 genera and species were eligible for protection. Although it is still considered premature to evaluate the full impact, the following effects have been observed:

- introduction of PVP resulted in a large number of PVP applications by residents. Membership of UPOV was associated with a large number of PVP applications by non-residents, particularly in the ornamental sector;
- instant response to the extension of the range of genera and species covered by PVP which was typically observed in the case of the extension of protection to ornamental crops in July 2001;
- new, improved varieties have been produced in a range of agricultural and horticultural crops, including in traditional crops (e.g. ginseng);
- introduction of new foreign varieties, especially varieties of ornamental crops such as rose, providing immediate benefits for the flower industry of the Republic of Korea, one of the fastest developing sectors of agriculture in the country; introduced varieties have been used by domestic breeders for further breeding;
- increase in the number of breeders of certain crops, such as rice and rose;

- stimulation of certain sectors of plant breeding; for example, in rice breeding, new types of breeders such as individual rice breeders (farmer breeders) and university researchers, have appeared. Since the introduction of PVP there has been an important transformation in the rice breeding sector to meet the evolving demands for rice. In the sector of rose breeding, private breeders have appeared and the number of domestic varieties has increased.

## Overall Development of the UPOV System

Section II of the report “Development of the UPOV System of Plant Variety Protection” contains an overall review of the development of the UPOV system.

The overview considers the situation from the perspective of oldest and newest members, categorizing countries into those which were UPOV members by 1992 (older members) and those which became members at a later time (newer members).

With regard to the 10 older UPOV members that were members of the European Community (Belgium, Denmark, France, Germany, Ireland, Italy, Netherlands, Spain, Sweden and United Kingdom), the report demonstrates the impact of the Community PVP system within the European Community, showing that, whilst the number of applications for protection with the CPVO has continued to increase, breeders have been able to substantially reduce the overall number of applications required for equivalent, or wider, protection within the European Community. It notes that the development of such a regional system could also have particular benefits for breeders from countries located outside the region concerned because of the simplified administrative procedures compared to a situation where applications have to be made in many countries and languages. The European Community has offered an increasingly important market for breeders from outside the European Community. On the other hand, the number of applications made by residents of the 10 European Community countries with UPOV members other than those belonging to the European Community more than doubled between 1993 and 2003, demonstrating that the expansion of UPOV has presented increased opportunities for breeders based in the European Community.

An overview of developments with regard to the other 10 older UPOV members (Australia, Canada, Hungary, Israel, Japan, New Zealand, Poland, South Africa, Switzerland, United States of America) demonstrates that, in a similar way to developments for the European Community countries, that group of countries has also seen an increase in the number of applications received, particularly from non-residents, and also shows that the number of applications made by their breeders in other territories has also increased.

In summary, the developments in the 20 “oldest” UPOV members show the importance of an international PVP system. Put simply, farmers, growers and breeders have had access to the best varieties produced by breeders throughout UPOV member territories and have been shown to be taking full and increasing advantage of that opportunity.

With regard to countries which have joined UPOV in the more recent past, it is already possible to consider impacts which became apparent immediately on joining UPOV, or soon thereafter. The majority of countries which joined UPOV between 1993 and 2000 and, therefore, for which it has been possible to obtain useful data, were countries in transition to a market economy (Bulgaria, Czech Republic, Estonia, Kyrgyzstan, Republic of Moldova, Russian Federation, Slovakia, Slovenia and Ukraine) or were Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Mexico, Panama, Paraguay and Uruguay). Of the remaining seven countries which joined UPOV between 1993 and 2000 (Austria, China, Finland, Kenya, Norway, Portugal and Trinidad and Tobago), China and Kenya are the subject of individual country profiles in this Study.

For the 10 Latin American countries which joined UPOV between 1993 and 2000 it is apparent that joining UPOV was characterized by a substantial demand for variety protection and, in particular, a large influx of foreign varieties (applications by non-residents). A high proportion of non-resident applications appear to relate to ornamental varieties. In that regard, it can be observed that access to such varieties is crucial to



enable producers in those countries to meet the demands of the global market place and indicates how the lack of an effective and internationally recognized PVP system can act as a barrier to global trade.

For the eight countries in transition to a market economy which joined UPOV between 1993 and 2000 it is apparent that joining UPOV was accompanied by a substantial demand for variety protection, with the majority of applications made by domestic breeders.

In summary, the review in Section II demonstrates the positive response for countries joining UPOV and demonstrates that the expansion of UPOV has led to the introduction of more varieties for both “old” and “new” UPOV members. It also recalls that membership of UPOV provides important technical assistance and maximizes opportunities for cooperation, which enables PVP to be extended to the widest range of plant genera and species in an efficient way.

## OVERVIEW OF THE IMPACT OF PLANT VARIETY PROTECTION

Having reviewed some of the impacts of PVP at the national and international level it is possible to identify some common or universal themes, although their detail in terms of crops and speed of the occurrence can vary. The following is a summary of those themes:

### Importance of PVP and Uptake of Protected Varieties

A strong argument can be made that the importance of the PVP system and protected varieties can be assessed simply by the occurrence of protected varieties. It is observed that, since there is significant cost involved in obtaining protection, breeders will not seek variety protection for their new varieties unless, firstly, protection is necessary and, secondly, their varieties have true market value. Strength is given to the first part of that argument by the observation that breeders have made less routine use of the PVP system where they have other forms of control over their varieties, for example in the case of some hybrid varieties. With regard to the second part, there is information to demonstrate that the uptake of new, protected varieties is very strong and rapid even though, in most cases, a royalty payment is included in the cost for farmers and growers with new protected varieties. Farmers and growers make the choice of new, protected varieties over existing non-protected varieties, the availability of which is not affected by the PVP system, i.e. the existing non-protected varieties remain freely available to farmers and growers after the introduction of PVP.

In the case of Kenya, it was clarified that PVP titles for many Kenyan-bred varieties are in the hands of public institutions and local farmers can use the propagating material of the new, protected varieties under privileged conditions; for example, subsistence farmers have been permitted to exchange seed among themselves.

### Number of New Varieties

Individual country reports have demonstrated increases in the overall numbers of varieties developed after the introduction of PVP. New, protected varieties have been developed for a wide range of crops including, for example, staple crops in the agricultural sector (e.g. barley, maize, rice, soybean, wheat), important horticultural crops (e.g. rose, Chinese cabbage, pear), traditional flowers (peony, magnolia, camellia in China) forest trees (e.g. poplar in China) and traditional crops (e.g. ginseng in the Republic of Korea). It is also apparent that it is important for countries to extend protection to all genera and species in order to receive the full benefits of PVP.

### Improvement of Varieties

As noted above, it can be argued that breeders will not protect their new varieties unless their varieties have true market value and that, furthermore, the final assessment of the value of a variety is made by the user of the variety. However, the individual country reports have demonstrated some of the ways in which new,

protected varieties represent improvements. For example, in Poland, varieties must demonstrate that they are improved varieties in order to be included in the National List, a list of varieties of agricultural, vegetable and fruit plant species whose seed can be legally produced and marketed in Poland. In crops such as barley and potato, increased numbers of new, protected varieties have been associated with increased numbers of varieties on the National List. In Argentina, evidence of the improved performance of new, protected varieties has been found in crops such as wheat and soybean where the demand for new, protected varieties is shown by their increased proportion of the certified seed area, which has risen from 18% to 82% and 35% to 94%, respectively, since the introduction of the UPOV-based PVP law and UPOV membership. Within the individual country reports a range of examples of varieties with improved features have been provided in the form of text boxes.

### **Introduction of Foreign Varieties**

An almost universal observation in the Impact Study was that the introduction of the UPOV PVP system and, in particular, membership of UPOV was accompanied by a large number of variety applications by foreign (non-resident) breeders, particularly in the ornamental sector, which was seen to be enhancing global competitiveness for producers.

A particular illustration of this was found in Argentina. Prior to adaptation of its national law on plant variety protection to the UPOV Convention and membership of UPOV, Argentina had a plant variety protection system in force and offered protection to non-resident breeders on a mutual reciprocity basis. However, full adaptation of the national law to the 1978 Act of the UPOV Convention and UPOV membership had an immediate positive effect on the number of titles granted for new varieties from non-residents. The report from Kenya noted that the introduction of foreign varieties contributed to the diversification of the horticultural sector (for example the emergence of the flower industry) and supported the competitiveness of Kenyan products (cut flowers, vegetables and industrial crops) in global markets. Similarly, in the Republic of Korea, the introduction of new foreign varieties, especially varieties of ornamental crops such as rose, was noted to provide immediate benefits for the flower industry of the Republic of Korea, one of the fastest developing sectors of agriculture in the country. Poland experienced the same influx of foreign-bred varieties and China reported the start of an introduction of new, foreign varieties, in particular for ornamental varieties. The overview summary of the 10 Latin American countries which joined UPOV between 1993 and 2000, provided in Section II, indicated that joining UPOV was characterized by a substantial demand for variety protection and, in particular, a large influx of foreign varieties, with a high proportion of those applications relating to ornamental varieties. In that respect, it is recalled that the ornamental sector is both diverse and dynamic and restricting the number of plant genera and species for which protection is offered can restrict the scale of the influx of foreign-bred varieties.

An additional factor which was noted with regard to the introduction of foreign-bred varieties was that, according to the breeder's exemption in the UPOV Convention foreign varieties could, and were, used by domestic breeders in the development of their breeding programs.

### **Domestic Breeding**

Impacts of PVP on domestic breeding could be seen with regard to the number of breeding entities and the type of breeders and breeding activities.

#### *(a) Number of breeding entities and varieties*

Assessing the number of breeding entities presents a number of difficulties with regard to the availability of useful data. However, the report from Argentina provided information on an increase in the number of domestic breeding entities seen, for example, in soybean and wheat, most of which occurred in the private sector. The report from the Republic of Korea demonstrated an increase in the number of breeders of certain crops, such as rice and rose. Poland reported an increase in the number of commercial breeding entities and

an overall increase in the number of improved varieties despite a reduction in State-funded breeding and an overall decline in the number of domestic breeding entities. China reported on the stimulation of commercial breeding activities in domestic public research institutes and domestic seed companies, with an increase in the number of breeders (e.g. maize and wheat in Henan Province) linked to increased numbers of PVP applications. It was also noted that the protected varieties resulted in income generation for breeders, including public research institutions and agricultural universities, and encouragement of further investment in plant breeding.

*(b) Types of breeders*

The Republic of Korea reported on the stimulation of certain sectors of plant breeding. For example, in rice breeding, new types of breeders such as individual rice breeders (farmer breeders) and university researchers, had appeared. Since the introduction of PVP there had also been an important transformation in the rice breeding sector to meet the evolving demands for rice. In the sector of rose breeding, private breeders had appeared and the number of domestic varieties had increased. In Kenya, facilitation of public / private partnerships for plant breeding, including partnership between international research institutes (CGIAR Centers) and Kenyan seed companies, and emergence of new types of breeders (university researchers, private farmer-breeders) were reported.

### **Membership of UPOV**

The review in Section II and the individual country reports demonstrate the positive responses which have been seen for countries introducing the UPOV PVP system and also the significant impact of countries joining UPOV. In addition, the developments in the 20 "oldest" UPOV members, as summarized in Section II, indicate the importance of an international PVP system and the benefits for all UPOV members as the Union grows in membership. Put simply, farmers, growers and breeders have access to the best varieties produced by breeders throughout UPOV member territories. It is also important to note that membership of UPOV provides important technical assistance and maximizes opportunities for cooperation, which enables PVP to be extended to the widest range of plant genera and species in an efficient way, thereby enabling the benefits to be maximized.