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Italian Efforts and Italy-IPGRI Cooperation in the Safeguard and Development of Plant Genetic Resources **

1. Introduction

Mr. Chairman of the Board of IPGRI, prof. Fasella, representative of the Minister for Universities and Scientific Research, Mr. V. Director General FAO, Director General of IPGRI, Authorities, Colleagues, Ladies and Gentlemen, I am greatly honoured to have been invited to take part in this meeting celebrating the twenty fifth anniversary of IPGRI.

My own main scientific efforts have been, and still are, dedicated to the study of genetic variability, to methods of increasing it by means of induced mutations, to inheritance studies in characters of theoretical and practical value, and to their use in genetic improvement of plants significant to agriculture. For who has been engaged in organization and management of research projects and in international programs aimed at safeguarding and promoting plant germplasm, it is indeed a great joy and satisfaction to take the floor in this occasion to give evidence of the results achieved and express wishes for the greatest success in the future of IPGRI.

2. IBPGR, IPGRI and FAO

I can claim to know IPGRI, this scientific institution of global dimension and action, since its very beginning, even prior to its joining the CGIAR, when it was a Board within FAO.

These first 100 years of plant genetics and research on biodiversity of cultivated plants were characterized by important events. The first is the Vavilov dis-

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covery of the centers of origin and diversification of cultivated plants and the establishment of collections, in the 1920s and 1930s, of crop species and varieties and related wild species. Vavilov is an example of scientist pursuing his own intuition and plans, guided by his peculiar intelligence and supported almost solely by his own efforts. The second is the set of programs of collection, conservation and evaluation of plant germplasm in national and international institutions and laboratories. The third is the international Convention on Biological Diversity (CBD) approved at the UN Conference on Environment and Development held in Rio in 1992. The Convention has pointed at the imminent risks of genetic erosion and loss and set guidelines and objectives of a world program for safeguarding biodiversity, with specific reference to agro-biodiversity.

The century now ending is witnessing the coming to the scene of a fourth, fundamental event in crop genetics: an increasing body of biotechnologies, molecular studies on gene collections, genetic engineering applied to plants. However, the controversies and anxieties now being experienced around these procedures, particularly in Europe, lead me to predict that their value and socio-economic impact will be more clearly visible at the beginning of next century.

As for the CBD again, this is no place to assess the degree of implementation of the engagements of the 172 countries which have signed and ratified the Convention. In fact, considerations in this respect could not assume optimistic, or simply satisfactory tones. And yet, it is important that issues regarding biodiversity have now become part of the collective consciousness, even if with errors, distortions and dangerous delays. Present shortcomings can, however, be corrected by better and more objective training and information about theoretical and practical validity and impact of the initiatives undertaken and through the wisdom of Governments and international Agencies, assisted and advised by experts and scientists.

The dimension of these initiatives is not so much national as regional and global, and this underlines the fundamental importance of international institutions as IPGRI, and of its links with FAO, in ensuring the correct use of such large segment of biodiversity concerning cultivated plants and agriculture at large.

Following resolutions of the Italian Government and Parliament, advised by Italian plant geneticists, the IPGRI could establish its headquarters in Rome, as done, long time before, by FAO. In this way, the approach to plant genetic resources issues, started by FAO even earlier than 25 years ago, has never been interrupted.

FAO initiatives in the field of plant genetic resources started in 1947. The increasing international concern about genetic erosion and losses led to the convening, in 1965, of an expert panel on plant exploration and introduction and the establishment, immediately afterwards, of a technical service. Three international technical conferences (1967, 1973 and 1981) were also convened. In the meantime, in 1974, the International Board for Plant Genetic Resources (IBPGR) was established, housed and supported by FAO. The Board was to become progressively

autonomous and, in a frame of intense and systematic cooperation with the FAO, to complete its affiliation to the CGIAR as a full-fledged international institution. Three main events concurred in 1983: the institution of a permanent Intergovernmental Commission on Plant Genetic Resources (counting 123 member countries); the adoption of the International Undertaking on Plant Genetic Resources, with the adhesion of 110 countries; and the development of a FAO Global System for Plant Genetic Resources, supported by 140 countries. These achievements have gained international recognition: the importance and urgency of problems have been pointed out, scientific and technical aspects debated, lines of action designed and programs started. In fact, genetic resources entered political agendas.

The U.N. Conference on Environment and Development, held in Rio de Janeiro in June 1992, adopted the Agenda 21 and opened the Convention on Biodiversity, so far signed by more than 170 countries and ratified by 172. It must be underlined that Resolution 3 of the Conference for the adoption of the CBD, as well as Agenda 21, specifically acknowledges the importance of genetic resources for food and agriculture and requests a strengthening of the FAO Global System.

I think I have managed to clearly refer to the origins of IPGRI, also in respect to its establishment in Italy, in a natural geographical propinquity with FAO.

And it seems appropriate, at this point, to speak of the role of Italy in the research on genetic variability and plant genetic resources, also in order to offer a picture of it better focused and more complete than the one reported in an inadequate and pretentious manner in a book recently (1997) published by IPGRI: "Scientists, Plants and Politics: a history of the plant genetic resources movement", by Robin Pistorius.

3. Italian contribution in the field of plant genetic resources

3.1. *Historical data*

The interest of Italian institutions on plant genetic resources goes back to the years when the first botanical gardens were established in Pisa (1544) and Padua (1546), indeed also for very practical reasons. In fact, the official act by which the Republic of Venice instituted the Padua Botanical Gardens clearly mentions that objective of the same was the growth, preservation, and use of plants for the benefit of human beings.

A large collection of fruit trees must have been present in Florence in the XVII century, when a painter named Bartolomeo Bimbi could paint 102 different citrus fruits, 365 peaches, 9 apricots, 34 cherries, each with its own denomination. The Grand Duke of Tuscany, Cosimo III, a botanist himself, used to send his technicians to the Amsterdam Botanical Gardens to learn how to grow exotic plants. Furthermore, in the official correspondence with his ambassadors in different European cities, in addition to political affairs, he constantly recommended to

describe and send to Florence any type of fruit plant not present in Tuscany. Most of this material, useful and incomparable heritage, still exists.

A more systematic approach to the cataloguing and utilization of plant genetic resources began during last century, when Italian scientists took part in a wide European movement that established public research and educational institutions. Catalogues were prepared and varieties began to be characterised, also in view of developing new cultivated types from local and/or imported material. A. Mendola, working in Sicily from 1855 to 1870, assembled a collection of table grape vines and obtained some new cultivars from crosses between local material. About the same time, a vast crossing program between introduced American vine wild species was established, leading to the release of a number of new rootstock clones. They gave a decisive contribution to the reconstitution of Italian vineyards after the *Phylloxera* (now, *Viteus Vitifolia*) invasion.

However, it was a breeder, N. Strampelli, the one who fully exploited the potentiality of genetic resources. In 1900 he made the first documented cross between two varieties of wheat in Italy, after years of pure-line selection on land races and introduced material. He succeeded in combining together the rust resistance of the variety Rieti with the short culm and lodging resistance of the variety Noè, thereby producing a group of varieties released in 1914. Soon after the first cross, in 1903, he started utilising wild species and other cereals, such as *Dasypyrum* and *Secale*. At the time, he already had in his fields more than 250 accessions of wheat imported from France, UK, Netherlands, Algeria, Australia, Japan, ready for the 1904 crosses.

More than 400 landraces of wheat were present in Italy at the beginning of this century. Many of them were still present during the 1920s, and were carefully described by E. De Cillis (1927). Later (1942), U. De Cillis would have assembled and described a large collection of Sicilian wheats, mainly durums. Unfortunatly, only a limited part of this material is still in existence. Important has been also the activity carried out on maize by A. Brandolini. Wild relatives of wheat were the breeding material preferred by Forlani (1950), and wild species of *Beta* were the source from where O. Munerati would derive disease resistance genes.

The first concern about the loss of genetic stocks was expressed in 1932 by Vavilov. At that time, he had already organized, in the Plant Industry Institute of the Ministry of Agriculture in Leningrad, the first germplasm laboratory, endowed with the numerous and superb collections of cereals and other plants he had gathered since the 1920s. Immediately before World War II, another germplasm laboratory was started by Stubbe in Gatersleben, Germany.

However, it is mainly after World War II that great attention was focused on plant genetic resources in Europe, USA and Japan, with the organization of several missions to explore and collect germplasm in the primary and secondary centres of origin of the species and in the areas characterized by traditional farming.

In 1969, as a follow up of the 1967 FAO Technical Meeting, the Italian

National Research Council (CNR), recognising the urgent need to preserve the invaluable resouces present in the Mediterranean region, endorsed a proposal by G.T. Scarascia Mugnozza, and in May 1970, in cooperation with that University, a germplasm institute, or Istituto per il Germoplasma (IG) was established in Bari, entirely devoted to the collection and preservation of plant genetic resources.

The institute was directed by prof. E. Porceddu and, since 1983, by dr. P. Perrino. It soon established contacts with FAO and other specialised institutions, as the Beltsville and Fort Collins USDA Centres, the Vavilov All-Union Institute of Plant Industry in St. Petersburg, the IPK in Gatersleben, the John Innes Institute in Norwich. It then started exchanging collections of *Triticum*, *Lathirus*, *Vicia*, *Cynara*, and organising exploration and collection missions in Italy and abroad, expecially in the Mediterranean region and in East Africa. The collection was also pursued of landraces of wheat, forage crops and vegetables in Sicily, Sardinia and Southern Italy, as well as the analysis and description of the collected material. This activity attracted a number of students and young scientists from Mediterranean countries, who visited the Institute, spent months and often years taking part in collecting expeditions and studies. Training courses were and still are organised by the IG, which also co-operated with the IBPGR in establishing a Mediterranean Network for Plant Genetic Resources, hosting its Secretariat for about three years and publishing a newsletter. Finally, the Institute established a sub-network of the FAO co-operative network for durum wheat, and, with some CGIAR centres, takes part in the European Co-operative Program on Genetic Resources (ECP/GR), where it has organised a few international technical meetings.

Researchers at University of Tuscia and IG are partners in a European Concerted Action coordinated by the European Center for Nature Conservation, Tilburg, The Netherlands, in a project on: "Environmental Indicators for Sustainable Agriculture" (ELISA). Objective of ELISA is the development of environmental indicators capable to gauge and monitor changes in water, soil, air, genetic and biodiversity resources which could affect environment. Italian partners have proposed the adoption of indicators of agricultural changes affecting the gene pool diversity in farm and farm-related species, as: i) *index of agricultural intensity* (farmgate nitrogen balance, expenditure for household inputs having environmental significance, such as fertilizers, pesticides, herbicides), and ii) *index of agricultural specialization* in land use (utilized agricultural area (UAA) according to crop and livestock specialization and mixed farming household). Italians also proposed to carry out: a) a survey of gene pool diversity, in order to assess the impact of agricultural changes on farm and farm-related genetic diversity and to establish causal or numerical relationships between the above indexes and gene pool diversity values. To that aim, measures of effective population size in farm-related species in semi-natural farm environment (soil microbial flora, wild and weed relatives of endemic crop species, ruderal weeds mimicking crops, species of grass-legume associations in managed grazeland, wood species in authentic forests near farm

land or in hedgerows, pollinator and pollinator-related plant species, fauna species favouring plant dispersal, etc.) are strategic for any assessment of the amount of gene pool diversity and for a programmatic management of biodiversity and landscape; and b) a survey of farmers fields to detect the number of landraces still cultivated, and assess the gene pool diversity for crop genetic resources. The ratio of field grown landraces to the landraces in gene banks for selected crop species is to be regarded as indicative of the dynamic *in situ* conservation of gene pool diversity of crop species.

Italian contribution to safeguard and development of genetic resources, however, included still other initiatives. In October 1995, G.T. Scarascia Mugnozza was invited by the FAO to pronounce before its General Assembly the 19th McDougall Memorial Lecture. The title of the address was: "*The protection of biodiversity and the conservation and use of genetic resources for food and agriculture: potential and perspectives*".

In August 1996, scientists all over the world were invited to sign an Appeal ("*Appeal to concerned scientists throughout the world for the safe conservation and optimal utilization of biodiversity and genetic resources for food and agriculture, and the fair and equitable sharing of the benefits*") launched by G.T. Scarascia Mugnozza and M.S. Swaminathan, as Presidents of the Academies of Sciences of Italy and India. The Appeal invited Governments attending the World Food Summit convened by the FAO in Rome, 13-17 November 1996, to take immediate steps to put world food security upon a sounder footing, by promoting the secure conservation and optimal utilization of biological diversity of interest to food and agriculture, and the fair and equitable sharing of the benefits derived from their utilization. The appeal was eventually signed by over 1000 scientists.

3.2. *Italian participation in exploration and network activities*

Since 1971, 81 expeditions were carried out by the IG of Bari, in collaboration with other national and international institutions, in the Mediterranean region, Ethiopia, Somalia and South Africa. Particular attention was devoted to North Africa. Cereals and grain legumes were given some priority, although in the Mediterranean collecting work was mostly multi-crop. Priority in Ethiopia was on tetraploid wheats, barley and peas; in Somalia on maize and in South Africa on cowpea. At the beginning of the 1970s, on specific request of FAO, several missions were carried out in North Africa by the IG and other national institutions aimed at collecting samples of cereals and grain legumes. Later, specifically oriented expeditions in collaboration with FAO-IBPGR were conducted by the IG in Galicia (Spain), to collect maize; in continental Italy, Sardinia, Corsica, France and Spain to collect wild *Brassica oleracea*, in southern Italy to sample wild *Beta* and, more recently, in collaboration with IPGRI in Albania for an emergency mission to rescue vegetable crops biodiversity. Systematic collections of vegetables and faba

beans were organized in Southern Italy, in the frame of a co-operation agreement between the IG and the Universities of Palermo, Catania, Sassari and Naples. At the IG, a collection of more than 3,000 accessions from 37 countries has been assembled and conserved, to act as a base and active seed collection.

In 1978, FAO and IBPGR in collaboration with the IG started a Germplasm Support Unit in Karage (Iran), with the main aim of improving collection and maintenance of plant genetic resources of crops and wild relatives in Middle East, one of the centers of origin of several cereals, legumes and fruit trees. This Germplasm Unit, thanks to the engagement of Iranian scientists and politicians, has grown up and is now very active.

In 1981, CNR decided to establish a network for the preservation of fruit crops genetic resources under the co-ordination of the University of Florence. The co-ordination was later entrusted to the Institute for the Fruit Culture of Rome. The network, while interacting with the ECP/GRs, brought together the major fruit tree research institutions in Italy, each of them taking care of the conservation of different species, according to their areas of activity. Some of the institutions enlarged their programs to include pasture plants. Still others took care of forest plants genetic resources activities, as the CNR institutes in Porano and Florence.

The environmental organisations, in collaboration with the IG, Universities, WWF and other Italian NGOs (as Crocevia and GAB) have been very active in drawing the attention of concerned authorities and policy makers on the importance of biodiversity and the need of its conservation.

In the 1990s several projects and coordinated programs were funded by the CNR, the Ministry for Agricultural Policies (MiPA) and the Ministry for Universities and Scientific Research (MURST). Those projects and programs involved several research institutes engaged in the safeguard, development and use of plant genetic resources.

3.3. *Italian activities in conservation, documentation, distribution and exchange of agricultural and forest genetic resources*

From a survey of the plant genetic resources conserved *ex situ* in Italy, it results that about 80,000 accessions belonging to more than 40 genera and 584 species are stored at the IG. More than 12,000 of them are original collections. Over 76,000 samples were distributed world-wide, the largest number (46,721) to European countries. Numerous field and greenhouse collections, representing thousands of species of different geographical origin, are maintained in 36 botanical gardens, 27 of which belong to Universities. The number of species, either native or exotic, present in each botanical garden ranges from 10 to 6,000. The Fruit Trees Network, in addition to the *ex situ* activity, has played an important role also in the *in situ* conservation. Its members have been invited to focus their conservation efforts on areas particularly rich in genetic variability, already identi-

fied, and where experts are still collecting genetic resources. As a result of this activity, the Network in co-operation with technical agricultural schools, botanical gardens and farmers, has established 84 stations throughout the peninsula, where 8,861 traditional cultivars belonging to 10 species have been identified and are protected by 24 different institutions.

Italy represents a centre of diversification for many medicinal, aromatic and officinal plant species. The Institute of Pharmaceutical Botany of the University of Sassari and the Agronomy Institute of the Bari University, in collaboration with other national and international organizations, have started a project of *in situ* conservation of some of these species. The project also aims at improving the knowledge of the geographic distribution of the species.

Five biosphere reserves have been created in Italy, viz. Miramare (Trieste), Circeo (Latina), Collemuccio-Montedimezzo (Isernia), Vesuvio (Naples) and Cilento-Vallo di Diano (Salerno). The protected species belong respectively to evergreen schlerophyllous forests (including coastal/marine components), evergreen schlerophyllous woodlands and mixed mountain systems with complex zonation. Four biospheres belong to the biogeographical province of Mediterranean Sclerophyll; while the third one belongs to that of Central European Highlands.

It is also worth mentioning that in the forests and grasslands of the Castelporziano presidential estate, near Rome, as many as 1,082 plant species were identified, meaning that just 1/5,000 of the Italian territory hosts as much as 1/6 of the Italian plant biodiversity.

In conclusion, at least 16 institutions maintain plant genetic resources in Italy. They have in storage about 95,000 accessions belonging to 55 genera and more than 600 crop and their wild relatives. Part of this material includes lines, mutants, breeding material and improved varieties not available for distribution. Characterisation and evaluation data are computerised to document diversity, provide input for collection planning, and contribute to management of genetic resources collections. Four European databases for four forage crops (*Lolium*, *Phalaris*, *Vicia* and *Hedysarum*) were set up and are maintained in the framework of a collaboration with the European Cooperative Program of Genetic Resources (ECP/GR).

Information on fruit crops genetic resources is stored in computers and is available for all potential users. The IG has also created a database for rare plant species, to the benefit of regional institutions willing to start conservation activities. Recently, the University of Palermo, in colllaboration with the Council of Europe, has supported the preparation of a "*Catalogue of the Wild Relatives of Cultivated Plants Native to Europe*".

The IG, in co-operation with IPGRI and the Italian Agency for the Environment and Alternative Energies (ENEA), has prepared a list of underutilized plant species having some potential for the future development of mediterranean and european agriculture.

Since 1970, surveys and some collections of obsolete crop varieties, including

those of the above mentioned group of species, have been carried out in Italy and other Mediterranean countries by the IG, in collaboration with IPGRI, the European Union, national institutions and the IPK.

4. Research activities

Several Italian institutes, belonging to Universities, CNR, MiPA, ENEA and other Organizations, are involved in studies on genetic resources, utilizing both traditional and innovative techniques. Research activities are underway on several species, to assess the amount of variation by conventional and advanced techniques, especially for the identification and characterization of genetic resources in plants, animals and micro-organisms, mainly through molecular techniques. Several programs are also being carried out for the identification of useful traits in germplasm collections. Data bases have been organized for several groups of species. A synthesis of the Italian research activities on genetic resources has been reported by E. Porceddu and P. Perrino (*Plant Genetic Resources*, In "Italian Contribution to Plant Genetics and Breeding", G.T. Scarascia Mugnozza and M.A. Pagnotta eds., EUCARPIA, Viterbo 1998).

5. An Italian Plan for Biodiversity

As a consequence of the Rio de Janeiro World Summit on Biodiversity in 1992, the Italian Minister of Environment assigned the National Academy of Sciences, chaired by Scarascia Mugnozza, the drafting of a National Plan for Biodiversity that will probably be approved during 1999. Objective of the plan is to promote the conservation of the national biodiversity, the recognition of its value, and its sustainable use. The plan addresses issues concerning not only plant species, but also animals and micro-organisms. Some of the specific objectives include the acquisition of the documentation and the comprehension of the roles and functions of genes, species and ecosystems. For a correct use of plant genetic resources, the plan suggests that the biological resources maintain their reproductive ability through traditional agricultural systems. Best *in situ* and *ex situ* conservation systems are indicated. Particular actions are envisaged for a better training at school and university levels, in order to improve the culture on biodiversity.

6. The Italy-IPGRI-CGIAR relationships and interactions

In the 1980s and 1990s, the Italian General Directorate for Cooperation to Development of the Ministry for Foreign Affairs gave substantial financial contributions to the unrestricted core budget of the former IBPGR and, at present, of

IPGRI. It supported, at the same time, special programs for germplasm studies and research both at IPGRI and at other CGIAR Centers, as ICARDA, IITA, CIAT, CIP and IRRI. Emblematic, in this context, has been the partial or complete financial support by the Italian cooperation to the establishment of germplasm units and *ad hoc* plants for the conservation and evaluation of genetic resources in some of those centers, namely: ICARDA, IITA, CIAT and CIP.

At the beginning of the 1990s, also with the support of the European Union, a two-year program was launched for the establishment of a network for the preservation of plant biodiversity in West Asia.

In 1985, the IBPGR emerged as a CGIAR center in its own right, with an international management structure and a Board of Trustees. However, it continued to rely upon FAO for a variety of services and was subject to FAO personnel and financial policies. In 1989-90, the CGIAR, following a proposal of its Technical Advisory Committee (G.T. Scarascia Mugnozza was one of its members), supported "the establishment of IBPGR as an international organization independently managed and preferably located near FAO headquarters in Italy". Negotiations then started to implement this plan. An international agreement was drafted on the establishment of the International Plant Genetic Resources Institute (IPGRI). It was submitted to a number of potential donors. In parallel, a Headquarters Agreement was negotiated and agreed upon with the Government of Italy. IPGRI was formerly established on 9 October 1991, when representatives of the Governments of China, Denmark, Italy, Kenya and Switzerland signed the above mentioned international Establishment Agreement. IPGRI's international status was further strengthened with the signature of 47 governments. The Institute, however, became fully operational only when the Headquarters Agreement with the Italian Republic, signed on 10 October 1991, was ratified by the Italian Parliament in 1994. In this Agreement, a special status was recognized to IPGRI, analogous to FAO and IFAD status.

G.T. Scarascia Mugnozza was Board member of IBPGR from 1981 to 1986. L. Monti exerted the same role from 1989 to 1994. Since then, L. Monti is in charge as country-representative Board member.

The following themes were given priority in the 25-year-long cooperation between IPGRI and Italian research groups: training of scientists from developing countries; research on under-utilized Mediterranean plant species; an image-mapping data base project; a study on genetic erosion in germplasm collections, and others. Italy has also funded, during a 9-year period (1989-1998), a CGIAR public awareness unit operative in Italy, after initial attempts to gather wider support from other European countries. In the course of years, such unit ended up devoting most of its efforts in favor of IPGRI's public awareness.

Probably more can be done for Italy-IPGRI scientific collaboration, also in terms of training and hosting IPGRI staff and for short periods of better qualification in new, advanced technologies. The perspectives of more intense relationships

between Italy and the Institute will develop significantly in the near future, when the Institute itself will move to Rome-Fiumicino, also with the financial support of the Directorate for Cooperation with the Developing Countries of the Italian Ministry for Foreign Affairs, into a Science and Technology Park that is being established within the large agricultural estate of Maccarese. The beginning of the remodeling and renovation works to the designated building will start soon. The Institute will have space and structures sufficient for its activities of coordination, management and programming, as well as for research, experimentation and training. In the new location, interaction will also be possible with the already existing centers of agricultural research, particularly for the sustainable management of agro-ecosystems and for the development of biotechnologies aimed at the conservation and improvement of natural resources, biodiversity first. Particularly relevant, in this respect, is a new initiative involving the Universities of Rome-La Sapienza and Viterbo, the CNR and ENEA, aimed at launching new research programs in the field of molecular biology for studies on biodiversity and genetic transformation of crop plants and forest trees.

I am therefore confident that there will be great opportunities for mutually-profitable interactions between IPGRI and Italian research institutions.

Finally, further stimulus especially to the cooperation between public and private sectors may result from the recent acquisition of the whole area including the future IPGRI building by a large and dynamic agro-industrial corporation, with good perspectives for scientific research and technological innovation also in the agro-food and agro-industry domains.

7. The IPGRI mission at the dawn of the XXI century

Two recently-occurred events are bound to increase role and responsibilities of IPGRI. Following the conclusions of the 1992 Rio de Janeiro Conference, genetic resources belong to the country where they are found. Therefore, they cannot be considered any longer as a "mankind heritage", and will probably undergo an increasingly binding process of "nationalization". In a parallel way, in virtue of the progresses in biological and biotechnological research recently achieved in most industrialized countries, mainly through private investments, the level of protection of biological innovations is also increasing, including the exploitation of modified gene constructs and/or transgenic plants and animals.

Both these facts are creating difficulties for public international research institutes as IPGRI in the fulfillment of its mission of protection and safe conservation of biodiversity. A mission to be pursued not only for the benefit of developing countries, as declared in the tasks of the CGIAR system, but also in the interest of the developed regions: that is, for the benefit of the entire humanity.

Having in mind the rapid progresses achieved in crop plant breeding through

the use of genetic resources, the 25th anniversary of IPGRI offers the opportunity of underlining: 1. the absolute importance, for the benefit of this generation and of those to come, of a conservation and sustainable utilization of the agricultural genetic resources inherited from natural evolution and selection and the skill, dedication and creativity of innumerable generations of farmers; 2. that crucially important genetic resources are being eroded and irreversibly lost; 3. that all countries depend, and will continue to depend, for their agriculture and food production, on genetic resources originated from other countries and continents, in a system of interdependence which must result in a full, mutually profitable exchange and cooperation; 4. that further delays in the international cooperation on the CBD principles could impair the implementation of many current programs of conservation of the agro-biodiversity.

Consequently, IPGRI and FAO, which have so far excellently exerted their role, shall, more than ever, pursue the task of persuading national governments and international agencies, public and private industries and enterprises and intensify their commitments and efforts towards:

a) the secure conservation of resources, by completing *ex situ* collections, particularly of material at risk, and by bringing such collections under the international network of *ex situ* collections under the auspices of FAO;

b) an effective *in situ* conservation of the wild relatives of crops and farm animals, and the development of *in situ* gene parks;

c) dynamic on-farm conservation strategies aiming both at ensuring a long-term conservation of agricultural genetic diversity and at the economic and social development of the farmers themselves, and their farming communities;

d) intensive evaluation of the immense reservoir of characters of agricultural genetic resources, in order to improve and intensify their utilization;

e) optimal utilization of the agricultural genetic resources, also through biotechnological procedures, at the service of the fundamental needs of humanity;

f) a rapid and effective completion of the revision of the International Undertaking and the strengthening of the FAO Global System for the Conservation and Utilization of Plant Genetic Resources;

g) recognition of the Farmers' Rights, in virtue of farmers' past and ongoing contribution to genetic resources conservation and enhancement.

It must be remembered that the principle of Farmers' Rights aims at reconciling the views of, respectively, "technology-rich" and "gene-rich" countries, in order to ensure the availability of plant genetic resources within an equitable system. It also provides some balance between breeders' rights and "formal" intellectual property rights (patents), the latter intended to reward "formal" innovations resulting from advanced research and investments in industrialized countries.

It may be concluded that it is a moral duty towards humanity, first of all of scientists and experts, but essentially of all men and women of culture and science, to

contribute to the development of a public policy and to educate the public opinion about the fundamental need of protecting the life forms that nourish the planet, conserving the biological diversity, using its components sustainably and sharing fairly and equitably the benefits arising from the utilization of these resources.

It is a moral responsibility, an inalienable obligation for the Governments, the United Nations, the policy-makers, the scientists, the opinion makers to ensure that all the world's citizens, now and in the future, can effectively exercise their natural right to food and to a free and peaceful development. It must be remembered that international, planetary cooperation is imperative without delay, and that, if the danger is incumbent on all, the benefits will also be for all.

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