Chapter 15

Plant Breeders

The Point of View of a Plant Breeder on the International Treaty on Plant Genetic Resources for Food and Agriculture

José I. Cubero

Introduction to plant breeders

Plant genetic resources (PGR) are the most important tool for plant breeders. Access to these resources was free since the beginning of agriculture. Only in the last 50 years, has the value of the genes, hence of the living organism carrying them, increased in astronomic proportions. This value is translated not only in their monetary price but more importantly also in their strategic and political value as they are the only way to reach food security in the future. Having always been important, food security has reached an even higher level of significance as food insecurity has acquired the unfortunate character of endemic at a global scale (Sasson, 2009).

Plant breeding is as old as agriculture itself. In fact, the first farmers also were the first breeders: they sowed what they spared for sowing the previous year – that is, what they selected. The only conscious method of crop improvement was what is nowadays called ‘bulk selection’, consisting in choosing the seeds of the best individuals, or even the best seeds in the whole harvest, and mixing them to form the sowing bulk for the next season; obviously, there were spontaneous crosses among plants of different plots, but these crosses were done by Mother Nature, not by a careful planning by the breeder-farmer. Hand-made crosses with the purpose of increasing the variation found in the varieties used by farmers was not possible until the sex in plants was scientifically demonstrated at the end of the 17th century.
by Camerarius (De sexu plantarum epistola, 1694). Other methods were added in the 20th century such as polyploidy, artificial mutation and, recently, genetic engineering (Cubero, 2003). The common practice by plant breeders consisted in applying the chosen method to a suitable variety obtained either by him or by any other breeder. It was not a written statement but a universal practice taken for granted as it can be seen in the first textbook on plant breeding (Bailey, 1895) and all the classical ones in the 20th century (for example, Davenport, 1907; Poehlman, 1959; Sánchez-Monge, 1955, 1974; Allard, 1960, 1999; Simmonds, 1979; Jensen, 1988; Hayward et al, 1993). Recent textbooks on plant breeding as those of Cubero (2003) and Acquaah (2009), already include the subject as an important topic for plant breeders.

Germplasm collections were freely exchanged and national organizations were happy to provide subsets of their collections under request. Only when the problem emerged of applying intellectual property rights (IPR) to the work performed by plant breeders, was the question of the indiscriminate use of varieties such as a source of genes for own work put on the table and more concise terms were sought to define the practice. Thus, the traditional practice followed by plant breeders had to be modified to accommodate the IPRs to their productions; the concept of \textit{breeder’s exemption} or \textit{scientific option} was probably coined during the first meetings held on that and related topics (see below) under the Food and Agricultural Organization’s (FAO) umbrella in the 1960s. This broad concept was later on defined in Article 15iii of the 1991 UPOV Convention\textsuperscript{1} and incorporated in national laws; for example, Spanish Law 3/2000 governing the Protection of Plant Varieties, states in its Article 15 that the varieties protected in Spain may be used as initial source of variation to breed new varieties without requiring the breeder’s authorization or generating rights for the owners of the protected varieties used.

Since the beginning of agriculture, farmers were accustomed to reserving a portion of the harvest as seed for the next season. Now, when varieties were produced by professional plant breeders (roughly speaking since the end of the 18th century (Cubero, 2003)) and registered, the varieties obtained reached the farmers through seed companies or official agencies, but farmers usually continued with their old practice. At the same time as it was necessary to refine the concept of \textit{breeder’s exemption} (see above), the ancestral practice of farmers had to be discussed as it confronted the implementation of breeders’ property rights. The very important concept of \textit{farmer’s privilege} had precedents in consuetudinary practices in some countries as, for example, the \textit{farm saved seed} in the US, the \textit{semence de ferme} in France or the \textit{landwirte vorbehalt} in Germany (the latter translates exactly as ‘farmer’s privilege’); it was probably introduced in the meetings in the 1960s as the counterpart of the \textit{breeder’s exemption}; it was finally accepted in the legal texts following the 1991 UPOV Act (Article 15.2) (Sánchez, 2009). The \textit{farmer’s privilege} meant that farmers can be exempt from paying royalties due to the producer of the variety, provided the farmer kept the seeds for his own use, never to be multiplied and sold in the market. The \textit{farmer’s privilege} has produced a considerable amount of literature in many fields, agronomical as well as juridical (Elena, 2007; López de Haro, 2007; Mateos, 2009).
It is not advisable to use the farmer’s privilege for a long time because of the varietal degeneration; the best practice is always to resort (if not annually, at least periodically) to reliable private or official seed producers, even in the case of the most favourable materials for the farmer (self-pollinating or vegetative reproduced varieties), but in spite of that technical difficulty, farmers still save seeds for their own use.

The conflict between the traditional farmer’s practice and the plant breeders’ rights as a *sui generis* system of IPRs was evident and has become even more critical in recent times: valuable cultivars possessing important characteristics were released under contract and royalties were demanded by private seed companies to developing countries which revolted as many of these genes were identified in landraces or wild forms found in their territories. In many cases, developing countries prohibited germplasm recollections without special permission and under agreement of sharing the material collected. In some cases, the germplasm collections were placed under the authority of the defence ministries.

Besides, many abuses were committed under the *breeder’s exemption*: to transfer a character by backcrossing is usually easy, especially between modern cultivars; the use of wild or primitive forms is much more complicated because the useful gene is generally linked to undesirable ones and to ‘clean’ the former requires, in the best cases, many years of painful backcrosses and selection. The temptation to transfer a useless but easily identifiable gene to an outstanding cultivar was very high. Only after a few backcrosses, a variety possessing the whole valuable genotype plus an insignificant new gene would be able to be registered in commercial lists as being *distinctive, uniform and stable* (DUS in the breeders jargon); but the true value was that of the original genotype. As a solution to these abuses, the concept of *essentially derived varieties*, to separate what was an important breeding contribution from unimportant derivatives, was launched in the UPOV Act of 1991. The main idea is to preserve the breeder’s exemption but maintaining the rights of the first breeder, whose permission would be necessary to market the derived variety (CIPR, 2002). This concept is easier to understand than to put in practice, because in the 1991 Act this concept is not very well defined (for example, would a transgenic variety with a simple but very valuable transferred gene be an essentially derived variety?). This lack of precision and the fact that many countries have not yet signed the 1991 Act are causing many legal difficulties for its application.

Other serious concerns arose from IPRs concerning vegetal materials (CIPR, 2002). The Agreement of Trade-Related aspects of Intellectual Property Rights (TRIPS) established that a *sui generis* system could be applied as property rights for plant varieties, but left somewhat undefined the *sui generis* concept and, in fact, there are many possibilities to apply it. Europe favours protection as defined by the UPOV Convention revised in 1991, and several other countries led by the USA mainly use the patent system. The USA has indeed a long tradition concerning vegetative reproduced varieties (the seminal Plant Patent Act dates from 1930, later amended and modified; the USA Supreme Court has also decided on plant variety rights in favour of patents in recent times). In fact, the American concept
of **patent** applied to vegetal products is not much different from the European **protection** concept for the same purpose.

Any system designed to protect breeders’ IPRs over their varieties could be used provided they have the same legal enforcement. As it has just been mentioned, **sui generis** systems can be devised for that purpose (**UPOV protection** is, in fact, one of them) and there are many possibilities between the **protection** as defined by UPOV and **patent**. The important objective is to acknowledge the work of the breeders in producing new plant varieties and make available to them the same IPRs due to other innovators. Worth mentioning, **patents** are much broader than the **UPOV protection** and much better known for historical reasons by lawyers and judges, a fact that runs in their favour for the future. Besides, a fact adding difficulties to the problem is that several biotechnological innovations are being considered under the umbrella of industrial patent, such as, for example, genes modified in the laboratory by genetic engineering techniques fall under the strict concept of Industrial Property patent (**CIPR**, 2002).

The problem is more complex because although **cultivars** cannot be patented at present in the EU, genes or genetic constructions artificially produced or modified in the laboratory (**transgenes**) can be. The consequence is that a transgenic cultivar, that is, a cultivar whose genotype has been modified by genetic engineering, enjoys a peculiar situation: it is **protected** but the transgene it contains is **patented** in the current legal use of the concept, the result being a **hidden** or **virtual** patent running against many countries and therefore against most plant breeders. In fact, the **UPOV Act** of 1991 does not exclude the dual possibility of protection and patent for vegetal materials, at the same time allowing for restrictions to the traditional practice of both the **breeder’s rights** and the **farmer’s privilege**. The door is opened for patenting plant varieties as the limits between traditional and modern breeding techniques are more dubious every day. The **terra nullius** in this field, as in any other, is clearly to the advantage of the people first occupying it, as many court cases demonstrate in recent times.

---

**Positions regarding the Treaty’s negotiation and implementation**

Genetic resources that were of free use some 50 years ago were fully controlled by the end of the last century. Restrictions were imposed by countries, private as well as public organizations, and by breeders themselves. Traditional rights, like the farmer’s privilege and the breeder’s rights were or are in the way of being suppressed. It is a revolution in classical agricultural practices, a revolution concerning genetic resources and, especially, their control. Some international action seemed necessary as there were conflicts at all levels: political, geographical, economic and scientific.

In a certain sense, genetic resources go beyond strict plant breeding projects. They can be used, for example, in the recovering of degraded areas, but even in this case a breeding effort can obtain better results by improving adequate materi-
als. The same can be said of industrial applications: chemical compounds can be obtained directly from wild plants, but the best results are always obtained through domesticated forms of any organisms: genetic resources collections are still a must. Within the industrial uses should be included the new uses of old crops for agro-fuels that is affecting the food security itself (Sasson, 2008). Old crops can be re-domesticated (for example, a forage crop as a seed crop) but there is still an unexplored wealth of genetic resources, both in collections and in the wild, not conflicting with food production: many non-food plants could be used to find new sources of agro-fuels without using staple crops such as wheat and maize for that purpose. No doubt, biotechnology can play a relevant role in this matter (Ruane and Sonnino, 2006), and not only in developed countries but in developing ones (Sasson, 1993, 1998, 2000).

Germplasm collections have acquired a high economic value, obviously related to their strategic importance – a fact bothering the breeders’ work, constrained to use what is commercially available to them. Germplasm collections have to be used if they are to be conserved; they cannot be ‘stamp collections’. As in many other cases, what is not used easily disappears. International restrictions on the use of germplasm collections, both in situ and ex situ, can lead to their erosion or even their loss in a short period, as their conservation in good shape is expensive and politicians are reluctant to spend even a small budget on something that will not allow them to show up every day in the news.

Free movement of germplasm would have undesirable consequences such as the introduction of pests in new environments and the erosion of local landraces and wild forms not only because of the spreading of modern cultivars but also as a result of careless collectors. It is also worth mentioning the inadequate facilities for germplasm conservation in countries that face great difficulties in sharing the collections because of the fear of someone getting valuable genes without any benefit sharing. The experience accumulated on other related challenging threats like pest introduction, land races erosion and biopiracy is also very wide. Nowadays these threats are still recurrent in spite of all the scientific and historical knowledge accumulated on the various topics and in many cases we have not been able to prevent them or minimize their consequences. This is due in part to a lack of social knowledge of the problem and also to a lack of interest in stimulating the social awareness of it.

Norms for germplasm collectors were set up to stress the need for them to respect the environment and the local traditions (for some incredible examples of collectors’ misconduct see Fisher, 1989), never eroding the local plant populations, emphasizing the right of the prospected countries over their genetic resources and leaving a duplicate of the collected material in the host country. It was an ethical and not compulsory code, and in recent times bilateral agreements between developed and developing countries facilitated the collecting tasks. But it was felt by the international scientific community that this was not enough. Most breeders did accept these rules as they were always respectful of others rights. The problem was the greed of a few and the fear of many to suffer the consequences of the behaviour of the former.
Previous steps to solve the problems

The problems just outlined above concern a wide range of matters, not only those relevant to plant breeders. But all of them affect the production, release and spread of new varieties and the improvement of farming around the world.

FAO accepted the quixotic task of trying to solve these problems. Several international meetings and conferences have been held since 1965. It is impossible in the space of the present chapter to give an account of the many difficulties in order to reach an agreement valuable for all the interested parties. The matters under discussion went from idealism to pragmatism, and in spite of the great achievements, especially those established in the International Treaty on Plant Genetic Resources for Food and Agriculture (hereafter, the Treaty; see Annex 3 of this book for details on the main provisions of the Treaty), there is still a rough way ahead. Problems concerning plant breeders’ versus farmers’ rights have produced numerous papers, books and meetings (a recent one covering both matters in spite of its title can be seen in Anonymous, 2007) and a clear and complete review of the history leading to the Treaty is given by Esquinas-Alcázar (2005) (see also the introduction to this book and Annex 1 of this volume for the list of all Commission and Treaty negotiating meetings). Fortunately, from the 1950s until now, the positions seem to have moved from pure idealism (for example, ‘natural resources are common heritage of mankind’) to real pragmatism (‘natural resources belong to the country where they are found’). The loss of ethical value is compensated by the necessity of agreements among countries, private and public agencies and, generally speaking, among all stakeholders. The balance has to be positive.

One of the problems in the numerous conferences held in the last 50 years is the fact that genetic resources for food and agriculture were frequently covered (many times even hidden) by the more general concept of ‘natural resources’ or, even better, ‘biodiversity’. One of the great achievements was to separate both concepts, but this did not happen until rather recently.

The main dates, at least concerning plant breeding, can be outlined as follows:

In 1965 the FAO started the technical work on Plant Genetic Resources for Food and Agriculture (PGRFA) collection and conservation, and triggered a series of international technical conferences on the topic. Although ‘for Food and Agriculture’ was always present in the meetings, ‘Plant Genetic Resources’, as mentioned before, were frequently included in conferences on more general topics on environment, as, for example, the United Nations Conference on the Human Environment held in Stockholm in 1972.

For plant breeders, an important step was the creation in 1974 of the International Board for Plant Genetic Resources (IBPGR, later renamed the International Plant Genetic Resources Institute – IPGRI – and today Bioversity International), belonging now to the Consultative Group of International Agricultural Research (CGIAR) with the mandate of coordinating collection and conservation efforts. Very important from a legal point of view was the establishment of the International Union for the Protection of New Varieties of Plants (UPOV, see above) to defend breeders’ rights; the last revision, as already mentioned, was that of 1991
although it has not been signed by several countries. By then, many countries had already restricted the access to their own genetic resources, and wide discussions between developed and developing countries were on the table. Developed countries favoured IPRs while developing ones tried to focus the discussions on the recognition of Farmers’ Rights. The Commission on Genetic Resources for Food and Agriculture (CGRFA; now it includes all components of biodiversity for food and agriculture, including farm animals, forestry and fisheries) was set up in 1983 within FAO and the International Undertaking (IU) on Plant Genetic Resources was adopted, although it was non-binding (see Annex 1 of this book).

In fact, the first binding agreement on biological diversity (in general) was adopted at the Rio Conference in 1992 and is known as the Convention on Biological Diversity (CBD); agricultural biodiversity was only related to a set of subjects discussed in the Convention, but under the scope of FAO and its offshoot, the Commission on Genetic Resources for Food and Agriculture. A revision process of the IU led to the adoption of a new binding international instrument in 2001: the International Treaty for Plant Genetic Resources for Food and Agriculture (ITPGRFA). The IU is still applied in those countries that have not signed the Treaty yet (for a history of the revision of the IU, see the Introduction of this volume and Chapter 10).

Although its objective was the conservation and sustainable use of biological diversity and the equitable sharing of benefits arising out of their use (Article 1), thus not specifically referred to food and agriculture, the importance of the CBD on the topic was clear. The statements declaring states’ sovereign rights over their own biological resources and those on the responsibility of humankind over the biological diversity are since then well established principles. The adequate transfer of technology was also firmly established and ‘biotechnology’ was defined in Article 2 as ‘any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific uses’. A financial mechanism (Article 21) was created by developed countries to support developing ones, but rather on philanthropic terms as it was not compulsory.

Meanwhile, between 1993 and 1996 the CGRFA developed the Leipzig Global Plan of Action on plant genetic resources and the first report on the state of the world’s PGRFA. The FAO conference at Leipzig recognized the role of farmers since the very old times, hence including the indigenous and local communities, as well as that of plant breeders. Equally important was the Global Plan of Action for the conservation and sustainable use of genetic resources for food and agriculture adopted in 1996 in Leipzig; all countries are interdependent concerning these resources. The Leipzig conference also established important actions for breeders such as in situ and ex situ (i.e., the germplasm collections) conservation and the importance of the recovery of infra-utilized species.

Unfortunately, all these advances, as well as the financial mechanism established for genetic resources for food and agriculture were accepted concepts without any mechanism to implement them. Financial procedures were not established and, more important perhaps for plant breeders, there was a very
light treatment of biotechnology at a moment when (the Leipzig conference was held in 1996) biotechnological achievements via genetic engineering were being introduced in the market; the first transgenic cultivars were in the farm and some medicines, like the ‘transgenic’ insulin, were already in the pharmacies. For plant breeders, statements on the essential importance of genetic resources as a base for reaching food security sounded logical. They were surprised that an International Conference to establish that obvious principle was necessary. To promote a just and equitable distribution of benefits was out of their scope and possibilities.

The International Treaty on Plant Genetic Resources for Food and Agriculture: Challenges ahead

After many years of wide conferences and consultancies at all levels, the Treaty was approved by the international community in 2001 (in force since June 2004). It was an International Treaty, hence a legal compulsory instrument in order to ensure conservation and sustainable use of genetic resources for food and agriculture, as well as the equitable sharing of benefits for all signatory countries. An essential difference with all the previous agreements was the multilateral way of access to and benefit-sharing arising out of the plant genetic resources and the establishment of a financial mechanism and a governing body to support the implementation of the agreement. Worth to be repeated, it was compulsory for all the signatories.

The Treaty has some important points from the plant breeders’ point of view:

1. A genetic resource for food and agriculture is considered ‘any genetic material of plant origin of actual or potential value for food and agriculture’, ‘genetic material’ being ‘any material of plant origin … containing functional units of hereditary’. The definitions are very wide in scope as they include all the plant kingdom. This is a scientifically sound interpretation as, following the success of genetically modified organisms in agriculture, the fourth genetic pool under the Harlan and de Wet system (Harlan, 1992) contains all the living beings.

2. But recipients of genetic resources will not claim for any intellectual property right limiting the access of these genetic resources or their genetic parts or components in the form received by the multilateral system (Article 12.3.d). This statement is confusing and, indeed, provoked a lot of discussion and contradictory explanations between developed and developing countries.

3. The Treaty includes a list of plants included in the multilateral system that is far from complete and acceptable by breeders. Some important crops are lacking and the list, as a whole, seems to be set up more politically than technically or scientifically.

Point 2 is especially important for plant breeders. The different points of view expressed between developed and developing countries at the moment of the approval of the Treaty did not leave great room for hope. Breeders from developed
countries (especially those working in private companies) consider the material received from developing countries as not included in the Treaty if it has been modified especially by biotechnological methods. The donors of landraces and wild forms, generally persons or institutions working in developing countries, think differently: they argue that they are the real owners of these valuable genotypes, the operated transformation, even by biotechnological means, being, according to them, of minor importance; thus, they defend that the plant materials they send to developed countries have to be included in the Treaty even if they are later on modified by genetic engineering. A lack of agreement in this sense would likely affect plant breeding at a global scale.

Point 3 is also very important. The feeling that it was a political issue is not helping in international relations among plant breeders. It seems as if participants in the Treaty negotiations were more concerned about restricting access to their own genetic resources than in granting access to the global gene pool that so far had been the main factor of agricultural development. This point is very important as many non-classical uses (bio-alcohol and biodiesel among many other industrial applications) will require the study and use of all kind of plant resources. Of course, the Treaty did not close all possible negotiations in 2001; the list of plants contained in Annex I can be modified in the future.

Plant breeders experience many constraints in their daily work: asking for permits to import and export his/her own productions and/or national germplasm that could benefit other colleagues in different regions of the world. This is not the traditional behaviour of plant breeders. In recent times, I was able to observe the exchange between breeders belonging to two countries at war at that very moment. It would be paradoxical for the same breeders not to be able to exchange the same materials in peacetime.

**Interactions among plant breeding agencies**

Farming and plant breeding came about by the same human act of sowing some wild seeds during a certain period of time to solve a problem of food scarcity. The first farmers also were the first breeders: they sowed the seeds that they spare (i.e., select) from the previous year's harvest, and repeated the practice over several years; we now call the method *automatic selection* to differentiate it from the *intuitive* (but conscious) one performed by already authentic farmers much later. But in operating in this way, they selected only a subset of the genes present in the previous generation.

Hence, the domesticated form (the cultigen) only had a minimum set of the whole amount of genes present in the wild stock. But we do not know about the nature and possibilities of those genes that were not chosen or that later on were discarded when farmers were conscious about the possibilities of their crops. Breeders need that material for their own work. The Treaty, in this sense, while offering many more possibilities than any other agreement on natural resources made up to now, is setting some limits to the free accession to these sources of genes.
The work accomplished by plant breeders in the last two centuries has produced varieties of high value, varieties characterized by genotypes not present in Nature. This work has to be recognized, but it would not be a wise practice to hinder its use by other professionals. The advance reached so far would stop. This limitation in the exchange of plant materials can bring negative consequences, especially since genetic engineering is producing new forms by integrating alien genes in plant genotypes. These new breeding forms increase the pool of genetic resources and adding new administrative and cumbersome tasks for their transfer can constitute an additional barrier for further developments.

**Conclusion**

For millennia, farmers were also plant breeders as they selected their seeds for the next sowing season themselves. Generally speaking, the creation of the first seed producer companies (Vilmorin being the very first one early in the 18th century) separated both professions in different persons: the farmer and the plant breeder at the service of his employer. In the countries that adopted both the industrial and the agricultural revolutions — that is, the ‘developed-countries-to-be’ — marketing strategies were used to sell their seeds to the farmers. Good farmers perceived the advantages of purchasing seeds of good quality for their fields, and little by little, the traditional landraces disappeared in these countries.

But the rest of the world still maintained their traditional farming practices, ‘farmer’ and ‘plant breeder’ still coexisted in one person. Interchanges were generally performed on a local basis. The amount of genetic variability in crops was still huge.

At the turn of the 20th century, the genetic erosion in crops in developed countries was manifest. Breeders such as Henry Harlan perceived the problem and started collecting barley landraces around the world (he described his voyages in *One Man’s Life with Barley*, Exposition Press, New York, 1957); Nikolai Vavilov started in Russia collecting a multitude of landraces of almost one thousand crops, a work that he widened to explore most of the countries where trips could be done in those times.

But still the worst was to come. After the Second World War, travelling was easier, routes were safer, marketing techniques were much more elaborate and varieties of developed countries such as the maize hybrid cultivars were almost perfect. Powerful seed companies easily spread these varieties out through the world. The genetic erosion reached most corners in the globe. Many landraces and wild forms persisted in developing countries because of economic or trade difficulties, but in developed countries the genetic homogeneity of main crops was already a very serious problem by in the second half of the 20th century (National Academy of Sciences, 1972).

By that time, some developing countries had perceived that many modern cultivars obtained in the developed world but marketed also in their farming areas were carrying important genes transferred from their own landraces that had being
collected in many cases without explicit permission from national authorities. The request by the developed agencies of royalties for using these cultivars sent a fire over all developing countries. They claimed property rights over those genes and, in general, over the vegetal materials taken, with or without permission, in their lands, and accused developed countries of malpractices ranging from abuse to biopiracy. They opposed farmers’ privilege to plant breeders’ intellectual property rights. One further complication was the introduction of molecular techniques in plant breeding as they rendered the use of a whole plant not necessary by using only a tiny portion of it in order to extract its DNA.

The FAO, through its Commission on Genetic Resources for Food and Agriculture, very patiently tried to aggregate both sides. It took a long time before concepts were defined and agreements started to be settled. The painful path to a solution has been described in this and other chapters in this book. The International Treaty on Plant Genetic Resources for Food and Agriculture was finally signed in Rome in 2001. It is a binding tool sharing benefits among those who are able to offer valuable plant materials and those possessing the techniques to modify them, thus increasing their biological value. But the signature has not overcome a wide reticence originated in past behaviours. Claims that the vaults of both private companies and public institutions of developed countries are full of plundered plant genotypes are still alive. Mistrusts among the signatories have not been thrown away. Besides, although the steps already achieved were unimaginable some 20 years ago, there is not yet a common reading by developed and developing countries of at least one crucial article (namely 12.3.d) of the Treaty concerning the modification, especially by biotechnological means, of the material received. It is probable that this difficulty will decrease in importance once developing countries have access to these techniques, as it is in fact the case for Brazil, India, China and several other countries.

From the point of view of plant breeders, the already mentioned difference in interpreting some specific (but important) aspects of the Treaty is an added difficulty in their work because they are interested not only in wild forms and in the old landraces produced through the millennia by local communities around the world. They are also interested in the new plant material obtained by applying all kinds of technologies, including ‘biotechnology’. If additional progress is required to increase food production in the future, then facilitated access to genetic resources will always be a must.

**Note**

1 UPOV is The International Union for the Protection of New Varieties of Plants (the acronym follows the French wording of the name), an intergovernmental organization with headquarters in Geneva (Switzerland). It was established by the International Convention for the Protection of New Varieties of Plants 1961; the last revision is of 1991.
References

Davenport, E. (1907) Principles of Breeding, Gion and Co, Boston, MA
NAS (1972) Genetic Vulnerability of Major Crops, National Academy of Sciences, Washington DC
Sánchez-Monge y Parellada, E. (1955) Fitogenética, Salvat Editores, Barcelona, Spain
Sánchez-Monge y Parellada, E. (1974) Fitogenética (Mejora de Plantas), INIA, Madrid, Spain