Chapter 5

The state of national programmes, training needs and legislation

5.1 Introduction

National programmes for the conservation and sustainable use of PGRFA aim to support economic and social development and underpin efforts to develop more productive, efficient and sustainable agricultural systems. They lie at the heart of the global system for conserving and using PGRFA. While international cooperation between national programmes is essential and is dealt with in Chapter 6, this chapter attempts to define and categorize national programmes, describes developments that have taken place since 1996, identifies current needs and opportunities for training and capacity building and describes the status of national legislation. The chapter concludes with a summary of the main changes that have taken place since the publication of the first SoW report and presents key gaps and needs for the future.

5.2 State of national programmes

5.2.1 Purpose and functions of national programmes

Priority Activity Area 15 of the GPA advocates the formation or strengthening of national programmes for PGRFA as a strategy to involve and coordinate all relevant institutions and organizations in a country, in a holistic enterprise aimed at promoting and supporting the conservation, development and use of PGRFA. Countries vary in the extent to which national PGRFA programmes are incorporated in national developmental plans, or are included in more specific agricultural or environmental policies and strategies. Components of a national programme include both the institutions and organizations involved in PGRFA as well as the linkages and communications among them. In practice, the design and function of a national programme is country specific, shaped by many factors such as history, geography, the status of biodiversity, the nature of agricultural production and relationships with neighbouring countries with respect to shared biodiversity.

An efficient national PGRFA programme should have well-defined goals, clear priorities and a blueprint for implementation. It needs to be well structured and coordinated, involving all relevant stakeholders, no matter how diverse. Its success depends to a large extent on the commitment of national governments to provide the necessary funding, policies and institutional framework.

Given the aforementioned, it is not surprising that there is considerable heterogeneity among national programmes in terms of their goals, functions, organization and infrastructure. At the same time there are many commonalities, in part arising from obligations incurred under various international instruments such as the CBD, the ITPGRFA, the GPA and various other trade and IPR agreements (see Chapter 7).

5.2.2 Types of national programmes

In the first SoW report, an attempt was made to classify the diversity of national programmes into three categories: (i) a formal, centralized system; (ii) a formal, sectorial system in which different institutions take on a leadership role for specific components of the national programme, with national coordination; and (iii) a national mechanism for coordination only, involving all relevant institutions and organizations. In retrospect, this scheme may have been too simplistic.

The process of compiling information for the SoWPGR-2 revealed a wide diversity of national PGRFA systems, in terms of size, structure, organization, institutional composition, funding and objectives. It was difficult to distinguish the three categories of national PGRFA activities used for the first SoW report. For example, there are centralized systems that may not be 'formal' and there are sectorial systems that do not have coordination mechanisms.

Perhaps the most familiar model is a national centralized system based on a vertical integration of PGRFA units within a national institution, such as a Ministry of Agriculture, funded by the national government, with linkages to relevant sectors outside the central organization, such as academic institutions, NGOs and the private sector, coordinated by a national advisory coordinating committee. Another model is a

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national system based on decentralized but strongly coordinated sectorial leadership, with funding arising independently from each sector. Yet another model might be a regional structure involving other countries, balancing components that are missing in one country with components that are well developed in another. In this case, expertise and germplasm are shared, training opportunities are enhanced and greater efficiency is achieved as a result of no single country having to develop every component independently.

Countries were not asked to self-identify their type of national programme with respect to the three categories, for either the first or second SoW reports. In many instances, factors that would have helped in the categorization were not reported. Information on the current status and trends in national programmes since the first SoW report was published should thus be interpreted with caution. Interpretation is complicated further by the fact that a different and smaller set of countries provided information for the second report compared with those reporting in 1996 and that in most cases a different person or group of people was responsible for providing country report information in the two time periods. In spite of these difficulties, some revealing and relevant comparisons are possible.

5.2.3 Status of development of national programmes

There has been considerable progress over the last decade in the percentage of countries having a national programme of one type or another. Of the 113 countries[1] that contributed information for both the first and second SoW reports, 54 percent reported having a national programme in 1996, whereas 71 percent report having some form of national programme now.

At the time of the first SoW report, 10 percent of reporting countries had a national programme 'under development'. Of these, seven provided information for SoWPGR-2 and all but one had followed through, now being able to report a national programme in place.

Of the 120 countries that provided information for the SoWPGR-2 either through a country report, a NISM, or participation in a regional workshop,[2] the most common type of national programme reported is a sectorial type (67 percent of reporting countries), whether formal or informal, with national coordination or not.

Most of the current reports from countries that still lack a national programme recognize the value of establishing one and are discussing what form it might take and what is needed. A few of these indicated that committees are currently looking into the situation.

It is clear that there is still room for countries to improve national systems and coordination of PGRFA. Comprehensive PGRFA management requires the integration of efforts within and outside the country concerned, involving the participation of a diverse set of institutions. As described elsewhere in this report (see, for example, Section 4.7.3), the weak links between the PGRFA conservation and use sectors are still a major concern. There are some signs that the situation may be improving, for example, a number of countries now include their PGRFA programmes within the context of their national development plans and the like. However, strong and fully effective institutional links between national genebanks and plant breeders and/or farmers are still comparatively rare, especially in developing countries.

Even in countries with active and well-coordinated national programmes, certain key elements may be missing. National, publicly accessible databases, for example, are still comparatively rare as are coordinated systems for safety duplication and collaborative public awareness.

Another area that still requires greater attention in many national programmes is a more effective integration of the efforts of the public and private sectors (see Chapters 1 and 4). In a number of countries, private plant breeding and seed sector companies need to see the value of devoting time and resources to strengthening their collaboration with public sector technical institutions. In other cases, however, it was the private sector that insisted that governments should establish national programmes.

Country reports from many regions mentioned NISMs in relation to the implementation of the GPA, as a valuable tool for establishing and improving national programmes.[3] Participating countries recognized NISM helpful role in facilitating the management of

information and the exchange of PGRFA, as well as for fostering within-country identification of stakeholders and promoting collaboration.

The process of contributing to a NISM integrates the efforts of different stakeholders, thus helping to build a broader institutional base for the conservation and use of PGRFA. NISMs provide a key platform for information sharing, policy setting, scientific exchange, technology transfer, research collaboration and for determining and sharing responsibilities. They are also important in the regional and international context in helping to raise awareness of the value of PGRFA and the actions being undertaken by other countries to conserve and use it.

5.2.4 National programme funding

The majority of the country reports indicated that the primary source of funding to sustain their national programme was from the national government. This is one indicator that can be used to help define a 'formal' programme. In some cases this is supplemented by funds from international donors. Individual components of the national system (e.g. units involved with conservation, crop improvement, seed systems, crop protection, protected areas, extension, education, or training) generally receive funds from a variety of different sources: different ministries, national or international funding agencies and foundations, or private philanthropy. To a large extent, the participation of private, for-profit companies within national systems is self-funded.

Although several countries, especially in Europe, reported that overall funding has increased substantially since 1996, many of the country reports noted that their national programme received inadequate and unreliable funding, making it difficult to plan over multiple years. While national genebanks *per se* generally have direct and identifiable funds provided by the national government, the financing of national coordinating mechanisms and other elements of a national system are often buried within other budget categories and hence, subject to greater uncertainty.

In some regions, for example, Africa, the country reports have highlighted the need for greater support for infrastructure. Where this has not been forthcoming from national governments, help has sometimes come from international and regional organizations, bilateral agencies and private foundations. In general, funding support from such agencies for the conservation and use of PGRFA in developing countries appears to have increased since the first SoW report was published.

Although there are no figures available to indicate overall trends in funding, the CBD, GPA and ITPGRFA have all clearly helped to give greater prominence to the subject and overall, this has almost certainly had a positive impact. Likewise, the international publicity surrounding events such as the launching of the GCDT and the opening of the SGSV have served to raise awareness of the importance of conserving and using PGRFA in the minds of the general public, policy-makers and donors.

While the level and reliability of funding are major factors that determine the strength and effectiveness of a national PGRFA programme, other factors are also important such as the extent of public awareness and support, political will and the quality of leadership and management. These factors clearly vary from country to country and from region to region, as does financial support.

5.2.5 Role of the private sector, non-governmental organizations and educational institutions

As described above, in most countries the national government is the principal entity involved in national programmes for the conservation and use of PGRFA, generally through multiple public sector institutions under one or several ministries. However, the involvement of other stakeholders appears to have expanded since the publication of the first SoW report. These include private, for-profit companies, NGOs, farmer organizations and other rural community groups and educational institutions, especially universities.

5.2.5.1 Private sector

Private sector companies are very diverse in size, scope and core business and their participation in national programmes reflects this diversity. Their interests and

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involvement vary from the collecting and maintenance of germplasm collections (generally breeders' working collections) and the evaluation of germplasm, to genetic improvement, multilocation testing, biosafety and seed release, multiplication and distribution. They are also sometimes actively involved in education, training and public awareness activities. Over recent years, public-private research and development partnerships appear to have grown in importance, especially in the area of biotechnology.[4] Within Western Europe, Australia and the United States of America and other industrialized countries, the private sector now accounts for a large proportion of the total breeding effort (see Section 4.4) and it is expanding rapidly elsewhere, especially in parts of Latin America and Asia. Stronger links between private companies and public institutions involved in basic research, conservation, genetic enhancement, information systems, and the like, offer considerable potential benefits for all parties concerned.

5.2.5.2 Non-governmental organizations

In many countries NGOs play a very important role at the farm and community level in promoting and supporting the conservation and management of PGRFA. Their activities range from direct involvement in *in situ* conservation in protected areas to promoting the on-farm management of PGRFA for the benefit of local households and communities. Many are also active in lobbying governments to devote more attention to these issues. In a number of countries, NGOs actively participate in nationally coordinated efforts. It is not possible to provide a comprehensive overview or analysis of NGO activities in PGRFA because they are so numerous and diverse, especially at the regional and national levels.

According to the country reports, NGOs are active in most regions and are particularly strong in Africa, Asia, Europe and parts of Latin America. Germany, the Netherlands and Switzerland reported the effective involvement of NGOs. In Asia, NGOs such as LI-BIRD in Nepal and the M.S. Swaminathan Research Foundation and Gene Campaign in India have been very active in promoting the on-farm management of PGRFA. Farmers' unions and cooperatives are recognized as important and crucial stakeholders in many countries of the Near East region. A number of national PGR workshops and training programmes have helped enhance the role of NGOs within national programmes, especially in technology transfer, public awareness and capacity building.

5.2.5.3 Universities

Universities are active participants and collaborators in national PGRFA programmes in many countries and in all regions. Many examples have been cited elsewhere in this report. Not only are universities vital for their role in the development of human resources but they also contribute substantially to research and the development of PGRFA. They have become increasingly involved in the application of biotechnology to conservation and crop improvement, for example, in cryopreservation, *in vitro* propagation, the development and application of molecular markers, the measurement and monitoring of genetic diversity, and the analyses of species relationships.

While they play a vital role, many universities and other learning institutions, especially in developing countries, lack adequate facilities and financial support, which limits their ability to contribute to their maximum capacity.

5.3 Training and education

Meeting national programme needs for training and capacity building is among the priorities listed in the GPA. Expanding and improving education and training is Priority Activity Area 19 in the GPA and capacity building is addressed by the entire fourth section. Strengthened staff competence is needed in all sectors: scientists and technicians, development workers, NGOs and farmers. Special efforts are needed to educate research managers and policy-makers. In many countries biological sciences curricula at all educational levels need to be developed or updated to include conservation biology, especially with respect to agrobiodiversity.

Since 1996, a number of developments have taken place in training and education, with significant new opportunities opening up in several countries.

Collaboration for training between national programmes and international and regional organizations, especially with FAO and the CGIAR centres, has expanded and capacity building opportunities have increased. Much of this has been the result of additional funding becoming available from bilateral and multilateral donors for research projects that have a human resources development component. More universities are now offering short-term informal courses as well as longer-term M.Sc. and Ph.D. courses in areas related to PGRFA. New training materials are becoming available and field and laboratory facilities for training have improved in a number of countries. However, in spite of these developments, there is still a need for greater capacity in education and training to meet the expanding demand for new, well-trained professionals and for upgrading the skills and expertise of those already engaged in the conservation or use of PGRFA.

Most national programmes concerned with on-farm management of PGRFA aim to build both their own professional capacity as well as that of the farmers with whom they work. However, many NGOs and development agencies lack sufficient qualified personnel to impart the necessary training to farming communities. While higher-degree training in *in situ* conservation and on-farm management of PGRFA was specifically mentioned by Indonesia, Malawi and Zambia, most capacity building in these areas has been less formal. Cuba, India and Nepal, for example, all indicated that there has been an increase in the number of groups trained in PPB (see Section 4.6.2) and the compilation of community biodiversity registers. Several country reports[5] mentioned activities on the on-farm management of PGRFA that include technical courses for farmers, farmer-to-farmer training, the setting up of farmer associations, courses for extension workers and short-term professional training. Participatory approaches have been central to much of the work undertaken in this area and have resulted in the enhancement of local capacity for informal research and the evaluation of diversity.

In Morocco and Nepal, work on diversity has been linked to literacy campaigns that *inter alia* help strengthen diversity management capabilities. Increased gender awareness has been another important facet within many projects, not only through the collection of gender-disaggregated data and the participation of women farmers, but also as a result of the increased involvement of women in research and project management.

Since the first SoW report was published, many new manuals and other tools have been developed to support training on how to manage on-farm genetic diversity. Examples include a training guide developed by Bioversity International,[6] a source book on the conservation and sustainable use of agricultural biodiversity by CIP,[7] and a 'tool kit' to help the development of strategies for the on-farm management of PGRFA.[8] The community biodiversity management approach, including community biodiversity registries, aims to build the capacity of local communities to make their own decisions on the conservation and use of biodiversity.[9] It does this through facilitating community access to knowledge, information and genetic materials.

The following sections summarize major developments in relation to training and education on a regional basis.

Africa

From an analysis of the country reports it appears that in spite of advances in several countries, overall capacity to carry out training and education on PGRFA in Africa remains limited. Universities in Benin, Ghana, Kenya and Madagascar all reported that courses on genetic resources have been included in university curricula at both the undergraduate and postgraduate levels. In Benin and Côte d'Ivoire, postgraduate courses have been initiated in collaboration with Bioversity International and a partnership has been established in Kenya to teach a diploma course on PGR conservation involving Maseno University together with KARI, the Kenya Forest Research Institute (KEFRI) and the National Museums of Kenya (NMK). In Ethiopia, the IBC organizes both long- and short-term training courses on the management of genetic resources.

Americas

In Latin America, several countries have invested in educational programmes. The Plurinational State

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of Bolivia, for example, has offered ten short-term university courses in PGR since 1996 and in Brazil, the Federal University of Santa Catarina started M.Sc. and Ph.D. courses in 1997 with financial support from the National Council for Scientific and Technological Development (CNPq). In Argentina, undergraduate and M.Sc. courses are available in several universities. In Costa Rica, the EARTH University offers regular courses in subjects related to genetic resources and in 2002, a postgraduate course, entitled 'Management and Sustainable Use of PGR', was conducted at CATIE with the aim of improving the use of genetic diversity of cultivated plants. A large training programme exists in Mexico, where many universities and other institutions offer courses in aspects of genetic resources, from secondary school to postgraduate levels and in Uruguay, undergraduate courses in applied science cover subjects related to conservation and sustainable use of biological diversity. According to the country reports, however, there is currently no formal training programme on genetic resources in Cuba, the Dominican Republic, Ecuador, Jamaica, Peru, Trinidad and Tobago or the Bolivarian Republic of Venezuela.

Asia and the Pacific

In recent years several regional and international short-term training courses have been conducted including: field genebank maintenance (Universiti Putra Malaysia, UPM); *in vitro* conservation and cryopreservation (NBPGR, India); documentation and bamboo genetic resources, Forest Research Institute of Malaysia (FRIM) and the Universiti Malaya (UM, Malaysia); *in vitro* conservation and cryopreservation of tropical fruit genetic resources (NBPGR, India); molecular data analysis of tropical fruit tree species diversity (Huazhong Agricultural University, China); cryopreservation of tropical fruit genetic resources (Griffith University, Australia); use of molecular markers for characterization of genetic resources (Huazhong Agricultural University, China); and on-farm and community-based conservation and the role of public awareness (Secretariat of the Pacific Community [SPC, Fiji]).

Both Bioversity International and NIAS/Japan's International Cooperation Agency (JICA) have been actively involved in training on the management of PGRFA in the region. Recently, Bioversity International has recognized NBPGR, India and the Chinese Academy of Agricultural Sciences (CAAS), Bioversity Centre of Excellence for Agrobiodiversity Resources and Development of China (CEARD) as Centres of Excellence for training on *in vitro* conservation and cryopreservation. In Nepal, LI-BIRD and the Napok Agricultural Research Centre (NARC) have been identified as Centres of Excellence for training in on-farm conservation.

The University of the Philippines Open University (UPOU) has entered into an agreement with Bioversity International to develop specialized courses on international and national policy and laws relating to the management of PGR. The Genetic Resources Policy Initiative (GPRI) of Bioversity International has published several training documents and other materials for use in education and training programmes.

Since 1996, NBPGR and the Indian Agricultural Research Institute (IARI) in New Delhi have offered joint M.Sc. and Ph.D. degree programmes in the conservation and management of genetic resources. Formal degree programmes were also initiated at the University of the Philippines Los Baños (UPLB), the Philippines in 1997 and in Malaysia and Sri Lanka in 2000.

In the Pacific Islands, the University of the South Pacific (USP), Alafua Campus, Samoa, hosted a meeting on PGR Education in 2004. Later, the Centre for Flexible and Distance Learning of USP was mandated to develop a course curriculum on genetic resources.

Europe

In Europe, many universities provide courses in agricultural sciences, plant breeding and plant science, which include aspects of PGR. Formal B.Sc., M.Sc. and Ph.D. degree programmes having special emphasis on biodiversity and genetic resources have been established in several countries as a response to calls for action by the CBD. In some countries, genebank staff are engaged as university faculty members on an adjunct or part-time basis and various institutions, societies, NGOs and a few national genebanks offer

short courses (workshops, seminars) on practical aspects of PGRFA. Courses on collecting and conservation techniques are very much in demand, especially in Eastern Europe.

Near East

Universities in Egypt, Jordan and Morocco are developing master's degree programmes that focus on the conservation of genetic resources and the management of natural resources. Substantial efforts have been made in a number of countries to increase public awareness of the importance of conserving biodiversity in general and agrobiodiversity in particular. Jordan, Kazakhstan, Morocco, the Syrian Arab Republic and the West Bank and Gaza Strip, have developed educational curricula and extracurricular activities directed at increasing the awareness of students and their parents. A variety of different media (TV, radio, workshops, meetings, posters, leaflets, agricultural fairs and ecotourism) have been used by government agencies and by different biodiversity projects in the region to help educate the public. The innovative use of rural theatre by the Extension Directorate in the Syrian Arab Republic, for example, has resulted in increased general public awareness of the role and value of PGRFA.

In conclusion, while good progress has been made, there is still much to be done to provide more and better training opportunities at the local, national, regional and international levels.

5.4 National policy and legislation

While many important agreements relating to PGRFA have been negotiated and adopted at the international level (see Chapter 7), the number of national laws and regulations has also increased. Appendix 1 provides details of the status of countries with respect to their signing or ratifying major international agreements as well as the enactment of national laws relating to the conservation and use of PGRFA. The following sections describe the status of national regulations and legislation in five areas: phytosanitary regulations, seed regulations, IPRs, Farmers' Rights and biosafety. Regional approaches to phytosanitary regulations are dealt with in Section 6.4.1 and the topic of ABS is a major topic of Chapter 7.

5.4.1 Phytosanitary regulations

Most countries in all regions have adopted national phytosanitary legislation. Since the first SoW report was published, much of the new national legislation in this area has been influenced by the adoption of the revised text of the IPPC in 1997 (see Section 6.4).[10] Many countries subsequently amended their plant protection laws or enacted new ones to ensure that their legislation used the new definitions from the 1997 text and reflected the concepts and rules of the WTO Agreement on the Application of Sanitary and Phytosanitary Measures. One of the main changes that occurred is the requirement that the decision to import plants, plant products and other regulated articles should have a scientific basis.

All decisions on imports that are not based on international standards must be based on pest risk analysis.

5.4.2 Seed regulations

The seed system is highly regulated in most countries, from the release of new varieties and the quality control of seeds to the legal status of organizations that implement seed control and certification and variety release procedures. Since the first SoW report was published, three main trends have occurred: the emergence of voluntary arrangements regarding seed certification and variety release; the growing use of accreditation principles within official national rules and standards; and the regional harmonization of seed laws (see Section 4.8).

Recent years have seen a significant development of the seed trade by the public and, especially, private sectors, largely in parallel with the more traditional seed exchange arrangements of local agricultural communities. This has led governments to set up seed regulations for the protection of seed users (farmers, consumers and agrifood industries) that cover such areas as catalogues of plant varieties, marketing authorization and seed-quality control.

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In some countries including Australia, Canada and New Zealand as well as some Latin American, African and Asian countries, the growth of the private seed sector has led governments to review their seed laws, resulting in many cases, in a shift away from compulsory rules on seed certification and variety release towards more voluntary arrangements. The largely self-regulated nature of variety release and seed certification in the United States of America allows for the marketing of seeds of local varieties. In India, changes have been made in the other direction, from voluntary arrangements to more compulsory rules, with a view to strengthening the protection of consumers and small farmers.

The growth of the private seed sector has also led to an increased use of accreditation principles within the national or regional seed rules and standards of a number of industrialized countries and ones with emerging economies. The introduction of private certification and testing services or in-company systems, complements or, in some cases, replaces the government's traditional role in these matters. Taking into account the evolution of seed regulations, the International Seed Federation (ISF) has regularly updated its rules dealing with contracts among seed merchants and between companies and contract growers.

The third main trend is the regional harmonization of seed laws, especially in Africa and Europe, in order to avoid disincentives to cross-border seed trade. The most far-reaching example of regional harmonization of seed laws is in the European Union where seed certification and seed quality standards[11] were adopted in the late 1960s and a common variety catalogue established in 1970. In 2008, the concept of 'conservation varieties' was introduced. These are varieties that, although having to meet quality standards, have neither to adhere to strict uniformity and stability rules nor have any proven value for cultivation and use.[12] However, such 'conservation varieties' are limited to old and locally used varieties that are threatened by genetic erosion.

In the countries of Southern Africa, the harmonization of seed laws with the assistance of FAO resulted in the adoption in the early 2000s of a joint variety list that enables varieties to be grown in the different member countries. However, a variety must be listed in at least two countries before it enters the SADC regional list. Harmonization efforts are also underway in Western Africa with the development of a joint variety list by members of the Economic Community of West African States (ECOWAS) and the adoption in 2008 of Regulation C/REG.4/05/2008 on the Harmonization of the Rules Governing Quality Control, Certification and Marketing of Plant Seeds and Seedlings in the ECOWAS Region.

In parallel with these trends and despite growing awareness of the value of informal exchange of seeds among farmers, most laws explicitly apply to packed and certified seed with only very few countries having exemptions or special arrangements for farmers' seed (see Box 5.1). Most seed laws aim to protect the seed label and are reserved for controlled seeds, labelled 'Government-certified seeds', 'Government-tested seeds', or the like. The Moroccan seed law restricts the use of the word 'seed' to controlled seed only. In many countries, the informal marketing of local varieties and landraces is illegal.

A major challenge in developing national seed laws is balancing the need to promote diversity and local varieties with systems that promote access to good quality seed of appropriate varieties. Another challenge, reported by several countries, is how to ensure the effective implementation of seed laws and regulations in situations where government funding, trained staff and infrastructure are limited.

5.4.3 Intellectual Property Rights

Systems for protecting and rewarding IP in relation to PGRFA primarily involve PBR and patents. The following sections give an overview of the state of play at the national level in both of these areas. Other forms of IPR can also play a role, for example, trade secrets for protecting inbred lines for producing hybrid varieties, geographical indications for protecting products that have a specific geographical origin and possess qualities, reputation, or characteristics that are essentially attributable to that origin and copyright for protecting databases and other information sources. However, these are not considered further in this report.

Box 5.1
Examples of developments in national legislation that support the conservation and use of traditional crop varieties

Bangladesh: the forthcoming national framework for PGRFA is expected to include, *inter alia*, the recognition of Farmers' Rights, including provisions for benefit sharing.

Ecuador: the new National Constitution approved in September 2007 strongly promotes the conservation of agricultural biodiversity and the right of people to choose their own food. In particular, Article 281.6 has the title: "promote the preservation and rehabilitation of agrobiodiversity linked to ancestral knowledge; likewise its use, conservation and free seed exchange". Several government programmes will be put in place to support small and medium farmers in the production of organic and traditional food.

Morocco: in 2008, a law was adopted covering Appellation of Origin, Geographical Indication and Agricultural Labelling of produce. It allows for the registration of products from local varieties and landraces and thus helps promote their use and conservation.

Nepal: a 2004 amendment of the 'Seed Regulatory Act' has added a new provision on plant variety registration that allows for the inclusion of farmers' field trial data and other data from participatory trials, in registration applications. This will enable farmers' varieties and landraces to be registered, thus helping to promote conservation; and it will also expand opportunities for the sharing of any benefits that result from any increased use of local genetic resources.

Tunisia: in 2008, a law was adopted to promote the *in situ* and *ex situ* conservation of date palm genetic resources. It includes the use of *in vitro* methods to multiply varieties for conservation purposes and to rehabilitate old plantations in the oases.

5.4.3.1 Plant breeders' rights

According to the UPOV, PBR allow breeders the exclusive right to sell seed or propagating material of their new varieties over a given number of years, although these varieties can still be used without restriction for research and further breeding ('breeders' exemption'). The number of countries that provide legal protection to plant varieties through PBR has increased substantially over the past ten years. While most western European countries, Australia, Canada, New Zealand and the United States of America already had PBR systems in place prior to the publication of the first SoW report, most countries in Africa, Asia, Latin America and the Caribbean, Eastern Europe and the Near East that have enacted PBR legislation have done so in the last decade.

The move to enact PBR legislation largely results from the TRIPS Agreement of the WTO that requires countries to provide for the protection of plant varieties either by patents or by an effective *sui generis* system or by any combination thereof (Article 27.3). Although there is no mention of UPOV in the TRIPS Agreement, the UPOV *sui generis* models are widely considered to meet the requirements of TRIPS and as a result, the number of countries that have joined UPOV almost doubled between 1998 and 2007, reaching 68 in February 2010.

The increasing membership of UPOV is also a consequence of a number of free-trade agreements that have been concluded that extend standards of IPR protection beyond the TRIPS requirements, for instance by making explicit reference to UPOV.

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Africa, Burkina Faso, Cameroon, Kenya and South Africa, have all implemented PBR legislation, while four other countries have developed a national *sui generis* plant variety protection (PVP) system.[13] Six other countries[14] are in the process of developing or approving such regulations. At the regional level, the African Intellectual Property Organization (Organisation africaine de la propriété intellectuelle/ African Intellectual Property Organization, OAPI) revised the 1999 Bangui Agreement that governs the common intellectual property regime of its 16 Member States.[15] The new Agreement establishes, in its Annex X, a uniform PVP system that conforms with UPOV and foresees that the OAPI Member States will join UPOV by depositing an instrument of accession to the 1991 Act. In addition, the African Regional Industrial Property Organization (ARIPO) is currently drafting a regional PVP system.

In Asia and the Pacific, seven countries[16] have implemented PBR and eight other countries have developed a national *sui generis* PVP system,[17] 13 of these having done so in the last decade. The Philippines and Singapore have initiated the procedure for accession to UPOV and Nepal is currently drafting a bill on PVP.

In the Americas, 15[18] of the 34 countries in Latin America and the Caribbean have PBR legislation in place and six others[19] have developed national *sui generis* PVP systems. Guatemala and Saint Vincent and the Grenadines have developed draft legislation. In all countries except Argentina, Chile, Colombia, Cuba and Paraguay, the legislation has been adopted since the publication of the first SoW report. At the subregional level, the five Member States of the Andean Community adopted Decision 345 on Common Provisions on the Protection of the Rights of Breeders of New Plant Varieties that was modelled according to the UPOV Convention of 1991 (see Section 6.4).

All European countries have put in place or drafted national legislation on PBR or PVP except Greece, Lichtenstein, Luxembourg, Monaco and San Marino. While most Western European countries adopted such legislation before 1996, many amendments to the original laws and regulations have been made over the past decade. Most Eastern European countries have been involved more recently, with more than half of them having enacted laws in the last decade. At the European Union level, the Council Regulation No. 2100/94 on Community plant variety rights provides for the protection of PBR throughout the territory of the 27 European Union Member States in addition to national systems already in place.

Twenty-one of the 30 countries in the Near East region have adopted either PBR or a national *sui generis* PVP system,[20] the large majority having done so in the last decade. The Commonwealth of Independent States (CIS) countries adopted an agreement on the legal protection of plant varieties including the examination process in 2001 aiming to foster cooperation in that field.

5.4.3.2 Patents

At the time when the first SoW report was under preparation, the issue of patenting varieties or parts of varieties (e.g. genes or traits) and biotechnological processes (e.g. transformation), had only recently begun to emerge. Since then it has become the subject of much debate, especially as a result of increased adherence to the TRIPS Agreement. While parties are allowed to exclude from patentability "plants and animals other than microorganisms, and essentially biological processes for the production of plants and animals other than non-biological and microbiological processes", they must provide "by patents or by an effective *sui generis* system or by any combination thereof", for the protection of plant varieties. Part of the controversy arises from the fact that patents are generally claimed not for a single variety, as is the case with PBR, but for a whole class of varieties or even a trait within a whole species. Furthermore, while patents applied to plant varieties generally include a limited research exemption, unlike the situation with PBR and UPOV, they generally do not include either a breeder's exemption or a farmer's privilege. There are, however, exceptions to this, for example in France, Germany and Switzerland.

Today, relatively few countries allow patent protection for new crop varieties. However, the patent system is widely used in the United States of America, at least in part because of concerns that

the UPOV 'farmers' privilege' results in insufficient protection. Australia and Japan also offer forms of patent protection for new crop varieties. In Japan, for example, the novelty requirement for patentability is interpreted in such a way that new varieties that exceptionally show breakthrough improvements can be protected with a patent, whereas others can only be protected by PBR.

In 1998, the European Union adopted Directive 98/44/EC on the Legal Protection of Biotechnological Inventions that allows patents to be awarded for a wide range of biotechnological materials and processes, including products containing or consisting of genetic information, however, it excludes plant varieties from patentability. The Directive provides for certain exemptions, in particular the farmers' exemption allowing small-scale farmers to freely use products harvested from specified plant varieties for propagation or multiplication on their own farm.

Whereas several emerging countries such as China and India have recently amended their patent laws to comply with TRIPS requirements and, in particular, to make microorganisms patentable, most developing countries, especially in Africa, consider that life forms cannot be patented and that plant varieties should be protected through *sui generis* systems. Patents on plants are not allowed in Latin American countries.

5.4.4 Farmers' Rights

While the issue of Farmers' Rights was a topic of extensive discussion prior to the publication of the first SoW report, it has since become even more hotly debated, particularly around the time of the final negotiations of the ITPGRFA (see Chapter 7). The importance of farmers as custodians and developers of genetic diversity for food and agriculture was recognized in the ITPGRFA through the provisions of Article 9 on Farmers' Rights. The Article recognizes that the responsibility for realizing Farmers' Rights, as they relate to PGRFA, rests with national governments. Such rights are seen to include: the protection of traditional knowledge relevant to PGRFA; the right of farmers to equitably share benefits that result from their use; their right to participate in making decisions at the national level on matters related to the conservation and sustainable use of PGRFA; and the right of farmers to save, use, exchange and sell farm-saved seed/propagating material, subject to national law. While all Contracting Parties of the ITPGRFA are legally bound by it, they are free to determine how they will implement the Farmers' Rights provisions at the national level.

The state of national implementation of Farmers' Rights is the focus of a recent study by the Fridtjof Nansen Institute in Norway.[21] The study describes examples of projects or activities that have resulted in substantial achievements in each of the areas referred to in the previous paragraph. Some of these involve national legislation; others focus more on civil society initiatives. Examples of such initiatives include the movement to resist increasing the scope of breeders' rights in Norway and the creation of a registry of rice varieties maintained at the community level in the Philippines, as a way of protecting traditional knowledge and farmers' varieties against misappropriation.

Although Farmers' Rights do not deal with the protection of IP *per se*, they are often regarded as a counterpart to it and countries that have enacted legislation promoting such Farmers' Rights have generally done so within their PVP legislation. At least ten countries have reported that they have adopted regulations covering one or more aspects of Farmers' Rights and several others are currently drafting legislation in this area. Many other countries do not deem it necessary to enact specific legislation of Farmers' Rights but meet their obligations under the ITPGRFA through existing mechanisms such as PBR or national participatory decision systems.

Even before the concept of Farmers' Rights was formally adopted in the ITPGRFA, a number of countries including Bangladesh, India and Thailand had already implemented legislation that protected Farmers' Rights in terms of the right to save, use, exchange and sell farm-saved seeds, participate in making decisions and, in the case of India, introduced a 'Gene Fund' financed by all users, including farmers, to support farmers who maintain genetic resources (see Box 5.2).

Africa, Ethiopia, Ghana, Malawi and Namibia are currently developing specific regulations on Farmers'

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Box 5.2
India's Protection of Plant Varieties and Farmers' Rights Act of 2001

The 2001 Act protects the rights of farmers to save, use, sow, re-sow, exchange, share and sell their farm produce, including seed, of a variety protected by breeders' rights, provided that they do not sell branded seed packaged and labelled as a seed variety protected under the Act.

The Act provides for the registration of farmers' varieties on a par with breeders' varieties. Farmers' varieties are required to meet the same criteria of distinctiveness, uniformity and stability, but are not required to meet the criterion of novelty. It also protects the rights of farmers by requiring breeders and other persons applying for the registration of varieties under the Act to declare that the genetic material acquired for developing the new variety has been lawfully acquired and to disclose any use of genetic material conserved by tribal or rural families in the development of the registered variety. Claims for compensation may be made where it is found that the tribal or rural communities have contributed material used in the development of the variety. The Act provides for claims for benefit sharing to be made after the publication of certificates of registration of new varieties. Where benefit sharing is ordered by the responsible governmental authority, the money is to be paid into the National Gene Fund. Farmers who conserve or improve landraces or wild relatives of economic plants are eligible to receive an award from the Gene Fund.

Rights and Ethiopia has already implemented some aspects of Farmers' Rights in its Access to Genetic Resources and Community knowledge and Community Rights Proclamation No. 482/2006.

In the Americas, Costa Rica has addressed the issue of Farmers' Rights by establishing a Small Farmers Board in 1998 as a member of the National Commission for the Management of Biodiversity, which has the function of formulating national policies on the conservation and sustainable use of biodiversity. Other countries have addressed some aspects of Farmers' Rights, such as Brazil, in its PVP act and seed law, Cuba and Paraguay.

In Asia and the Pacific, in addition to Bangladesh, India and Thailand, Nepal and the Philippines are currently developing draft Farmers' Rights laws. In Malaysia, the Protection of New Plant Varieties Act of 2004 seeks to introduce more flexibility into the requirements for the registration of farmers' varieties. While reiterating the normal criteria for professionally bred varieties, i.e. that they must be new, distinct, uniform and stable, the Act exempts new varieties bred or discovered and developed by farmers, local communities and indigenous people, from the requirements of stability and uniformity; farmers' varieties only need to be distinct and identifiable. The Act also allows acts that are carried out privately on a non-commercial basis, thus allowing small farmers to continue their normal practices of using and exchanging farm-saved seed.

In the Near East, no country has yet enacted specific legislation on Farmers' Rights[22] although the Islamic Republic of Iran and Turkey are currently developing specific laws in this area. However, the Islamic Republic of Iran has already implemented some aspects of Farmers' Rights in broader legislation. Pakistan has drafted legislation on access to biological resources and community rights that addresses some aspects of Farmers' Rights.

In most industrialized countries, where farmers' organizations tend to be well connected to policy processes, the issue of Farmers' Rights has not taken on as much importance and the debate on the use of farm-saved seed is generally held in the framework of IPR and seed legislation. In Europe, while only Italy has adopted specific regulations on Farmers' Rights, many other countries, for example, Austria and Estonia, consider that they have adequately addressed, or are in the process of addressing, aspects of Farmers' Rights in other legislation and regulations as

appropriate. However, several countries in the region are now considering how they might best support the realization of Farmers' Rights in developing countries.

5.4.5 Biosafety

Biosafety has been defined as the "the avoidance of risk to human health and safety and to the conservation of the environment, as a result of the use for research and commerce of infectious or genetically modified organisms (GMOs)".[23] Concerns over biosafety have grown substantially over the last decade, in parallel with the expanding use of GMOs and the impact of infectious agents. Factors that have contributed to this increasing concern have included outbreaks of transboundary diseases affecting animals, plants and people; heightened awareness of the potential impact of GMOs on biological diversity; increased concern over general food safety issues; and greater attention to the impact of agriculture on environmental sustainability.

Since the first SoW report was published, biosafety has emerged as an important issue and many countries in all regions have now either adopted national biosafety regulations or frameworks, or are currently developing them. At the international level, the adoption of the Cartagena Protocol on Biosafety of the CBD[24] in 2000 marked a milestone in cooperation on the safe transfer, handling and use of GMOs. The Cartagena Protocol entered into force in 2001 and as of February 2010, had been ratified by 157 countries. It now provides the international legal framework that underpins the current development of national biosafety regulations in many countries. In spite of concerns over the capacity of some developing countries to fully implement such regulations, it is likely that they will lead, in the near future, to a wider adoption of GM-varieties.

Over the past decade many countries have adopted national regulations and biosafety frameworks that aim to reduce risks to the environment and human health. The United States of America has adopted an incremental approach to the regulation of biotechnology, based on the regulation of the characteristics of a product, rather than on the assumption that products of biotechnology automatically need special regulations. In Europe, the application of the 'precautionary principle' can block use of a GMO until evidence is presented that the transgenic organism is safe. This has limited the number of approvals that have been granted for the commercial use of GMOs and even fewer approvals for their deliberate release into the environment. At the European Union level, Directive 2001/18/EC on the release of GMOs was adopted in 2001. At the national level, all 27 European Union Member States have enacted biosafety or biotechnology-related laws and among non-European Union European countries, eight[25] have done so as well. Albania, Armenia, Bosnia and Herzegovina, Croatia and Georgia are currently drafting biosafety legislation.

The development and adoption of biosafety frameworks and regulations in developing countries is increasing rapidly, supported in many cases by foreign donors or regional intergovernmental agencies. Many African countries[26] have adopted formal biosafety measures while 33 other African countries[27] are in the process of developing or adopting such regulations. In the Americas, all Central and South American countries have adopted some form of regulation or guidelines on biosafety, with the exception of Ecuador and Nicaragua and these are both currently drafting such regulations. Of the Caribbean nations, only Belize and Cuba have enacted biosafety laws, although in 12 other countries,[28] legislation is being formulated.

In Asia and the Pacific, legislation or guidelines on biosafety are in place in eleven countries[29] and draft regulations are under development in fifteen,[30] while in the Near East, Cyprus, Egypt, Israel, Kazakhstan, Malta, Pakistan, the Syrian Arab Republic and Tajikistan have adopted biosafety legislation and it is under development in twelve other countries.[31]

5.5 Changes since the first State of the World report was published

Although it has been patchy, progress has been made overall since the publication of the first SoW report in the strengthening of national programmes, the development of training capacity and particularly, in

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the adoption of national policies, laws and regulations relevant to the conservation and use of PGRFA. Nevertheless, as indicated above, there is still a way to go in each of these areas:

- although the first SoW report classified national programmes into three categories, since then it has become clear that such a typology is too simplistic and that there is huge heterogeneity among national programmes in terms of their goals, functions, organization and structure;
- there has been considerable progress in establishing national programmes, at least in part as a consequence of the adoption of the ITPGRFA and GPA. Of the 113 countries that provided information for both the first and second SoW reports, 54 percent had a national programme in 1996 whereas 71 percent currently have one;
- even in countries with active and well-coordinated national programmes, certain elements are still often missing. National, publicly accessible databases, for example are still comparatively rare as are coordinated systems for safety duplication and collaborative public awareness;
- the new NISM on the implementation of the GPA was mentioned by many country reports as a valuable tool for establishing and improving national programmes;
- although several countries, especially in Europe, reported that overall funding has increased since 1996, many of the country reports noted that their national programme received inadequate and unreliable funding, making it difficult to plan over multiple years;
- while in most countries national government institutions are the principal entities involved in national programmes, the inclusion of other stakeholders has expanded, especially of private for-profit companies, NGOs, farmer organizations and educational institutions;
- public-private research and development partnerships appear to have grown in importance, especially in plant breeding and biotechnology, not only in developed but also in many developing countries;
- universities have become increasingly involved in research on PGRFA, especially in the application of biotechnology to conservation and crop improvement;
- new education and training opportunities have opened up in several countries and more universities now offer M.Sc. and Ph.D. courses. Collaboration in training between national programmes and international and regional organizations has become stronger and new training materials have been developed;
- since the first SoW report was published, most countries have enacted new national phytosanitary legislation, or revised old legislation, in large part in response to the adoption of the revised IPPC in 1997;
- there have been three main trends in national seed legislation and policy over the past decade: the emergence of voluntary arrangements on seed certification and variety release; the growing use of accreditation principles alongside official national rules and standards; and the regional harmonization of seed laws;
- most developing and Eastern European countries that now provide legal protection to new plant varieties, have done so in the last decade. A few others are currently drafting legislation;
- the importance of farmers as custodians and developers of genetic diversity was recognized in the ITPGRFA through the provisions of Article 9 on Farmers' Rights. A few countries have adopted regulations covering one or more aspects of Farmers' Rights;
- since the first SoW report was published, biosafety has emerged as an important issue and many countries have now either adopted national biosafety regulations or frameworks, or are currently developing them. As of February 2010, 157 countries and the European Union had ratified the Cartagena Protocol on Biosafety.

5.6 Gaps and needs

Key gaps and needs for the future include:

- whether a national PGRFA programme is centralized, sectorial, or even regional, it is vital that there be effective coordination and collaboration among its elements, including ministries, government institutions, universities, private companies, NGOs, farmers' groups and others;

- the links between institutions concerned primarily with the conservation of PGRFA and those concerned primarily with its use are weak or even absent in many countries and need to be strengthened;
- many countries lack nationally endorsed strategies and plans for the conservation and use of PGRFA. These are important for setting priorities, distributing roles and responsibilities and allocating resources;
- almost half of the country reports indicated that they had no NISM for PGRFA, and thus lack an effective tool for promoting both internal as well as international collaboration;
- there is a need to assess human resource capacity and needs in the various aspects of conserving and using PGRFA and to use this as the basis for drawing up national (and ultimately regional and global) education and training strategies;
- in spite of the expansion of education and training opportunities over the past decade, they remain inadequate overall. More opportunities are needed both for the training of young researchers and development workers and for upgrading the knowledge and skills of existing staff;
- special efforts are needed in many countries to educate senior managers and policy-makers about the complex legal and policy issues relating to the conservation, exchange and use of PGRFA;
- greater efforts are needed to include the concept of conservation biology, especially with respect to agrobiodiversity, in biological sciences curricula at all levels;
- efforts to raise additional resources to support work on PGRFA require new and innovative approaches, better coordination in fundraising among the different institutions and sectors and greater efforts to increase awareness among policy-makers, donors and the private sector as to the actual and potential value of PGRFA;
- greater attention needs to be paid in many countries to the development of appropriate, non-conflicting and complementary national policies and legislation relating to the conservation, exchange and use of PGRFA, including such areas as phytosanitary regulations, IP protection, Farmers' Rights and biosafety taking into account the needs and concerns of all stakeholders.

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