Historic and Modern Update on Plant Variety Protection©

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INTRODUCTION

You and I most probably agree that the world of plants is fascinating and interesting, but does the rest of the World's population have the same priorities? When performing a Google search on "plants," "plant novelty(ies)," or "plant novelty/breeders' rights," almost 190 million hits were revealed; "beer" had 127 million matches; "wine" had 232 million; "sex" had 413 million; and "food" revealed 661 million hits. In other words, plants are half as interesting as sex, but 50% more fascinating than beer. Wine is just a bit more interesting than plants, the interest of which is only a little less than 1/3 that of food. Certainly, plants are fascinating!

The demand for new ornamental crops in the plant market continues to soar and independent breeders are the key source for such introductions. The job of a plant breeder is to create improved plants. This may be accomplished simply by selecting a superior individual from amongst a range of existing possibilities, or it may require that a breeder know how to efficiently swap or replace parts, recombine components, and rebuild a biological system that will be capable of growing vigorously and productively in the context of an agricultural or horticultural environment. How the breeding is done and what goals are achieved is largely a matter of biological feasibility, consumer demand, and production economics. What is clear is that the surest way to succeed in a reasonable amount of time is to have access to a large and diverse pool of genetic variation.

The process of plant breeding is theoretically simple but its power resides in the fact that it creates novelty. A breeder generally selects two individuals for crossing, each of which has specific traits or characteristics of interest. The cross provides the mechanism by which genes are exchanged between the parents so that a wide array of diverse individuals is observed in the progeny of future generations. From a breeding perspective, this provides the basis for selection so that individuals containing the best features of both parents can be identified and further bred. By selecting parents that are genetically similar, a breeder restricts the amount of variation that will be evaluated in the offspring. On the other hand, by crossing genetically divergent parents, the range of phenotypic variation will be much more extensive and can even be surprising, with many individuals presenting phenotypes that would not be expected based on the attributes of the parents. Thus, if a breeder is interested in innovation and wants to generate maximum variation from which to make selections, wide crosses are the most productive.

Not all generic variation is created equal. When Darwin first introduced the concept of evolution (Darwin, 1859), he challenged the prevailing view that species were fixed entities with a single, invariable genetic identity. The concept of natural selection presupposed that species were comprised of genetically variable individuals such that selection could act on them. The genetic variants differ in the alleles (versions of genes) they carry. Alleles that are deleterious in terms of the survival and reproduction of the organism will eventually be eliminated while alleles that

are favourable or neutral will be perpetuated in the population. Recombination in natural populations allows alleles that may be deleterious in one genetic background to be reassessed in a different genetic context. Over time, the alleles that are transmitted at high frequency across generations represent those with a substantial likelihood of contributing positively to an organism's long-term viability in a variable environment. For this reason, natural variation is a much more valuable and informative reservoir of genes for the purposes of plant improvement than would be an equivalent number of induced mutations generated in a laboratory.

Domesticated selections have been made by humans in the last 10,000 years and inevitably represent a subset of the variation found in their wild ancestors. Cultivars are recognizable because they manifest characteristics that are associated with domestication in plants. Unusual or extreme phenotypes, such as large fruit or seed size, intense colour, sweet flavour, or pleasing aroma are often selected by humans and maintained as cultivars for aesthetic reasons, while synchronous ripening or inhibition of seed shattering (a dispersal mechanism) are selected to facilitate harvest. These phenotypes may occur in nature but they will frequently be eliminated by natural selection before they are fixed in a population. Because of human selection, cultivars may exemplify a range of exaggerated phenotypic attributes that give them the appearance of being, on the whole, more diverse than some of the wild populations from which they were derived, but in truth, domestication usually represents a kind of genetic bottleneck. Furthermore, cultivars are grown in agricultural environments that are generally more uniform than the environments in which wild species grow, and this tends to further narrow the gene pool. Thus while cultivars may embody a high degree of obvious phenotypic variation, this may not always be a good predictor of the extent of their genetic variation.

The landrace varieties are the earliest forms of cultivar and represent the first step in the domestication process. Landraces are highly heterogeneous, having been selected for subsistence agricultural environments where low, but stable yields were important and natural environmental fluctuation required a broad genetic base. Landraces are closely related to their wild ancestors and embody a great deal more genetic variation than do modern, high-yielding cultivars that are selected for optimal performance within a narrow range of highly managed environmental conditions. The value of both the wild species and the early landrace varieties in the context of modern plant breeding is that they provide a broad representation of the natural variation that is present in the species as a whole. The fact that natural selection has acted on such populations over the course of evolution makes them particularly valuable as materials for breeders. The value added by imposing a low intensity of human selection on the early landraces resides in the fact that some of these early varieties represent accumulations of alleles that produce phenotypes particularly favourable or attractive to the human eye, nose, palette, or the other appetites. It is also noteworthy that some of these rare or unique alleles or allele combinations that were selected by humans might never survive in the wild. Wild relatives and early landrace varieties have long been recognized as the essential pool of genetic variation that will drive the future of plant improvement. The old landraces can be considered as populations of genes and genetic variability is absolutely essential for further improvement. In fact, variability is absolutely essential to even hold onto what we already have.

The development of new varieties is a step by step process. It is time consuming and costly. Private plant breeders are not philanthropic institutions. In order to safeguard the continuity of their enterprises, they need a fair return on their investment, which has been ensured through the introduction of Plant Breeders' Rights (PBR) or Plant Variety Rights systems, which create a sound financial basis for the breeding industry. Furthermore, applicable patent systems offer a useful instrument for the protection of plant inventions, which are not related to one or a number of specific plant varieties, such as the European Community Biotech Directive.

Professional plant breeding is a crucial factor in respect to biodiversity in cultivated agricultural areas. Intellectual property rights related to plant varieties and plants or plant material not in the fixed form of a variety are indispensable for private breeders to be able to recover their investments and continue their activities. Combining these two facts, the conclusion is that there is an interaction between intellectual property rights and biodiversity. The importance of this interaction should not be underestimated and should be taken into account in policies aimed at the conservation of biodiversity.

Plant breeding should not be considered an activity that by definition leads to a decrease in biodiversity. To be able to improve the genetic structure of varieties, the availability to breeders of all relevant genetic resources is a necessity. Access to germplasm present in nature, gene banks, and other collections — under strict conditions — must be assured. The so-called breeders' exemption, which gives breeders the possibility to use germplasm of other breeders even if protected by a plant variety right, should not be frustrated by a restrictive interpretation of the research exemption as defined in the Biotech Directive in relation to plant material.

PLANT VARIETY PROTECTION AND MANAGEMENT

Plant variety management relates to the conservation, use, and commercial exploitation of plant varieties by farmers, commercial breeders, governments, and relevant international organisations. Plant variety protection is one subset of this broad field which focuses exclusively on knowledge which can be commercially exploited. In other words, plant variety protection relates to intellectual property rights over plant varieties which guarantee rights holders' exclusive commercial rights for a specific period of time.

The usual rationale for introducing exclusive intellectual property rights in specific fields of technology is that an individual or legal entity that devotes significant resources to the development of new technologies should be rewarded with a temporary exclusivity. This is linked to the idea that certain forms of knowledge can easily be copied. In such cases, individuals who have not contributed to the development of an invention would be in a position to benefit from the fruits of the invention if no exclusive right was offered to the inventor.

In the agricultural field, inventiveness was traditionally based on the sharing of biological resources and related knowledge among farmers in most parts of the world. This changed slowly in the early part of the 20th century in certain Organization for Economic Co-operation and Development (OECD) countries where a private sector seed industry slowly developed. The development of the private sector in this field led to calls for a form of intellectual property rights protection over plant varieties to give sufficient incentive to private sector individuals to enter the seed business. However, while in most fields of technology, the preferred mode of legal

protection for inventions was patents, in the agricultural field, an alternative form of intellectual property rights, PBRs, was developed. Several factors led to the development of this alternative form of intellectual property protection. On the one hand, it was progressively recognized that a form of intellectual property rights was necessary to foster private investment in the seed sector. On the other hand, there were two forms of resistance to the extension of patent rights in this field. For a while, the industry argued that the notion of inventiveness which characterized patents would be diluted if plant varieties were brought onboard because a new plant variety was seen more as an improvement on an existing product of nature than as a "scientific" invention. Other individuals argued, and in some cases still argue, that seeds had always been part of the common heritage of humankind and were freely exchanged among farmers and farming communities. The different positions expressed with regard to the introduction of plant breeders' rights have assumed added significance in the wake of the adoption of the Trade Related Aspects of Intellectual Property Rights (TRIPS) Agreement. Indeed, while a number of OECD countries had progressively adopted a form of PBRs before 1994 to foster the development of their private seed industries, most developing countries had not introduced any form of intellectual property right protection in the agricultural sector.

At a general level, PBRs have been linked to the progressive commercialisation of the agricultural sector and have mainly been the preserve of developed countries which progressively felt they needed to give further incentives for the development of a private sector seed industry. In other words, it became progressively accepted that breeders should be given specific legal rights to the varieties they develop in a bid to foster the development of new varieties that could easily be reproduced by farmers or competing breeders. As a result, PBRs as they exist today have been developed for the specific contexts and needs of developed countries. The legal regime for PBRs is quite uniform thanks to the fact that most countries having introduced PBRs have either joined the International Union for the Protection of New Varieties of Plants (UPOV) regime or modelled their legislation after the UPOV regime.

The following part of my paper consequently analyse PBRs as they have developed in the UPOV context.

The PBR can generally be described as patent rights with some missing attributes. A PBR shares a number of characteristics with patent rights: it provides exclusive commercial rights to the holder, rewards the inventive process, and is granted for a limited period of time after which it passes into the public domain. Over time, the criteria for PBR protection has been strengthened.

To be more specific, PBRs protect plant varieties. Plant varieties can only be protected by PBRs if they fulfil the four basic criteria of novelty, distinctness, stability, and uniformity or homogeneity. Each of these characteristics is given further content by UPOV itself. The concept of novelty requires further elaboration because it differs from its acceptation under patent law. Under UPOV, a variety is novel if it has not been sold or otherwise disposed of to others, by or with the consent of the breeder, for purposes of exploitation of the variety. Novelty is thus defined entirely by commercialisation and not by the fact that the variety did not previously exist. The UPOV gives a specific time frame for the application of novelty. To be novel, a variety must not have been commercialised in the country where the application is filed more than a year before the application and in other member countries more than 4 years (6 years in the case of trees and vines). The criterion of distinctness

requires that the protected variety should be clearly distinguishable from any other variety whose existence is a matter of common knowledge at the time of the filing of the application. Stability is obtained if the variety remains true to its description after repeated reproduction or propagation. Finally, uniformity implies that the variety remains true to the original in its relevant characteristics when propagated.

Over time, the definition of protected variety has evolved insofar as so-called "essentially derived varieties" were not protected in the early days of plant variety protection. The latest revision of UPOV has introduced protection for such varieties. Protection as an "essentially derived variety" is obtained if the variety is predominantly derived from the initial variety and retains its essential characteristics. It must also be clearly distinguishable from the initial variety while confirming to the initial variety in the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial variety.

The rights conferred to plant breeders differ from patent rights insofar as they provide much more extensive exceptions to the rights conferred than patents. Breeders have exclusive rights to produce or reproduce protected varieties, to condition them for the purpose of propagation, to offer them for sale, to commercialise them, including exporting and importing them, and to stock them in view of production or commercialisation. These rights are restricted by a number of exceptions that are compulsory in the UPOV context. The rights of breeders do not extend to acts done privately and for noncommercial purposes, to acts done for experimental purposes, to the use of the protected variety for the purpose of breeding other varieties and the right to commercialise such other varieties as long as they are not essentially derived from the protected variety. While the previous exceptions are compulsory, there exists a set of further exceptions which have been progressively reduced over time. The so-called farmer's privilege falls into this category. Under UPOV1978, the rights of breeders were circumscribed in such a way that PBRs did not interfere with farmers' use of the legally obtained protected variety for propagating purposes on their own holdings. Under UPOV1991, the rights of breeders have been extended to the harvested material of the protected variety and the farmer's privilege has been made optional.

With regard to the duration of PBRs, their first characteristic is to be timebound. The period of protection has evolved over time but always with the idea that the rights conferred expire at the end of a specific period of protection. Under UPOV1978, the period of protection is of a minimum of 15 years. For vines, forest trees, fruit trees, and ornamental trees, the minimum is 18 years. UPOV1991 extends the minimum period from 15 to 20 years. For trees and vines, the minimum is of 25 years.

The PBRs were at first conceived as an alternative to patent rights and it was accepted that the two kinds of intellectual property rights should be kept separate. Thus, under UPOV1978, member states can only offer protection through one form of intellectual property rights. The grant of a PBR on a given variety implies that no other intellectual property right can be granted to the same variety. Under UPOV1991, this restriction has been eliminated and double protection is now allowed.

SUI GENERIS PROTECTION SYSTEMS

The question of *sui generis* intellectual property right protection for plant varieties has become a matter of great importance following the adoption of the TRIPS

Agreement. As a result of a negotiating compromise, TRIPS requires the introduction of plant variety protection in all member states but it does not impose the introduction of patents. Article 27.3.b specifically requires all member states to "provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof." The introduction of the *sui generis* concept reflects two broad elements. First, a number of countries in the North and the South rejected the compulsory introduction of plant patents. Second, negotiators did not manage to agree on one specific alternative to patents. As a result, TRIPS gives member states a wide margin of flexibility in determining how to implement their obligation to introduce plant variety protection.

The question of the introduction of plant variety protection is one that concerns mostly developing countries. Indeed, most developed countries had already introduced either plant patents or PBRs before the adoption of TRIPS. Developing countries that are member of World Trade Organization were left with the choice of either adopting the existing regime proposed in UPOV or to devise their own plant variety protection system adapted to their specific situation. A few countries have joined UPOV since 1994 but the majority has decided to adopt their own plant variety protection laws. In a number of cases, these laws draw directly and significantly from the UPOV regime and generally most existing proposals introduce PBRs. In cases where PBRs are adopted only as part of the regime, the regime is completed by the introduction of a form of farmers' rights. In fact, existing *sui generis* options can be generally defined as regimes introducing both PBRs and farmers' rights.

The prominence of the UPOV Convention in the debates concerning *sui generis* plant variety protection is in part linked to the fact that the interpretation of the concept of "effective" *sui generis* system in Article 27.3.b TRIPS remains problematic. The only generally agreed upon interpretation is that UPOV is an effective *sui generis* protection regime under TRIPS. This has led some countries like the member states of the *African Intellectual Property Organization* to simply adopt a regime modelled after UPOV1991 and at the same time to commit themselves to join the UPOV Convention.

Some countries like India have decided to implement plant variety protection regimes which seek to provide protection to commercial plant breeders and to farmers. Thus, the Indian plant variety protection regime introduces both PBRs and farmers' rights. While a number of countries have attempted to draw up their own *sui generis* plant variety protection regimes, the member states of the *Organization of African Unity* have taken a unique initiative in adopting a Model Legislation for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources. The model legislation is premised on the rejection of patents on life or the exclusive appropriation of any life form, including derivatives. Its provisions on access to biological resources make it clear that the recipients of biological resources or related knowledge cannot apply for any intellectual property right of exclusionary nature. The model legislation focuses mainly on the definition of the rights of communities, farmers, and breeders. Community rights recognized include rights over their biological resources and the right to collectively benefit from their use, rights to their innovations, practices, knowledge, and technology and the right to collectively benefit from their utilization. In practice, these rights allow communities the right to prohibit access to their resources and knowledge but only in cases where access would be detrimental to

the integrity of their natural or cultural heritage. Further, the state is to ensure that at least 50% of the benefits derived from the utilization of their resources or knowledge is channelled back to the communities. The rights of farmers are to a certain extent more precisely defined.

These include the protection of their traditional knowledge relevant to plant and animal genetic resources, the right to an equitable share of benefits arising from the use of plant and animal genetic resources, the right to participate in decision making on matters related to the conservation and sustainable use of plant and animal genetic resources, the right to save, use, exchange, and sell farm-saved seed or propagating material, and the right to use a commercial breeder's variety to develop other varieties. The breeders' rights defined under the model legislation generally follow the definition given in the UPOV convention and the duration of the rights is modelled after UPOV1991. One specificity of the plant breeders' rights regime under the model legislation is the rather broad scope of the exemptions granted. Exemptions to the rights of breeders include the right to use a protected variety for purposes other than commerce, the right to sell plant or propagating material as food, the right to sell within the place where the variety is grown, and the use of the variety as an initial source of variation for developing another variety.

The development of *sui generis* plant variety protection is still in its infancy. Until now, efforts have been made by developing countries to balance their obligations under Article 27.3.b of TRIPS with their specific needs and conditions. Since UPOV is the only model which is generally recognized as fulfilling the criteria of an "effective" *sui generis* plant variety protection regime, a number of states that have not had the time or resources to devise a completely separate *sui generis* protection regime have decided to take PBRs as a basis for a plant variety protection regime. In addition to the PBR system, there seems to be a growing trend towards recognising farmers' rights alongside and to provide for different compensation mechanisms (benefit sharing).

Other *sui generis* protection regimes will probably be developed in years to come, in particular by least developed countries which still have time to implement their plant variety protection regimes. Further, even countries classified as developing countries may amend their legislations over time as further *sui generis* models evolve. *Sui generis* protection is evolving and significant innovations can be expected in years to come.

NEW SPECIES AND NEW VARIETIES ARE OF VITAL IMPORTANCE

In conclusion to my presentation, I would like to give an overview of the situation in Denmark. Danish pot-plant breeders are enthusiastic, creative, and assertive. For years they have been able to maintain a small but stable position in the world market with an exceptional assortment of flowering potted plants. The many years of competition has been an important stimulus for the Danes to develop new introductions themselves.

Danish pot-plant growers have a long tradition in breeding and selecting novelties. The Danes got tired of growing old Dutch selections and having to pay royalties to them. In the seventies the Danes therefore started to breed plants themselves and that resulted in a large number of new introductions and species. Every year about hundred new selections are added.

The Danes are famous in Europe for their novelties, including pot roses, kalanchoe, November cactus, aster, *Osteospermum,* and *Campanula.*

Many of the special novelties come from nurseries that are considerably smaller and that are the unique characteristic of Danish horticulture. Preferably every grower has his own selected introduction!

Danish breeding and selection of ornamentals is a combination of traditional crossing and an open eye for special plants. They do not rely on expensive technology so the costs are relatively low. It is important, however, to take care of breeders' rights as the trade in ornamentals is an international business and Danish propagation material is available throughout the world.

Many of the enterprises are too small or lack the knowledge to perform breeding and selection themselves, and consequently they leave that part of the job to others, and sometimes just the administration, such as application for plant breeders' rights.

A number of these smaller nurseries are especially very keen in finding plants that are new to the pot-plant industry.

The Danish pot-plant growers pay much attention to marketing and presentation. Several growers have registered their own brand, either on their own (i.e., *Queen* by Knud Jepsen and *Fairytale Flowers* by PKM) or they introduce a brand together (i.e., *Group Unique*, *Living Colours*, or *Fools for Flowers*).

Also the promotion organisation *FloraDania* is very active with some collective initiatives, and in closing of my presentation, I have the pleasure to present a short video, which has recently been shown during the International Flower Show IPM in Essen in January 2007.