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Seed policies and the right to food: Enhancing agrobiodiversity, encouraging innovation

Background document to the report (A/64/170) presented by prof. Olivier De Schutter, Special Rapporteur on the right to food, at the 64th session of the UN General Assembly (October 2009)

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SEED POLICIES AND THE RIGHT TO FOOD:
ENHANCING AGROBIODIVERSITY, ENCOURAGING INNOVATION

SUMMARY

The professionalization of breeding and its separation from farming leads to the emergence of a commercial seeds system, alongside the farmers' seeds systems through which farmers traditionally save, exchange and sell seeds, often informally. This shift has led to grant temporary monopoly privileges to plant breeders and patent-holders through the tools of intellectual property, as a means to encourage research and innovation in plant breeding. In this process however, the poorest farmers may become increasingly dependent on expensive inputs, creating the risk of indebtedness in the face of unstable incomes. Private-led research may seek to satisfy the needs of farmers in industrialized countries, while neglecting those of poor farmers in developing countries. The farmers' seed systems may be put in jeopardy, although most farmers in developing countries still rely on such systems which, for them, are a source of economic independence and resilience in the face of threats such as pests, diseases or climate change. Finally, agrobiodiversity may be threatened by the uniformization encouraged by the spread of commercial varieties.

This report explores how States could implement seed policies that contribute to the full realization of human rights. It identifies how research and development could best serve the poorest farmers in developing countries, and how commercial seed systems could be regulated to serve the right to food and ensure the right of all to enjoy the benefits of scientific progress. Finally it examines how farmers' seed systems could be best supported, in order to serve the interest of all to the enhancement of agrobiodiversity.

I. INTRODUCTION

This report examines the impact of seeds policies and intellectual property rights in agriculture on the realization of the right to adequate food.[1] It seeks to provide guidance to States as to how to implement seeds policies that fully take into account both the need to favor innovation in agriculture and to ensure that the kind of innovation which is promoted contributes to the full realization of the right to food. It is the result of a large number of consultations held with farmers' organizations, the secretariats of the World Intellectual Property Organization, of the Union internationale pour la protection des obtentions végérales (UPOV), of the International Treaty on Plant Genetic Resources for Food and Agriculture (IT-PGRFA) within the United Nations Organisation for Food and Agriculture (FAO), and of Bioversity, the International Plant Genetic Resources Institute (IPGRI), the International Network for Improvement of Banana and Plantain (INIBAP), and various non-governmental organizations.[2]

While seeds policies have an important role to play in the realization of the right to food, they are only part of a much larger challenge governments face in supporting agriculture. At least as important in supporting agricultural production are improving the organization of farmers, the dissemination of knowledge about good soil management practices, crop rotation and combination, or – for instance – the management of water. The fact that this report focuses on seeds policies should therefore not be misinterpreted : in fact, one of its findings is that too much emphasis may have been put in the past on providing inputs to farmers, and that governments have sometimes neglected other forms or support to agriculture, often more appropriate, in particular, to smallscale farmers. In April 2008, the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD) reached the conclusion that '[t]echnologies such as high-yielding crop varieties, agrochemicals and mechanization have primarily benefited the better resourced groups in society and transnational corporations, rather than the most vulnerable ones. To ensure that technology supports development and sustainability goals strong policy and institutional arrangements are needed (…)'.[3] Just like research and development in agriculture in general, seeds policies must be guided, not by a preconceived view about the benefits technology can bring to farming, but by a careful examination of its impacts on food security and, specifically, on the ability of the most vulnerable farmers to improve their livelihoods.

There exists a growing tension between the strengthening of intellectual property rights, on the one hand, and the rights of farmers to save, re-use, and exchange seeds – and thus to contribute to innovation –, on the other hand. The development of a commercial breeding sector separate from farming and, more recently, of a biotechnological sector, has led to increased demands for the protection of rights of breeders and inventors of biotechnologies, demands which now have penetrated at the global level (section II). The shift from agricultural research as a public good providing farmers with seeds incorporating advanced traits to the granting of temporary monopoly privileges to plant breeders and patent-holders through the tools of intellectual property is essentially defended as a means to reward, and thus incentivize, research and

[1] Because it addresses seeds policies, the report is focused on agriculture ; it shall not discuss the impact of IP rights on the raising of livestock or on fishing, although similar issues – concerning the access of herders and fishers to productive resources – may arise in these areas. Nor will the report discuss the specific questions raised by GMOs in agriculture, since research on the impacts on the right to food is still ongoing.

[2] The Special Rapporteur is particularly grateful to Mr Francis Gurry, the Director general of WIPO, Mr Peter Button, technical director of UPOV, Mr Shakeel Bhatti, Secretary of the IT-PGRFA, and Mr Emile Frison, the Director General of Bioversity, as well as their staff, for having made available their time and expertise to facilitate the preparation of this report. He also benefited considerably from contributions of academic experts, including Michel Blakeney, Nicolas Brahy, Dan Burk, Vincent Cassiers, Philippe Cullet, Séverine Dusollier, Graham Dutfield, Richard Gold, Hans Morten Haugen, Eric Holt-Gimenez, Maria José Iglesias, Caroline Ker, Pat Mooney, Jean-Frédéric Morin, Bernard Remiche, Myriam Sanou, Geoff Tansey, Michel Trommetter, Geertrui Van Overwalle, and S.K. Verma. The contributions received from these experts have greatly enriched the information on which this report is based. A set of contributions prepared by these experts for the mandate and coordinated by S. Dusollier is available from the website www.srfood.org ; it will be referred to as the "experts' submission" in the remainder of this report.

[3] IAASTD (2008) Summary for Decision Makers of the Global Report.

innovation in plant breeding. But it may also produce a number of undesirable consequences. It will necessarily lead to transfers of resources from technology users to technology producers, both within States and between States.[4] It may reinforce the domination of a limited number of Northern firms in the global food system, since they will control access to improved varieties of seeds and biotechnological innovations by farmers – a consequence which may be particularly problematic for cash-poor smallholders in developing countries. It may direct research towards the needs of farmers in industrialized countries, while neglecting those of poor farmers in developing countries. Even more troublesome, the development of a commercial seed sector in which seed providers are protected by strong IP rights may put in jeopardy the farmers' seed systems, on which most farmers in developing countries still rely and which, for these farmers, is a source of economic independence and resilience in the face of threats such as pests, diseases or climate change. Finally, it is sometimes seen as threatening the preservation of agrobiodiversity, the subset of biodiversity that results from selection processes performed by farmers over generations, and which depends on the traditional knowledge and the free exchange of genetic materials and seeds.

A human rights framework may assist States in managing these trends, and where necessary, in redirecting them.[5] This framework obliges us to ask not only which policies may maximize yields – agricultural outputs –, but also, and primarily, who will benefit from any increases achieved by whichever policies are put in place. The right to food requires that we place the needs of the most marginalized groups, including in particular smallholders in developing countries, at the centre of our efforts.

Article 11 of the International Covenant on Economic, Social and Cultural Rights imposes on States three levels of obligations in the realization of the right to food. First, States have an obligation to *respect* existing access to adequate food. This requires that States do not take any measures that result in preventing such access (E/C.12/1999/5, para. 19). The introduction of legislation or other measures which create obstacles to the reliance of farmers on informal seed systems may violate this obligation, since it would deprive farmers from a means of achieving their livelihood: Guideline 8.1 of the FAO Voluntary Guidelines on the progressive realization of the right to adequate food in the context of national food security provides that States should 'protect the assets that are important for people's livelihoods'. Second, States have an obligation to *protect* the right to food: this obligation would be violated if a State failed to regulate the activities of patent-holders or of plant breeders, so as to prevent them from violating the right to food of the farmers depending on those inputs in order to be able to continue to farm (E/C.12/1999/5, para. 19). Thus, the Committee has recommended to India to provide 'state subsidies to enable farmers to purchase generic seeds which they are able to re-use, with a view to eliminating their dependency on multinational corporations' (E/C.12/IND/CO/5, para. 69). The FAO Voluntary Guidelines on the right to food also note that 'States should, within the framework of relevant international agreements, including those on intellectual property, promote access by medium- and small-scale farmers to research results enhancing food security' (Guideline 8.5). Finally, States have an obligation to *fulfill* the right to food. This means, *inter alia*, that they must facilitate it by pro-actively strengthening people's access to and utilization of resources and means to ensure their livelihood, including food security (E/C.12/1999/5, para. 15). The FAO Guidelines recommend that 'States should promote agricultural research and development, in particular to promote basic food production with its positive effects on basic incomes and its benefits to small and women farmers, as well as poor consumers' (Guideline 8.4). Which form such research should take, however, remains unspecified.

These obligations apply both to the regulation of commercial seed systems, and to the preservation

[4] Hans Morten Haugen, 'Patent Rights and Human Rights: Exploring their Relationships', *Journal of World Intellectual Property*, vol. 10(2) (2007), pp. 97-124, at p. 113.

[5] See in particular Audrey R. Chapman, 'The Human Rights Implications of Intellectual Property Protection', *Journal of International Economic Law*, 5 (December 2002), pp. 861-882 ; Hans Morten Haugen, 'Patent Rights and Human Rights: Exploring their Relationships', cited above ; Laurence R. Helfer, 'Toward a Human Rights Framework for Intellectual Property', 40 U.C. Davis L. Rev. 971 (2007) ; Laurence R. Helfer, 'Human Rights and Intellectual Property: Conflict or Coexistence?', 22 *Netherlands Human Rights Quarterly* 167 (2004).

and enhancement of informal or traditional farmers' seed systems. To the extent that the separation of seed production and improvement from farming and the emergence of biotechnologies has led to a commercial seed system on which farmers are increasingly dependent, that system has to be regulated in order to ensure that farmers have access to inputs at conditions which are reasonable, thus helping them to achieve an adequate standard of living; and they should ensure that the innovations leading to improved varieties and to new plant-resources benefit all farmers, including the most vulnerable and marginalized among them. This follows both from Article 11(2)(a) of the ICESCR, that imposes on States parties an obligation "to improve methods of production […] of food by making full use of technical and scientific knowledge"; and from the right of everyone to enjoy the benefits of scientific progress and its applications, recognized in Article 15, para. 1 (b) of the ICESCR, which could be relied upon in order to justify recognizing a right of access of farmers to seeds which are not in open access. But States also should ensure that informal, non-commercial seed systems can develop: they should not interfere with such systems without adequate justification; they should protect such systems from interference by third parties; and they should proactively ensure that these systems can expand, despite the pressure imposed by the commercial seed system. Only a balanced approach between these two sets of obligations will ensure that the farmers will be in a position to make a fully free and informed choice between these systems, which are alternative ways for them to pursue their livelihoods.

It would be inappropriate to frame the issue as one of human rights in conflict with one another. Instead, a clear distinction should be made between human rights and the granting of monopoly privileges as IP rights. Not making this distinction would result in confusing the ends with the tools which may serve to achieve them. Article 15, para. 1 (c) of the International Covenant on Economic, Social and Cultural Rights guarantees the right of everyone to benefit from the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he or she is the author. But this human right benefits only natural persons and not legal persons. In addition, the Committee on Economic, Social and Cultural Rights, in its general comment 17, takes the view that the private interests of authors should not be unduly favoured and that the public interest in enjoying broad access to their productions should be given due consideration. The Committee concludes that intellectual property is a social product and has a social function, and notes explicitly that States parties thus have a duty to prevent unreasonably high costs for access to plant seeds or other means of food production (E/C.12/GC/17, para. 35). Clearly, the privatization of genetic resources for agriculture resulting from the extension of intellectual property rights to plant varieties, plants or seeds may put this balance in jeopardy. Instead, framing the granting of monopoly privileges as IP rights as subordinate to the right to food obliges us to take into account the right of farmers to have access to productive resources (including seeds) either by benefiting from innovations leading to the development of improved varieties or by the encouragement and development of the informal seed systems on which they may choose to rely.

In seeking to assist States in taking into account human rights in the implementation of their seeds policies, this report therefore underlines the obligation of States to use to the fullest extent required by human rights the flexibilities included in the international agreements related to intellectual property rights, consistent with the obligation to protect the right of everyone to enjoy the benefits of scientific progress and its applications, and the right to food, including access to productive resources. But it is also mindful of the urgent need to support traditional knowledge, innovations and practices (TKIP).[6] TKIP can be supported through appropriate policies at domestic and international levels. Such policies should not only ensure that TKIP does not get lost, as a result of the de-skilling of traditional farming communities, the replacement of diverse polycultural systems by monocultures, and the top-down imposition of technologies all too often assumed to be superior to local knowledge; it should also favor the diffusion and sharing of TKIP, as a source of adaptation of local communities to new threats such as climate change, soil erosion, or outbreaks of new crop diseases. In addition,

[6] As also noted by Dr. Graham Dutfield in his contribution to the experts' submission.

farmers should be supported in developing innovative agroecological systems, that help conserve agrobiodiversity and can contribute to both productivity and resilience of the agroecosystems.

Section II of this report describes the existing international legal framework, and the different regimes which relate to IP rights and biodiversity protection. Section III describes the challenges faced by States, and identifies which measures States could take in order to ensure that their seed policies contribute to the realization of the right to food. Section IV summarizes the conclusions and recommendations.

II. THE DEVELOPING REGIME OF INTELLECTUAL PROPERTY RIGHTS AND BIODIVERSITY PROTECTION[7]

Domestic legislation and policies in this area are increasingly influenced by the changing framework of international law.[8] We have witnessed in recent years an important strengthening of intellectual property rights at the global level, at the request of developed countries and for the benefit of companies from these countries. At the same time, efforts are made to reaffirm the sovereignty of States over their genetic resources, as a means to reward the contributions States and communities make to preserving biodiversity. Even more recently, the importance to food security of the accessibility of plant genetic resources for food and agriculture has been recognized, and an ambitious multilateral system for access and benefit-sharing has been put in place in order to reconcile the needs of innovation and the protection of crop genetic diversity.

1. The expansion of intellectual property rights

The Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPs) requires World Trade Organization Members to adopt wide-ranging minimum standards of intellectual property protection in a number of areas, including copyright, trademarks, patents and plant variety protection, all of which will have considerable implications across the food system. In particular, TRIPs requires that a minimum patent protection of 20 years be available for all inventions, whether of products or processes, in almost all fields of technology. Protection is optional for plants and animals (other than microorganisms), as well as for essentially biological processes used in the production of plants or animals (other than microbiological processes). However, WTO Members must provide for the protection of plant varieties either by patents, by an effective *sui generis* system or by any combination thereof (article 27, para. 3 (b)).

Patents provide the right-holder with a 20-years monopoly on any use of the patented invention. They may apply to seeds, plant cells of DNA sequence. The importance of patents in plants has grown with the recent rise of agricultural biotechnology, particularly of transgenic crops which have been commercialized since 1996. Farmers cultivating patented seeds do not have any rights over the seeds they plant. They are considered to be licensees of a patented product, and they frequently are requested to sign agreements not to save, re-sow or exchange the seeds which they buy from patent-holders. Patents are the most far-reaching form of protection that can be granted.

Plant varieties may be protected, alternatively, by the recognition of plant breeders' rights. The International Convention for the Protection of New Varieties of Plants, developed under the auspices of the Union Internationale pour la protection des obtentions végétales (UPOV), was initially adopted in 1961. It was revised subsequently in 1972 and, more substantially, in 1978 and 1991. At the time of writing, it had 67 member States, including all large commercial powers with the notable exception of

[7] See, for an excellent overview, Geoff Tansey and Tasmin Rajotte (eds.), *The Future Control of Food: a Guide to International Negotiations and Rules on Intellectual Property, Biodiversity and Food Security* (London, Earthscan, 2008) ; and see also Laurence R. Helfer, 'Regime Shifting: The TRIPs Agreement and New Dynamics of International Intellectual Property Lawmaking', 29 *Yale J. Int'l L.* 1 (2004) ; Laurence R. Helfer, 'Regime Shifting in the International Intellectual Property System, 7 *Perspectives on Politics* 39 (2009).

[8] For a discussion of the freedom that States retain to choose the IP rights regime best suited to their needs, see Laurence R. Helfer, *Intellectual property rights in plant varieties. International legal regimes and policy options for national governments*, FAO Legislative Study No. 85, United Nations Food and Agriculture Organisation, Rome, 2004.

India.[9] It protects the rights of plant breeders provided they develop plant varieties which are new, distinct, uniform and stable (art. 5(1)). These criteria are lower than for the delivery of patents, since it is not required from plant breeders in UPOV-compliant legislations that, in addition, they comply with the criteria of non-obviousness (requiring an inventive step) and of utility (industrial applicability). Because of its requirement of uniformity and stability, however, the UPOV convention does not allow the protection of farmers' varieties, which are inherently unstable and in permanent evolution.

All countries joining the UPOV convention after 1999 are in principle obliged to accede to the 1991 version. Although it does contain a number of flexibilities, this more recent version strengthens the protection of original plant breeders' rights in four ways. First, it extends the duration of the protection from a minimum of 15 years to a minimum of 20 years (from 20 years to 25 years for vines and trees). Second, it increases the number of acts for which prior authorization of the breeder is required. In addition to the production for the purposes of commercial marketing, and the sale and marketing of propagating material of the variety, 'production or reproduction; conditioning for the purpose of propagation; offering for sale; selling or other marketing; exporting; importing; and stocking for the above purposes', are all prohibited without the authorization of the breeder (art. 14(1)). Third, these prohibitions extend beyond the reproductive or vegetative propagating material, to the harvested material obtained through the illegitimate use of propagating material (art. 14(2)) and so-called 'essentially derived' varieties (art. 14(5)). The 1991 version of the UPOV convention thus preserves the breeders' exemption – i.e., the right of breeders to use protected varieties as a source of variation for the creation of new varieties –, but the exemption is narrower, since a plant breeder seeking to commercialize a new variety B must seek the authorization of the breeder of the variety from which B was essentially derived.[10] Fourth, the 1991 version of the UPOV convention restricts the so-called 'farmer's privilege', by removing the possibility for States to allow farmers to exchange or sell seeds saved from the harvest of protected varieties: article 15 of the 1991 UPOV convention only allows restricting breeders' rights 'in order to permit farmers to use for propagating purposes, *on their own holdings*, the product of the harvest which they have obtained by planting (…) the protected variety' (emphasis added).

Clearly, WTO Members who do not wish to grant patents on plant varieties are not obliged to choose, instead, to grant plant variety protection (PVP) under the UPOV convention[11]: Article 27 para. 3(b) of the TRIPS agreement deliberately did not refer to the UPOV convention when it was drafted. WTO Members are therefore allowed to opt for a *sui generis* form of protection, best suited to their specific circumstances. In particular, if they feel that the farmers' privilege is unduly restricted under the 1991 version of the UPOV convention, they may wish not to adhere to UPOV and choose another *sui generis* protection for plant varieties that would for instance allow them to preserve the well-established practices of saving, sharing and replanting seeds, as well as the equally traditional practices of local farming communities to conserve and sustainably use biological diversity, including through the selection and breeding of plant varieties. Indeed, it was one of the recommendations of the Commission on Intellectual Property Rights established at the initiative of the United Kingdom in 2002 that countries should tailor their PVP to their specific needs.[12]

Nevertheless, in practice, most countries have been led to adopt UPOV-compliant domestic

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[9] However, Brazil, Canada, China and South Africa, in contrast the United States and the European Community, are parties to the 1978 version of the UPOV convention, and not to the 1991 version.

[10] Article 14(5) of the UPOV convention defines an 'essentially derived variety' as a plant variety that 1° is predominantly derived from the initial variety, or from a variety that is itself predominantly derived from the initial variety, while retaining the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial variety ; that 2° is clearly distinguishable from the initial variety ; and that 3° except for the differences, which result from the act of derivation, conforms to the initial variety in the expression of the initial variety in the expression of the essential characteristics that result from the genotype or combination of genotypes of the initial variety.

[11] There is no unanimity on this point, however. See World Trade Organization Council for Trade-Related Aspects of Intellectual Property Rights document IP/C/W/370/Rev.1.

[12] Commission on Intellectual Property Rights, *Integrating Intellectual Property Rights and Development Policy*, 2002, chapter 3.

legislation.[13] This may be the result of technical advice provided to developing countries, which often consists in recommending the adoption of UPOV-compliant domestic legislation, without taking into account the specific needs of the countries concerned or, for instance, differentiating between crops.[14] In addition, developing countries sometimes may not have the required expertise to draw up domestic legislation which is truly *sui generis*, and corresponds to their development needs. But another reason for this is that a number of developing countries have been pressured to adopt national legislation that is in compliance with the 1991 version of the UPOV convention, as part of trade agreements they have concluded.[15] Some free trade agreements require the introduction of patent protection for plants, animals and biotechnological innovations.[16] Others refer to the need for both parties to ratify the 1991 UPOV convention, or to adopt legislation complying with that instrument.[17] It should come as no surprise that, in bilateral relationships, developing countries are led to make concessions on issues which, in multilateral settings, they have resisted: since their share of world exports is much smaller than that of commercial partners such as the United States or the EU, the leverage the latter can exercise is far more important, and this cannot be compensated, in bilateral negotiations, with the formation of coalitions among developing countries.

Initiatives have been developing to resist this trend. The Organization of African Unity (now the African Union) has developed an African Model Law for the Protection of the Rights of Local Communities, Farmers and Breeders, and for the Regulation of Access to Biological Resources,[18] which aims to achieve a balance between the protection of breeders and the preservation of local farmers' rights in the interest of the sustainable use of biodiversity. When India enacted the Protection of Plant Varieties and Farmers Rights Act (PPVFRA) in 2001, in order to comply with the minimum standards imposed under the TRIPS agreement,[19] it sought to protect plant varieties, while at the same time enabling farmers to save, resow, exchange and sell new plant varieties developed by farmers and breeders.

2. The protection of biodiversity and the risk of misappropriation of genetic resources

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[13] See Philippe Cullet, "Intellectual property rights and food security in the South", *Journal of World Intellectual Property*, vol. 7, No. 3 (2004), p. 261; and Commission on Intellectual Property Rights, cited above, chap. 3.

[14] See 3dthree, *Seeds of hunger: intellectual property rights on seeds and the human rights response*, Backgrounder No. 2 in the THREAD series, May 2009, p. 7 (noting that the technical advice provided by UPOV, WIPO, and WTO, promote UPOV-compliant model laws, goig beyond the minium obligations imposed by the TRIPS Agreement, and linking this to the sources of funding of WIPO, 90 percent of which comes from the private sector).

[15] See http://www.grain.org/rights_files/TRIPS-plus-March-2008.pdf.

[16] See Agreement on Trade, Development and Cooperation between the European Community and its Member States, of the one part, and the Republic of South Africa, of the other part, concluded on 11 October 1999 (OJ L 311 of 4.12.1999, at p. 3), Art. 46(7) (defining intellectual property rights as comprising 'patents, including biotechnical inventions'). The role of intellectual property rights on plant varieties in the relationships between the European Community and other ACP countries is more ambiguous. Article 46 of the 2000 Cotonou Agreement refers to the need for the parties to cooperate, upon mutually agreed terms, in particular for the strengthening of the protection of intellectual property rights (para. 6). These include 'patents, including patents for bio-technological inventions and plant varieties or other effective *sui generis* systems' (para. 5). Ultimately, the question is the form of the technical advice provided by the EC as regards the drafting of regulations by the ACP States in this area. The issue has arisen also in the negotiation of Economic Partnerhsip Agreements (EPAs). In its resolution of 20 June 2007 on the Millennium Development Goals – the midway point (2007/2103(INI), P6_TA(2007)0274), the European Parliament has requested that issues related to intellectual property rights be removed from the negotiations of the EPAs, which are currently in the course of being finalized (para. 94).

[17] See, for example, Article 17.1, para. 3, of the United States - Chile Free Trade Agreement (FTA) (2003); Article 15.1, para. 2, of the United States-Morocco Free Trade Agreement (signed on 15 June 2004); Article 15.1, para. 5, of the Central America-Dominican Republic-United States Free Trade Agreement (signed on 5 August 2004) (requiring that all States ratify the 1991 UPOV convention by 1 January 2006, although Costa Rica (1 June 2007) and Nicaragua (1 January 2010) benefit from further deadlines); Article 16.1, para. 3, of the United States – Peru Trade Promotion Agreement (signed on 12 April 2006). An earlier example is Article 4, para. 1, of the Agreement between the United States and the Hashemite Kingdom of Jordan on the Establishment of a Free Trade Area (signed on 24 October 2000) (in addition, Article 4 para. 17 of this agreement suggests that patents may have to be available for all technologies, including presumably biotechnologies or plant varieties ('patents shall be available for any invention, whether product or process, in all fields of technology, provided that it is new, involves an inventive step and is capable of industrial application')).

[18] http://www.africa-union.org/root/au/AUC/Departments/HRST/biosafety/AU_Biosafety_I.htm.

[19] NO. DL-33004/2001, Gazette of India, 30 October 2001.

One of the concerns raised by the extension of the TRIPS minimum standards to life forms is that the patentability of plants or animals could encourage the appropriation of genetic resources without the consent of, or without adequate sharing of the benefits with, the farmers and communities who have developed those resources in the first place. International law should in principle prevent that risk from materializing. The Convention on Biological Diversity (CBD) has been concluded with the aim of ensuring 'the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources' (art. 1). The CBD was initially signed by 150 governments at the 1992 Rio Earth Summit. It has now achieved almost universal ratification with 191 States parties with the notable exceptions of Somalia and the United States of America. The CBD requires each Party to adopt a number of measures to maintain biological diversity, including *in situ* and *ex situ* conservation measures (art. 6, 7 and 8). Article 15 of the CBD, which is on access to genetic resources, implements the principle according to which each State has the sovereign right to exploit its own resources pursuant to its own environmental policies (see also art. 3). It provides therefore that 'the authority to determine access to genetic resources rests with the national governments and is subject to national legislation' (art. 15(1)), although the Parties at the same time 'endeavour to create conditions to facilitate access to genetic resources for environmentally sound uses by other Contracting Parties and not to impose restrictions that run counter to the objectives of this Convention' (art. 15(2)). Access to genetic resources, when it is granted, shall be on mutually agreed terms (art. 15(4)) ; it shall be subject to prior informed consent of the Party providing genetic resources (art. 15(5)) ; and it shall be on the basis of benefit sharing (art. 15(7)).

There is no agreement on whether the requirements of the CBD could be adequately complied with, and its objectives fulfilled, by contractual agreements between the providers of genetic resources and traditional knowledge and users.[20] Article 15(4) and (7) of the CBD itself refers to access to genetic resources being provided 'on mutually agreed terms', which suggests that such a solution might be in conformity with its underlying spirit. Such contractual agreements present the advantage of being flexible and, in principle, most responsive to the interests of both parties. Of course, contractual agreements also may lead to unfair outcomes, if the bargaining position of one Party is significantly stronger than that of the other Party, particularly where genetic resources could be obtained from a number of sources, allowing one Party to seek the resources from the territory that provides the most favourable terms. But this risk is present in any case, even under a system requiring that those seeking to be granted a patent have to provide evidence that they have acquired the resource in conformity with the national rules of the country of origin of the genetic resource and/or the associated traditional knowledge used. Such national rules, for instance, may be insufficiently robust to protect indigenous or local communities, whose representatives have no access to expert legal advice or severely underestimate the economic benefits which could be gained from their resources. In addition, it is unclear how reliance on contractual agreements would protect the countries or communities concerned from misappropriation of generic resources and/or associated traditional knowledge where the bio-prospectors have deliberately sought to circumvent their consent : it may be too bold a presupposition to believe that these countries or communities will be informed of the violation of their rights, and once informed, will be able to take effective action.[21] In that sense, reliance on contractual mechanisms may be just as ineffective as *post hoc* remedies (opposition to, or re-examination of, grants of patents which have been granted in violation of the principles of the CBD).

[20] The 2006 United States – Peru Trade Promotion Agreement referred to above contains an 'Understanding regarding biodiversity and traditional knowledge', in which the Parties 'recognize that access to genetic resources or traditional knowledge, as well as the equitable sharing of benefits that may result from use of those resources or that knowledge, can be adequately addressed through contracts that reflect mutually agreed terms between users and providers'.

[21] Although there are interesting attempts in this regard. For instance, Peru's Law No. 28216 (Law on Protection of Access to Peruvian Biological Diversity and to the Collective Knowledge of the Indigenous Peoples, 1 May 2004) establishes a National Commission for the Protection of Access to Peruvian Biological Diversity and Collective Knowledge (Commission for Prevention of Acts of Bio-piracy), tasked with surveying patent applications made or patents granted abroad that relate to Peruvian biological resources or collective knowledge of the indigenous peoples of Peru.

Box 1. The relationship between the TRIPs Agreement and the CBD

The relationship between the TRIPS agreement and the CBD is listed among the issues which should be addressed in the current Doha round of trade negotiations, fully taking into account the development dimension.[22] It follows from the principle of consistency in the interpretation of international agreements[23] that Article 27 para. 3(b) of the TRIPS agreement should be read in order to ensure compliance with the obligations imposed under the CBD. This requirement follows also from Article 16.5 of the CBD itself, under which '[t]he Contracting Parties, recognizing that patents and other intellectual property rights may have an influence on the implementation of this Convention', undertake to 'cooperate in this regard subject to national legislation and international law in order to ensure that such rights are supportive of and do not run counter to its objectives'. The requirement to ensure that the TRIPS agreement is not implemented in a way which would run counter to the CBD is also imposed on States not parties to the CBD, since this latter convention expresses principles, derived from the right to self-determination of peoples, which are principles of general international law. In addition, since the right to self-determination of peoples has acquired the status of a peremptory norm of international law,[24] it follows that any conflict between the requirements imposed under the TRIPS agreement and those following from the CBD should be resolved in favor of the latter, which seeks to implement, in a specific domain, the general principle that 'All peoples may, for their own ends, freely dispose of their natural wealth and resources (…)' and that 'In no case may a people be deprived of its own means of subsistence'.[25] Similarly, States should not be coerced into adopting domestic legislation protecting intellectual property rights which would run counter to their obligations under the CBD, for instance by the insertion into free trade agreements of provisions relating to intellectual property rights formulated in such a way as to allow the misappropriation of genetic resources ('biopiracy').[26]

It is generally agreed that, in order to ensure that the IP regime they adopt will not be in violation of the CBD, States should at a minimum abstain from granting patents relating to biological materials which have been obtained in violation of the requirements of prior informed consent and fair and equitable benefit sharing under the national system of the country of origin of the genetic resources. While the risk is particularly acute where patent laws impose particularly loose criteria for patentability and, specifically, where patents are granted for genetic materials in their natural state, the risk is not limited to those extreme situations: the granting of a patent even in conditions where there has been a truly inventive step would be in violation of the CBD if the genetic resources used by the 'inventor' have been misappropriated in the first place.

Where opinions do differ is how this requirement may be operationalized in practice. Essentially three positions have been defended. Some governments have taken the position that post-grant opposition or re-examination proceedings where patents have been granted without due regard for the national laws of the country of origin of the domestic resources, should be sufficient. It is true that, in certain cases, including after patents relevant to turmeric and neem were granted by the United States and European patent offices, such opposition procedures have been successful. However, it may not be practical for the countries or communities concerned to file such claims in all jurisdictions in which patents were successfully sought. In addition, many patents may be granted without this being known to the country

[22] See para. 19 of the Doha Ministerial Declaration. See, for a review of the positions adopted by WTO Members within the TRIPS Council, WTO doc. IP/C/W/368/Rev.1 (8 February 2006), prepared by the WTO Secretariat.

[23] Article 31, para. 3 (c) of the Vienna Convention on the Law of Treaties stipulates that the interpretation of treaties must take into account 'any relevant rules of international law applicable in the relations between the parties'.

[24] *Official Records of the General Assembly, Fifty-sixth Session, Supplement 10* (A/56/10), commentary to article 40 of the draft articles on State Responsibility, paras. (4)-(6); International Court of Justice, Case Concerning *East Timor (Portugal v. Australia)*, Judgment, 1995 I.C.J. Reports 90, p. 102 (para. 29); *Legal Consequences cf the Construction of a Wall in the Occupied Palestinian Territory*, Advisory Opinion of 8 July 2004, I.C.J. Reports 2004, p. 136, at 172 (para. 88).

[25] Article 1, para. 2 of the International Covenant on Economic, Social and Cultural Rights, and of the International Covenant on Civil and Political Rights.

[26] A State is internationally responsible if, with the knowledge of these circumstances, it coerces another State into committing an act which, but for the coercion, would constitute an internationally wrongful act of the coerced State. See Article 18 of the International Law Commission's Articles on State responsibility for internationally wrongful acts.

of origin of the genetic resources concerned. It is evident that preventive mechanisms are more effective than *post hoc* remedies, which depend on the ability and diligence of those whose rights have been violated to defend them.

It has been suggested that, alternatively, countries could establish and maintain a database, accessible to patent offices throughout the world, in order to ensure that by granting patents, they will not be facilitating misappropriation of genetic resources or of traditional knowledge. There are examples of such databases being successfully established. These include the potato catalog from Huancavelica and the Indigenous Biocultural Heritage Register in Peru or, for example, the community registry at Bohol, the Philippines.[27] It is however illusory to think that all such resources or knowledge could be included in databases held at national level: the costs of maintaining such a database and of organizing such a system of information would be so high as to be in practice unaffordable for precisely those developing States who detain most of the genetic resources.

Finally, it has been proposed by a number of WTO members that national patent laws, or possibly an international instrument, should impose a requirement to disclose the geographical origin of the genetic resources on which an invention is based, and to provide evidence of compliance with the rules of the country of origin.

It would go beyond the scope of this report to address this issue in detail. It deserves notice, however, that neither Article 27 of the TRIPS agreement, nor the Regulations under the Patent Co-operation Treaty (PCT) of WIPO, nor the Patent Law Treaty (PLT) of WIPO, should be interpreted as requiring the patentability of a claimed 'invention' where, although it is directly based on a specific genetic resource and/or traditional knowledge to which the inventor had access, the inventor does not provide information about the source and how the access and benefit-sharing requirements imposed in the source country have been fulfilled. Under Article 27(2) of the TRIPS agreement, WTO Members 'may exclude from patentability inventions, the prevention within their territory of the commercial exploitation of which is necessary to protect *ordre public* or morality, including to protect human, animal or plant life or health or to avoid serious prejudice to the environment (…)'. The filing by an 'inventor' for a patent where the access and benefit-sharing requirements of the source have not been complied with should be treated as contrary to the *ordre public* and morality, and this should result in denying the application under the applicable domestic patent laws. While Article 27(1) of the TRIPS agreement provides that 'patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application', that should not be seen as an obstacle to imposing requirements specific to applications for patents in the fields of biotechnology or plants, since the specificity of innovations on existing life forms is at the heart of what justified the adoption of the CBD in the first place. Nor are States prohibited from imposing certain requirements on those applying for patents : article 62.1 of the TRIPS agreement explicitly recognizes that Members may impose 'compliance with reasonable procedures and formalities'.

The TRIPs Agreement is therefore sufficiently flexible to accommodate the concerns which led to the conclusion of the CBD, and the principle of consistency in treaty interpretation referred to above should guide the implementation of the TRIPs Agreement in this respect. The CBD itself is premised on the idea that the objective of maintaining biodiversity can be achieved by guaranteeing the sovereign rights of States over their own biological resources and by adequate benefit-sharing. But the whole regime of the CBD is built on the idea of international cooperation, and specifically, cooperation between the States where the genetic resources are located and the States where biotechnologies are developed (see also article 19). Consistent with the duty of international

[27] See Alejandro Argumedo and Michel Pimbert, *Protecting Indigenous Knowledge against Biopiracy in the Andes*, IIED, 2006 ; Regine Andersen and Tone Winge, *The Farmers' Rights Project – Background Study 7: Success Stories from the Realization of Farmers' Rights Related to Plant Genetic Resources for Food and Agriculture*, FNI Report 4/2008 (Lysaker, Norway: The Fridtjof Nansen Institute, 2008), pp. 23-25 (for the example from Peru); Information Paper on Farmers' Rights submitted by the Fridtjof Nansen Institute to the Secretariat of the Plant Treaty, 20 May 2009, para. 2.1. (available on www.farmersrights.org).

cooperation embodied in the CBD, all States should include in their domestic legislation provisions requiring that those applying for patents on biological materials disclose where the materials originate from and, when the claimed 'invention' is directly based on a specific genetic resource and/or traditional knowledge to which the inventor had access, that they provide information about the source and how the access and benefit-sharing requirements imposed in the source country have been fulfilled. This requirement would be further strengthened by amending the TRIPS Agreement in order to include such an obligation, in order to make it more explicit. This would increase confidence among bio-prospectors and biodiversity-rich countries and indigenous communities. It would also be in conformity with the well established principle of international law that no State should allow actors under its jurisdiction to cause damage to the environment in other States,[28] as would be the case if a State granted a patent without requesting information about where the genetic resource on which the invention is based originated from, and whether the domestic legislation applicable in the country of origin was complied with.

It is encouraging in this respect to note that a number of national legislations already require from those seeking to be granted a patent that they disclose the geographical origin or the source of the genetic resources used in the variety or the breeding thereof, although the consequences of non-compliance are not uniform. A disclosure requirement is included, for instance, in Peru's Law No 27811 (Law Establishing the Regime for Protection of the Collective Knowledge of Indigenous Peoples Relating to Biological Resources, 10 August 2002), in Belgian Patent Law of 28th March 1984 (article 15, §1er, 6) as modified by the Law of 28th April 2005), or in s 8b the 1967 Norwegian Patent Act (*Lov om patenter*), following its revisions by Acts No. 20 of 7 May 2004 and No.80 of 29 June 2007.[29] The 27th preambular paragraph of Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998 on the legal protection of biotechnological inventions[30] states that 'if an invention is based on biological material of plant or animal origin or if it uses such material, the patent application should, where appropriate, include information on the geographical origin of such material, if known', although this is 'without prejudice to the processing of patent applications or the validity of rights arising from granted patents'.

While the inclusion of disclosure requirements in national patent legislations are to be encouraged and are in conformity with the obligations of international cooperation included in the CBD (see Box 1), they will not be sufficient to overcome the problem which may result from the disparity of national laws relating to access to genetic resources from the countries of origin of these resources. The only

[28] See the dissenting opinion of Judge Weeramantry to the Advisory Opinion of the International Court of Justice on the *Legality of threat or use of nuclear weapons*, where he noted : 'It is well entrenched in international law and goes as far back as the Trail Smelter case *(Reports of International Arbitral Awards,* 1938, Vol. III, p. 1905) and perhaps beyond (see also *Corfu Channel, Merits, Judgment, I. C. J. Reports 1949,* p. 4). This basic principle, that no nation is entitled by its own activities to cause damage to the environment of any other nation, appears as Principle 2 of the Rio Declaration on the Environment, 1992: 'States have, in accordance with the Charter of the United Nations and the principles of international law, the sovereign right to exploit their own resources pursuant to their own environmental and developmental policies, and the responsibility to ensure that activities within their jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of national jurisdiction." *(Report of the United Nations Conference on Environment and Development* (AICONF. 151/26/Rev. l), Vol. 1, Ann. 1, p. 3.). Other international instruments that embody this principle are the Stockholm Declaration on the Human Environment (1972, Principle 21) and the 1986 Noumea Convention, Article 4 (6) of which States: 'Nothing in this Convention shall affect the sovereign right of States to exploit, develop and manage their own natural resources pursuant to their own policies, taking into account their duty to protect and preserve the environment. Each Party shall ensure that activities within its jurisdiction or control do not cause damage to the environment of other States or of areas beyond the limits of its national jurisdiction.' (Hohmann, *Basic Documents of International Environmental Law,* 1992, Vol. 2, p. 1063.)

[29] Section 8 b of the *Lov om patenter* provides that if an invention concerns or uses biological material, the patent application shall include information on the country from which the inventor collected or received the material ; if the national law in the providing country provides that access to biological material shall be subject to prior consent, the application shall state whether such consent has been obtained.Where the providing country is not the same as the country of origin of the biological material, the application shall also state the country of origin, and the same principle applies where the law of that country requires prior consent. The disclosure obligation applies even where the inventor has altered the structure of the received material. Breach of the duty to disclose information is subject to penalty in accordance with the General Civil Penal Code § 166.

[30] OJ L 213 , 30.7.1998, p. 13.

way to ensure that fair outcomes are reached, and to avoid that countries or communities be forced to agree to cede their genetic resources on unfavorable terms, would be to strengthen national legislations defining the conditions according to which access to genetic resources and/or traditional knowledge and benefit-sharing can be achieved, and to do so through an international instrument, in order to avoid that States holding such resources are put in competition against each other. But the implementation problems facing the CBD run deeper than this. The next section describes what may be a more promising route for the promotion of biodiversity.

3. Crop genetic diversity as a global public good

The CBD has failed to generate sufficient benefits to fund the conservation of biodiversity. Despite the affirmation, in the CBD, that States parties must provide 'facilitated access' to the genetic resources on which they have 'sovereign rights', it sometimes has created insuperable obstacles to the access of both researchers and the bio-industry to genetic resources. Finally, the access and benefit sharing regime introduced by the CBD, while perhaps suited to avoid the misappropriation of genetic resources for medicines, is not adequate for domesticated plant genetic resources. Numerous farmers and farming communities have been involved in creating and maintaining genetic resources. Crop traits are genetically complex, owing their characteristics to a large number of genetic resources, conserved both within and outside their places of origin.[31] Because of these characteristics, it has been concluded that domesticated plant genetic resources should be treated as a common pool, rather than as 'property' of any particular State or local community. A specific system of management of genetic resources has therefore been set up, which seeks to offer an answer to the implementation problems faced by the CBD.

The International Treaty on Plant Genetic Resources for Food and Agriculture (IT-PGRFA) was adopted by the FAO Conference at its thirty-first session in November 2001 (Res. 3/2001) and has been in force since 29 June 2004. It seeks to establish a multilateral system to facilitate access to plant genetic resources for food and agriculture and to share the benefits in a fair and equitable way. The IT-PGRFA currently has 120 States parties, but in addition, the eleven International Agricultural Centres of the Consultative Group on International Agricultural Research (CGIAR) holding *ex situ* collections of PGRFA, as well as the Centro Agronómico Tropical de Investigación y Enseñanza (CATIE) and two of the four organizations hosting collections as part of the International Coconut Genetic Resources Network have placed the collections they host under the framework of the Treaty,[32] to be accessed according to the same rules.

The IT-PGRFA is premised on the idea that there exists a strong interdependence between regions as regards PGRFA: each region depends, to a large extent (often for more than 50 percent), on PGRFA from other regions. The Treaty therefore seeks to establish a novel system of governance for global commons, aimed at ensuring food security, which depends on permanent access to a large pool of genetic resources for the development of new and improved plant resources. Although the Treaty applies to all PGRFA, its most original component – the Multilateral System of Access and Benefit Sharing (MLS) – only applies to the plant genetic resources for food and agriculture listed in annex I to the Treaty that are under the management and control of the States parties and in the public domain (article 11.2), although States are to take appropriate measures to encourage natural and legal persons within their jurisdiction who hold plant genetic resources for food and agriculture listed in annex I to include such resources for food and agriculture in the MLS (article 11.3). This global pool comprises 64 food crops that make up more than one million samples of known plant genetic resources. The MLS which applies to these resources is based on the idea that, while States have sovereign rights over their own PGRFA, they agree to facilitate access to PGRFA for the purpose of 'utilization and

[31] See Stephen B. Brush, 'Protecting Traditional Agricultural Knowledge', *Washington University Journal of Law and Policy*, vol. 17 (2005), p. 59-109, at 80; Stephen B. Brush, *Farmers' Rights and Protection of Traditional Agricultural Knowledge*, CGIAR System wide Program on Collective Action and Property Rights Working Paper No. 36 (Washington, DC: International Food Policy Research Institute, 2005), p. 21.
[32] In accordance to what is provided in article 15.

conservation for research, breeding and training for food and agriculture' (article 12.3(a)),[33] and to share, in a fair and equitable way, the benefits arising from the utilization of these resources. Facilitated access is to be accorded through the Standard Material Transfer Agreement (SMTA) adopted by the Governing Body of the Treaty. Using the SMTA, recipients may use the materials for food and agriculture for free, or for the minimal costs involved (article 15). If, incorporating such materials, they then commercialize a final product that is itself a PGRFA and restrict others from using it for research and breeding,[34] they must pay an 'equitable share of the benefits arising from the commercialization of that product, except whenever such a product is available without restriction to others for further research and breeding, in which case the recipient who commercializes shall be encouraged to make such payment' (article 13.2(d)). This 'equitable share' has been set by the Governing Body at 1.1 percent of the sales of the product (minus 30 percent), or at 0.5 percent of the sales over a 10-year period of commercialization of the same crop. These royalties are to be paid into a common fund created under the Treaty. Article 13.3 of the IT-PGRFA provides that these benefits arising from the MLS 'should flow primarily, directly and indirectly, to farmers in all countries, especially in developing countries, and countries with economies in transition, who conserve and sustainably utilize plant genetic resources for food and agriculture'. Although these royalties shall only be paid to the fund in the next few years, it was announced at the third session of the Governing Body convened in Tunis on 1-5 June 2009 that projects in eleven developing countries[35] that conserve food seeds and other genetic material from major crops will receive USD 50,000 each to support their efforts. This remains a very small sum in comparison to the needs.

III. REDIRECTING INNOVATION TOWARDS THE REALIZATION OF THE RIGHT TO FOOD

The renewed interest in agriculture since the global food crisis of 2007-2008 confronts governments and the international community with important choices concerning the direction of future agricultural development. At least 1.5 billion individuals depend on smallscale farming for their livelihoods.[36] Developing agriculture by ensuring that farmers, particularly smallscale farmers, have access to improved varieties of seeds, has been a central component of a model of agricultural development sometimes called the 'Green Revolution' model, although this label now is often attached a broader and vaguer meaning. Support to these farmers often takes the form of the provision of inputs, particularly seeds and fertilizers but including also pesticides, since one of the reasons why smallscale farmers are poor and cannot move beyond subsistence farming is because of the high prices of inputs and the lack of access to credit. But this form of support can create its own problems.[37] First, although commercial seed varieties may improve yields in the short term, their higher performance often has been a response to inputs (fertilizers) and to water availability, making it difficult for farmers unable to access to

[33] The MLS does not apply when genetic resources are sought for other uses, such as 'chemical, pharmaceutical and/or other non-food/fedd industrial uses' (article 12.3(a)).

[34] Article 12.3(d) provides that 'Recipients shall not claim any intellectual property or other rights that limit the facilitated access to the plant genetic resources for food and agriculture, or their genetic parts or components, in the form received from the Multilateral System'. Despite its emphasis on free flows of germplasm ('open access'), the Treaty therefore seems to allow intellectual property rights on anything that is not 'in the form received' (article 12.3(d)). Upon ratifying the IT-PGRFA, the European Community and its Member States have made declarations according to which they interpret Article 12.3(d) of the Treaty as recognising that 'plant genetic resources for food and agriculture or their genetic parts or components which have undergone innovation may be the subject of intellectual property rights provided that the criteria relating to such rights are met'. Not all States share this interpretation, however. The Governing Body of the IT is still to adopt a position on this issue, and may do so when, in the next few years, the issue will arise.

[35] The projects which the fund supports are in Egypt, Kenya, Costa Rica, India, Peru, Senegal, Uruguay, Nicaragua, Cuba, Tanzania and Morocco. Funded projects include, for instance, on-farm protection of citrus agro-biodiversity in Egypt, the genetic enhancement and revitalization of finger millet in Kenya and the conservation of indigenous potato varieties in Peru. Norway, Italy, Spain and Switzerland have contributed the funds for the benefit-sharing scheme, Norway introducing a small tax on the sale of seeds on its domestic market to fund its donation. Indeed, since it can take 5-10 years to develop for commercialization a product once genetic materials are initially accessed, such voluntary funding appeared necessary to fill the time gap between the entry into force of the IT-PGRFA and the flow of funds in accordance with the provisions on benefit-sharing.

[36] World Bank, *World Development Report 2008 – Agriculture for Development*, Washington, D.C., 2007, p. 3.

[37] See for instance *Seeds of hunger: intellectual property rights on seeds and the human rights response*, 3dthree, May 2009.

such inputs and conditions to reap their benefits. Those who acquire inputs with their own means, often encouraged to do so during an initial period of subsidized inputs, may find themselves trapped in the vicious circle of debt as a result of a bad harvest and consequent impossibility to reimburse input loans. This may occur particularly when they have switched to mono-cropping leading to revenues which may be higher certain seasons but less stable across the years, and diminish resilience in the face of climate change.[38] Second, commercial seed varieties may be less suited to the specific agro-ecological environments in which farmers work, and for which landraces (traditional farmers' varieties) may be more appropriate. Finally, the expansion of surfaces cultivated with commercial seeds accelerates crop diversity erosion, as an increasing number of farmers grow the same crops, using the same, 'improved' varieties on their fields.[39]

States therefore face two separate challenges. They must ensure that the commercial seed systems not only raise aggregate yields, but also that they work for the benefit of the farmers who need most to have their incomes raised – smallholders in developing countries –. But they must also support farmers' seed systems, on which not only these farmers depend, but the enhancement of which is vital, in addition, for our long-term food security. We must not only make certain narrowly-focussed innovations more accessible to marginalized farmers : we must also ensure that they may prosper and be innovative themselves. This goes beyond reorienting science and technological innovation towards the needs of smallscale farmers by appropriate incentives and innovation models: it includes supporting appropriate local systems and institutional innovations that improve the maintenance, diffusion and improvement of the local seed varieties that are adequate to the complex agro-ecological environments in which a large proportion of the marginalized farmers live. We must ensure that farmer seed systems are made more innovative as well as more resilient in the face of the expansion of commercial varieties.

Succeeding at these two challenges with concrete results in rural areas would mean a better balance between the two systems so that farmer would have a real choice to purchase PVP-protected seeds or to use seeds from alternative seed systems. Both these objectives may and should be pursued together. Prioritizing one of these routes at the expense of the other would curtail the choice of farmers, whether to have access to improved varieties or to rely on farmers' seed systems. Sacrificing one of these objectives would lead either to the marginalization of farmers' seed systems and the disappearance of landraces which they cultivated locally – which would lead to a dramatic loss of agrobiodiversity and to increased uniformity of crops, as well as to increased dependency of farmers –, or to allow for a situation in which innovation will only benefit certain categories or resource-rich farmers, who are often also those who have disproportionate access to global food chains, to political influence, and to other productive resources such as land and water – while the poorer farmers, often relegated to subsistence farming, will preserve crop genetic diversity, but risk at the same time further marginalization in an increasingly dualized farming system.

1. Intellectual property rights in the commercial seeds systems and the right to food

There are clear benefits to the development of new varieties of plants. Varieties that offer high yields when the adequate conditions are present and when combined with appropriate inputs

[38] There exists a correlation between the switch to specialized and uniform varities on one hand and increased variability in productivity on the other hand : see D. Duvick, 'Variability in U.S. Maize Yields', in J. Anderson and P. Hazell (eds), *Variability in Grain Yields*, Washington D.C., World Bank, 1989; or P. Hazell, 'Sources of Increased Variability in Indian and U.S. Cereal Production', *American Journal of Agricultural Economics*, vol. 66 (1984), pp. 302-11; P. Hazell, 'Sources of Increased Variability in World Cereal Production Since the 1960s', *American Journal of Agricultural Economics*, vol. 36(2) (1985), pp. 145-159 (finding that the increase in aggregate production variability is predominantly due to increased yield variability and to a simultaneous loss in offsetting patterns of variation in yields between crops and regions, changes associated with the more widespread adoption of improved seed/fertiliser intensive technologies).

[39] The FAO Report on the State of the World's Plant Genetic Resources, based on more than 150 country reports, prepared for the International Technical Conference on Plant Genetic Resources held in Leipzig, Germany, 17-23 June 1996, concluded that 'the spread of modern, commercial agriculture and the introduction of new varieties of crops has been the main cause of the loss of genetic diversity'.

can limit the expansion of cultivated land and thus save virgin soils, which are a reservoir of biodiversity; certain varieties can have improved nutritional values, or specific disease resistance; and certain crops can be developed which are suitable for saline, dry or other marginalized soils.

The granting of IP rights in the form of patents or plant breeders' rights (PBRs) – through the revision of the UPOV convention in 1991, the implementation of the TRIPs Agreement, and the adoption of TRIPs-plus provision in bilateral or multilateral free trade agreements – is primarily justified by the need to encourage such innovations, by allowing the patent-holder or the breeder to be rewarded for the investment made in the development of a new variety, following a model of commercial plant breeding typical of industrialized countries. Yet, this development raises four sets of concerns.

a) Access to productive resources for smallholders

A first concern relates to its impact on the price of seeds in an increasingly concentrated market for input-providers. IP rights are, in effect, a set of rules that allow firms holding patents or plant breeders' rights to set prices at levels far exceeding actual costs and to segment markets by prohibiting lower priced products from moving from one area into others.[40] Particularly where patents are granted, such a monopoly privilege may create an obstacle to the access of farmers to productive resources, as the seeds which are protected may be unaffordable to them: more scarcity then appears to be the price of innovation – certainly a paradoxical, albeit entirely predictable, result of IP rights. The strengthened protection of intellectual property rights on plant varieties and seeds at the global level may accelerate the "verticalization" of the food production chain, particularly when patents are granted, as agricultural producers would become dependent on the prices set by companies for the seeds on which they have patents and would be denied the traditional right to sell and exchange seeds among themselves, as well as to save part of their crops in order to retain seeds for the next planting season.

The oligopolistic structure of the input providers' market may result in poor farmers being deprived from access to seeds a productive resources essential for their livelihoods, and it could raise the price of food, thus making food less affordable for the poorest. The UNCTAD secretariat has noted a significant increase in such concentration, which extends beyond seeds to all agricultural inputs: as a result of mergers and acquisitions, agrochemical companies have entered into the biotechnology and seeds business, leading to "unprecedented convergence between the key segments of the agriculture market (agrochemicals, seeds and agricultural biotechnology)", a process further reinforced by contractual agreements between companies in these sectors.[41] Thus, according to the ETC Group, the top 10 seed companies account for 14,785 million USD, representing 67 percent of the global proprietary seed market; the world's largest seed company alone, Monsanto, accounts for 23 percent of that market; and the top three companies (Monsanto, DuPont and Syngenta) account for 47 percent of the market, including 65 percent of the maize seed market and over half of the proprietary soybean seed market.[42] This concentration is itself the result of progress in biotechnology and of the patenting of genes or DNA sequences, obliging seed companies to resort to mergers and

[40] Geoff Tansey, *Supplementary written evidence to the All-Party Parliamentary Group Inquiry into 'World Food Security and the UK'*, June 2009, para. 13.

[41] *Tracking the trend towards market concentration: The case of the agricultural input industry*, UNCTAD secretariat, United Nations Conference on Trade and Development, April 2006. The tendency has continued after the date of publication of the UNCTAD report. For instance, in March 2007, Monsanto and BASF announced a 1.5 billion USD collaboration in research and development; in September 2007, Monsanto and Dow Chemicals announced they would cooperate in the development of a genetically engineered variety of maize endowed with eight genetic traits; in May 2008, Monsanto and Syngenta concluded cross-licensing agreements on maize and soybean. Such agreements also may lead to vertical concentration : in June 2009, Monsanto and Dole Fresh Vegetables, Inc., announced a five-year collaboration to develop new varieties of broccoli, cauliflower, lettuce and spinach, which Dole would commercialize on Northern American markets.

[42] ETC Group, *Who Owns Nature? Corporate Power and the Final Frontier in the Commodification of Life*, November 2008, p. 13, p. 12.

acquisitions in order to overcome the 'patent thickets' in order to further innovation. It is this concentration, rather than IP rights on their own, that threatens to make seeds unaffordable for many poor farmers.[43]

In addition, IP rights are not the only means seed companies have at their disposal to reap rewards for their investments. Even in the absence of strong IP rights protections in certain jurisdictions or in addition to such protections, companies selling seeds may resort to contractual clauses (technology use agreements) or genetic use restriction technologies (GURTs) in genetically-modified seeds, in order to protect their privilege. GURTs consist in introducing into the plant variety genetic elements that produce a toxin late in seed development, thus making the re-use of seeds technically impossible and obliging the farmer to buy seeds from the seed provider on a yearly basis, or to acquire specific chemicals which can activate germination. The reliance on GURTs has been provisionally halted due to adverse publicity, As noted by Dan L. Burk in his contribution to the experts' submission, the impact of their introduction would be worrisome : 'The development of technological use controls (…) may substitute private technological rules for the public statutory rules declared by the legislature. Where control over the design of information rights is shifted into the hands of private parties, those parties may or may not honor the public policies that animate public access doctrines such as the "farmer's exemption." Rights-holders can effectively write their own intellectual property statute in (…) DNA. Producers who employ lock-out technology may in essence become private legislatures, imposing rules of usage without regard to the broader public interest that informs democratic rule-making'.

b) The research exemption

Excessive protection of breeders' rights and patents may discourage innovation in the name of rewarding it. Applied research and crop improvement is a cumulative process, based on pre-existing plant material. Each incremental improvement that involves a new technology therefore faces the constraints of IP and germplasm which accumulate in the plant material. In jurisdictions where patents can be granted on life forms,[44] there is a risk that further research will be impeded, rather than

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[43] A study commissioned by the World Bank on Argentina, Mexico and Brazil concludes that prices of seeds increased slightly as a result of the introduction of IP rights, although the authors conclude that 'there appears to be little evidence of excessively high prices with agricultural inputs' (M. Lesser, G. Hortskotte-Wesseler, U. Lele and B. Byerlee, 'Intellectual Property Rights, Agriculture and the World Bank', in U. Lele et al. (eds), *Intellectual Property Rights in Agriculture: The World Bank's Role in Assisting Borrower and Member Countries*, The World Bank, Washington, D.C., pp. 1-21, at 9. See also N. Louwaars, R. Tripp, D. Eaton, V. Henson-Apollonio, T. Hu, M. Mendoza, F. Muhhuku, S. Pal and J. Wekunday, *Impacts of Strengthened Intellectual Property Rights Regimes on the Plant Breeding Industry in Developing Countries*, The Centre for Genetic Resources, Wageningen, 2005.

[44] In the case of *Diamond v. Chakrabarty*, 447 U.S. 303 (1980), following a patent application for genetically engineering a bacterium capable of breaking down crude oil, the U.S. Supreme Court decided that the creation of a live, human-made organism is patentable under Title 35 U.S.C. § 101. According to the terms of sec 101 : 'Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title'. The Court considered that while natural laws, physical phenomena, abstract ideas, or newly discovered minerals are not patentable under this section, a live artificially-engineered microorganism may be patented since 'the patentee has produced a new bacterium with markedly different characteristics from any found in nature and one having the potential for significant utility. His discovery is not nature's handiwork, but his own […]'. The U.S. Supreme Court has more recently confirmed that neither the 1930 Plant Patent Act of nor the Plant Variety Protection Act (PVPA) should be read as repealing by implication 35 U.S.C. § 101 : see *J.E.M. Ag Supply, Inc. v. Pioneer Hi-Bred International*, 534 U.S. 124 (2001). In the EU, while neither plant and animal varieties nor essentially biological processes for the production of plants or animals are patentable (Art. 4(1)), Article 3(2) of Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998 on the legal protection of biotechnological inventions (OJ L 213, 30.7.1998, p. 13) provides that 'biological material which is isolated from its natural environment or produced by means of a technical process may be the subject of an invention even if it previously occurred in nature'. In two decisions of 1992, the European Patent Office (EPO) took the view that given the potential value of genetically modified plants for combating food shortages, exploitation of such genetically modified plants cannot be considered immoral or against public order : see Opposition Division, March 31 1992, (concerning European patent application bearing publication number 122.791, *Lubrizol (Plant Gene Expression*); and Opposition Division, December 15 1992, concerning European patent application bearing publication number 242.236*, IIC*, 1993, 618; Technical Board of Appeal, February 21 1995 (T 356/93) (Appeal on the decision of the Opposition Division, December 15 1992), *Plant Genetic Systems* case. See more generally G. Van Overwalle, 'Protecting Innovations in Plant Biotechnology : Patents or Plant Breeders' Rights ?',

encouraged, as it would depend on the possibility to use patented material. The growing importance in recent years of patents on life-forms, itself the result of the progress of biotechnology, may result in increasing restrictions to both farmers' and research exemptions, which PVP regimes generally include.

It is therefore welcome that a number of countries, including the Andean Pact Countries,[45] Brazil and Argentina,[46] have chosen not to grant patents on plants. Although a number of countries not allowing patents on plants are parties to the 1991 UPOV Convention, this instrument should not be seen as an obstacle to establishing research exemptions in legislation protecting plant breeders' rights. It provides for exceptions for 'acts done privately and for non-commercial purposes [and] for experimental purposes' (Art. 15.1(i) and (ii)); it allows national legislation that permits farmers 'to use for propagating purposes, on their own holdings, the product of the harvest which they have obtained by planting, on their own holdings, the protected variety' (Art. 15.2); and it provides for the possibility of restricting breeders' rights for reasons of public interest (Art. 17.1).

But even those countries who chose to grant patents on plants may, consistent with Article 30 of the TRIPS Agreement,[47] introduce such an exemption, although the practice varies across countries.[48] WTO Members comply with TRIPS provided the exception imposed on patent-holders' rights remain limited; and provided patent-holders can still 'extract economic value from their patent' and can 'claim a 'legitimate interest' in the economic benefits'.[49] A broad reading of the limitations which can be imposed on the definition of patent rights contained in Article 28 of the TRIPS Agreement would be consistent with the intentions guiding the agreement. When they concluded the Agreement on Trade-Related Aspects of Intellectual Property Rights as part of the Uruguay Round of trade negotiations, the governments recognized that 'the protection and enforcement of intellectual property rights should contribute to the promotion of technological innovation and to the transfer and dissemination of technology, to the mutual advantage of producers and users of technological knowledge and in a manner conducive to social and economic welfare, and to a balance of rights and obligations' (Art. 7). They also recognized that 'Members may, in formulating or amending their laws and regulations, adopt measures necessary to protect public health and nutrition, and to promote the public interest in sectors of vital importance to their socio-economic and technological development, provided that such measures are consistent with the provisions of [the TRIPS] Agreement' (Art. 8, para. 1); and they noted that 'appropriate measures, provided that they are consistent with the provisions of [the TRIPS] Agreement, may be needed to prevent the abuse of intellectual property rights by right holders or the resort to practices which unreasonably restrain trade or adversely affect the international transfer of technology' (Art. 8, para. 2).

The granting of a research exemption may not be sufficient, however, since researchers face problems of delayed or blocked access to needed research tools because of a poor functioning of material

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Mededelingen van de Faculteit Landbouwwetenschappen Universiteit Gent (*Proceedings of the Sixth Forum for Applied Biotechnology, Brugge)*, 1993, vol. 57, 1521-1536. The Special Rapporteur is grateful to Ms Van Overwalle for her contribution to the mandate, submitted in preparation of this report.

[45] Article 15 (b) of the Subregional Integration Agreement of the Andean Community (Cartagena Agreement), Decision 486 – Common Provisions On Industrial Property (14 September 2000), see http://www.wipo.int/clea/docs_new/en/ac/ac005en.html.

[46] For more, see G. Van Overwalle, 'Biotechnology and Patents: Global Standards, European Approaches and National Accents', in *Genetic Engineering and the World Trade System,* Daniel Wüger and Thomas Cottier (eds.), Cambridge University Press, 2008, 77-108.

[47] Article 30 of the TRIPS Agreement provides that WTO Members 'may provide limited exceptions to the exclusive rights conferred by a patent, provided that such exceptions do not unreasonably conflict with a normal exploitation of the patent and do not unreasonably prejudice the legitimate interests of the patent owner, taking account of the legitimate interests of third parties'.

[48] For instance, while sect. 55.2(1) of the Canadian Patent Act provides for a research exemption, in the United States, an equivalent provision (35 U.S.C. § 271(e)(1)) has been significantly narrowed in recent case-law (see *Madey v. Duke University*, 307 F.3d 1351, 1362 (Fed. Cir. 2002)).

[49] Canada – Pharmaceuticals (WT/DS114/R), paras. 7.56 and 7.61.

transfer agreements (MTAs).[50] Innovative techniques to overcome barriers to research on patented material may have to be developed further.[51] In situations where multiple patent holders have patents in one variety, forming a "patent thicket", a patent pool could be formed, through which those patent-holders agree to license one or more of their patents as a package to one another, and to third parties (users) willing to pay the associated royalties.[52] Clearinghouses could be set up, in order to facilitate the matching between users and patent-holders, particularly in situations of "patent thickets" : a major example of this in the area of agricultural biotechnology is the Public Intellectual Property Resource for Agriculture (PIPRA), an alliance of more than 40 public institutions from more than 12 countries that seeks to decrease barriers created by intellectual property and to facilitate technology transfer by pooling their efforts to increase dissemination of innovations in staple and specialty crops, in particular by providing a one-stop IP information clearinghouse for access to public sector patented technologies. Finally, research can be encouraged by developing open source experiments such as the Biological Open Source (BiOS) License pioneered in Canberra by the Centre for Applications of Molecular Biology in International Agriculture (CAMBIA), which puts the GUS and TransBacter technologies at the free disposal of researchers in agricultural biotechnology, without any condition other than to ensure that any improvements made to these enabling tools will be shared under the BiOS open source license regime.

Where patents restrict research in ways which may have an impact on food security and are an obstacle to face situations of "national emergency" or other "extreme urgency", for instance in the face of declining crop productivity, Article 31 of the TRIPS Agreement allows compulsory licensing, i.e., the use "of the subject matter of a patent without the authorization of the right holder".[53] Inspiration may be sought in this regard from the Patents and Plant Variety Rights (Compulsory Licensing) Regulations adopted in the United Kingdom in 2002, which allow to apply for a licence to acquire or develop a new plant variety, which "constitutes significant technical progress of considerable economic interest in relation to the invention protected by the patent."[54]In addition, in line with the general purposes of the TRIPS Agreement recalled above, intellectual property rights may be restricted in the public interest, for instance through the doctrine of eminent domain.[55] And developed countries may make available to developing country any biotechnologies developed through public research without the need for a license or other permission.

In the short term, these tools may be appropriate to limit the negative impacts of the recent trend towards patent claims made following the adaptation of specific gene traits that could confer one or more forms of stress tolerance linked to climate change (including salinity, drought or flood, heat or cold). In the long term, it has been suggested by Michael Balkeney in his contribution to the mandate that a procedure be set up "to grant nonexclusive licenses to any requesting party for the use of any patented tool of biotechnology for developing country and LDC food security purposes. The royalty rate would reflect the extent of the value forgone by the patent holder. This will often be zero, given that a northern patent holder will often not contemplate commercializing its technology in developing country markets. Also, […] the patented technology will often be being used in a non-agricultural

[50] Z. Lei, R. Juneja, and B.D. Wright, 'Patents versus Patenting: Implications of Intellectual Property Protection for Biological Research', *Nature Biotechnology*, 2009, 36-40.
[51] The Special Rapporteur is heavily indebted to Ms G. Van Overwalle for the preparation of this section.
[52] It was found for instance that beta carotene, or GoldenRice, which because of its high content of vitamin A is of major interest for developing countries, embodied 70 patents, belonging to 32 different companies and universities. In order to overcome the resulting obstacles to the diffusion of Golden Rice, the key patent-holders were approached and agreed to grant licenses, free of charge, to developing countries, with the right to sub-license ; a specific governing body (the Humanitarian Board) was established to this effect. See M. Blakeney, 'The Role of Competition in Biotechnological Patenting and Innovation', 9 *Bio-Science Law Review* 95 (2006/2007).
[53] On the possibilities of compulsory licensing and eminent domain doctrines to overcome the obstacles created by patents, see the contribution of Michael Blakeney to the experts' submission.
[54] These Regulations implement Article 12 of Directive 98/44/EC of the European Parliament and of the Council on the legal protection of biotechnological inventions (OJ L 213, 30.7.98, p. 13).
[55] Michael R. Taylor & Jerry Cayford, 'Biotechnology Patents and African Food Security: Aligning America's Patent Policies and International Development Interests' 17 *Harvard Journal of Law & Technology* 323.

context. This compulsory licensing could significantly enhance food security without undercutting the profitability of the northern invention".

c) The direction of research : 'orphan crops'

The marked increase in IP protection has led to a significant rise in patenting activity and in plant breeding.[56] But it also has created an imbalance between the private and the public sectors in agricultural research : for a number of reasons, public research centres are less able to benefit from the protection of IP rights than private firms.[57] In turn, this has led to orientate research and development towards meeting the needs of farmers in rich countries, while the needs of poor farmers in developing countries have been comparatively neglected.[58] The private sector is driven by profit-seeking motives. It will therefore invest primarily where the returns can be expected to be highest: very little research has benefited tropical maize, sorghum, millet, banana, cassava, groundnut, oilseed, potato or sweet potato, for example – sometimes referred to as 'orphan crops', and public research centres have not made up for the lack of interest of the private sector in these crops.

It is therefore vital either that the capacity of the public research centres and associated funding be increased, or that incentives be developed in order to reorient research and development in the private sector towards the real needs of poor farmers in developing countries. Participatory plant breeding, if sufficiently supported through domestic public policies, could partially compensate for the existing imbalance.

d) The impact of IP rights on farmers' seed systems

The standard argument against the risk of increased dependency of smallholders towards commercial seed varieties, is that farmers are not obliged to purchase PVP (plant variety protection)-protected seed just because it is made available. This however presupposes that farmers have real alternatives to acquiring their seed from the commercial system. Yet, the coexistence between farmers' seed systems – operating at local or community levels between farmers, and mostly informal – and commercial seed systems is sometimes problematic.[59] Public authorities have supported the expansion of commercial seeds not only through plant variety protection schemes, but also through the use of input subsidies and via the diffusion of selected seeds in rural extension networks. Farmers often receive commercial varieties as part of a package that includes credit (often vouchers), seed, fertilizer and pesticide. In many cases, acceptance of such packages is the only way farmers can access credit in rural areas. They need to accept the whole package in order to do so. In addition, traditional varieties circulating farmers' seed systems – and on which the vast majority of farmers in developing countries still rely for most crops – are often excluded from government-approved seed lists that countries maintain under their seed regulations, and they are seldom included in seed distribution

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[56] For an evaluation of the impact of countries adopting UPOV-compliant legislation or joining UPOV, see *UPOV Report on the Impact of Plant Variety Protection*, 2005. Based on the examples of Argentina, China, Kenya, Poland, and the Republic of Korea, the report shows that accession to the UPOV convention stimulates new breeding work and the release in the country concerned of varieties developed by foreign breeders. However, the evaluation also notes that 'the development of new varieties of plants will be encouraged where there is commercial viability, but in cases where there is no existing, or potential, commercial market for varieties, the presence of a PVP system should not be expected to encourage the development of new varieties': in such cases, as acknowledged by the report, breeding should be supported by the public sector (p. 11). The report on impact prepared by UPOV does not discuss the impacts of UPOV-compliant legislation, with the associated expansion of the commercial seed system, on farmers' seed systems.

[57] See UNDP, *Human Development Report 2001: Making New Technologies Work for Human Development*, chapter 5, table 5.1.

[58] Only 6 percent of privately-funded agricultural research is focussed on developing country agriculture : Nienke M. Beintema and Gert-Jan Stads, *Measuring Agricultural Research Investments: A Revised Global Picture*, 2008, available at : http://www.asti.cgiar.org/pdf/global_revision.pdf.

[59] See C.J.M. Almekinders & Niels P. Louwaars, *Farmers' Seed Production. New Approaches and Practices*, London, Intermediate Technology Publ., 1999, 291 pages; Niels Louwaars, *Seeds of Confusion. The impact of policies on seed systems*, Ph.D., Wageningen Universiteit, 2007, p. 29.

programmes subsidized by governments. The end result is a progressive marginalization disappearance of local varieties.

Such a development may be consistent with a linear idea of progress favoring the replacement by high-yielding varieties of traditional crop varieties in the most productive areas.[60] Yet, it is a deeply problematic development even apart from the increased dependency of farmers it leads to. Farmers' seed systems may be particularly important to resource-poor farmers in resource-poor agro-ecological environments, because of the importance, for production in such environments, of locally adapted varieties. Production may not be discussed independently of distribution. Aiming to achieve food security simply by providing farmers with seeds that are high-yielding in certain conditions is premised on seeing food security as primarily a problem of production, when issues of accessibility are at least equally as important: the question which is omitted from this view is who will benefit from increased production, and the incomes of which groups will rise in comparison to those of other groups. Seeds from the commercial sector may be unaffordable to the poorest farmers, particularly when they require to be combined with other external inputs.[61] As explained by Sperling et al.: 'while formal sector varieties are referred to as 'improved' and the quality of the seed is certified, these varieties often yield poorly in many smallholder cropping systems. Such new varieties may not be adapted to the local agro-ecological conditions and farmers may not possess the management inputs (for example fertilizers and pesticides) crucial for their growth'.[62]

The spread of commercial varieties also raises the question of its impact on crop genetic diversity. For thousands of years, reasonable levels of production were achieved thanks to the management by farming communities of a vast portfolio of genetic diversity. Stability in the level of protection was achieved thanks to the coexistence of an array of plants, presenting different traits making them resistant to specific diseases, to drought, or to variations in temperature. This crop genetic diversity is now under severe threat. As a result of the pressure towards more uniform crops and species-specific learning – the species about which knowledge has developed becomes more attractive to cultivate –, all efforts have been put into the development of a limited number of standard, high-yielding varieties, so that barely more than 150 species are now cultivated; most of mankind now lives off no more than 12 plant species, with the four biggest staple crops (wheat, rice, maize and potato) taking the lion's share.[63] It is estimated that about 75 percent of plant genetic diversity has been lost as farmers worldwide have abandoned their local varieties for genetically uniform varieties that produce higher yields under certain conditions.[64] In addition, genetic diversity within crops is decreasing. In 1992-1993 for instance, 71 percent of the commercial corn crop in the United States came from six varieties, 65 percent of the rice from only four varieties, 75 percent of the potato crop came from four varieties, 50 percent of the soybeans crop from 6 varieties, and 50 percent of the wheat from nine varieties.[65] In Sri Lanka, 2,000 varieties of rice were cultivated in 1959; in 1992 they were fewer than 100, 75 percent descending from a common stock. In Bangladesh

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[60] J. Douglas, *Successful seed programs: a planning and management guide*, Boulder, Co., Westview Press, 1980, 302 p. See also W. Jaffé & J. Srivastava, "The role of the private and public sectors in enhancing the performance of seed systems", *The World Bank Research Observer* 9 (1994), pp. 97-117.

[61] See Niels Louwaars, *Seeds of Confusion. The impact of policies on seed systems*, Ph.D., Wageningen Universiteit, 2007, p. 29.

[62] L. Sperling, T. Remington, and J. Haugen, "Seed aid for seed security", Catholic Relief Services, 2006.

[63] José Esquinas-Alcázar, "Protection crop genetic diversity for food security: political, ethical and technical challenges", *Nature*, December 2005, vol. 6, pp. 946-953. See also P.C. Mangelsdorf, "Genetic potentials for increasing yields of food crops and animals", *Proc. National Academy of Sciences U.S.A.*, vol. 56 (1966), pp. 370-375 ; Timoth Swanson, *Global Action for Biodiversity*, James & James Science Publishers, 2005 (originally published in Earthscan Publ., London, 1997), p. 52.

[64] D. Nierenberg and B. Halweil, *Cultivating Food Security*, New York, Norton & Co., 2005.

[65] World Conservation Monitoring Center, *Global Biodiversity: Status of the Earth's living resources*, London: Chapman and Hall, 1992 ; Stephen R. Gliessmann, *Agroecology: the ecology of sustainable food systems*, Technology & Engineering, 2006, p. 193.

and Indonesia respectively, 62 and 74 percent of the rice varieties descend from a common stock.[66]

Such wide-scale genetic erosion increases our vulnerability to sudden changes in climate, and to the appearance of new pests and diseases.[67] For example, after the fungus *Helminthosporium maydis* destroyed much of the standing maize crop in the southern part of the United States in 1970, leading to losses to consumers and farmers totalling some 2 billion USD,[68] it was necessary to breed a variety resistant to this pest by using genetic resources borrowed from other parts of the world. A number of varieties have been ignored for long periods of time due to their negative agricultural characteristics, before it was found that they could contribute to agricultural developments due to their specific traits such as their resistance to certain pests or, for example, their higher nitrogen-fixing capacities. Preserving those varieties is thus, quite literally, vital.

The expansion of IP rights can constitute an obstacle to the adoption of policies that encourage the maintenance of agrobiodiversity and reliance on farmers' varieties. First, the expansion of IP rights directs innovation in agriculture towards improvement of plant varieties and seeds, rather than towards the provision of public goods, such as those listed above, that may be most effective in improving the livelihoods of farmers and that most closely correspond to their needs. Secondly, IP rights reward and encourage standardization and homogeneity, when what should be rewarded is agrobiodiversity, particularly in the face of the emerging threat of climate change and of the need, therefore, to build resilience by encouraging farmers to rely on a diversity of crops. Thirdly, IP rights – particularly patents granted on plants, or on genes or DNA sequences – can constitute a direct impediment to innovation by farmers. The preservation of agrodiversity and the development of farmers' seed systems relies not only on the use of landraces (traditional, non-PVP-protected varieties) but also on the saving, exchange, or sale of harvested seeds – since it is often the case that traditional varieties can be combined with modern varieties in order to produce varieties which perform better in specific local environments. However, although Article 9.3 of the IT-PGRFA refers to the rights of farmers to save, use, exchange and sell farm-saved seed/propagating material, this right is only recognized 'subject to national law and as appropriate', and restrictions to farmers' rights in order to better protect breeders' rights are common.[69]

The strengthening of breeders' rights in the 1991 UPOV convention is also a concern in this regard. This convention prohibits the commercialization of varieties which are essentially derived from a PVP-protected variety (art. 14(5)), and farmers are now prohibited from exchanging or selling seeds saved from the harvest of protected varieties (article 15). Instead, States – particularly developing countries where the function of traditional, farmers' seed systems is even more important both for the prevention of genetic erosion and for the livelihoods of farming communities – should design *sui generis* forms of protection of plant varieties which allow these systems to flourish, even if this means adopting non-UPOV compliant legislation ; and if they do join UPOV, they should use all the

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[66] World Conservation Monitoring Center, *Global Biodiversity*, cited above.

[67] See Geoffrey Heal et al., 'Genetic diversity and interdependent crop choices in agriculture', *Resource and Energy Economics*, vol. 26(2), June 2004, pp.175-184 (noting that, while a drop in the genetic diversity in food crops increases the risk of attacks by pathogens, farmers may not take this into account when making crop choices, leading to levels of diversity which are suboptimal). Genetic diversity is also important to food security for other reasons, less relevant in the context of this report. See, for an overview, UNEP, *The Environmental Food Crisis. The Environment's Role in Averting Future Food Crises*, February 2009, pp. 65-76.

[68] J. Kloppenburg, *First the Seed: The Political Economy of Plant Biotechnology*, Cambridge, Cambrige Univ. Press, 1988, p. 93.

[69] In the EU, Directive 98/44/EC of the European Parliament and of the Council of 6 July 1998 on the legal protection of biotechnological inventions (OJ L 213, 30.7.1998, p. 13) provides for a derogation from the rights of the holder of the patent when the propagating material incorporating the protected invention is sold to a farmer for farming purposes by the holder of the patent or with his consent, under the same conditions as those set out in Council Regulation (EC) No 2100/94 of 27 July 1994 on Community plant variety rights (OJ L 227, 1.9.1994, p. 1 (as amended by Regulation (EC) No 2506/95 (OJ L 258, 28.10.1995, p. 3)). The recognition of patent rights on biological materials therefore should not form an obstacle to the protection of farmers' privilege.

flexibilities available under the UPOV convention.[70]

In identifying the system of IP rights best suited to their specific needs, States could be supported by independent and participatory human rights impact assessments, in order to inform their choices.[71] But the use by States of the flexibilities they are allowed should not be discouraged either by international agreements or by private initiatives. No State should be forced to establish a regime for the protection of IP rights which goes beyond the minimum requirements of the TRIPs Agreement : free trade agreements imposing countries to join the 1991 UPOV convention or to adopt UPOV-compliant legislation, therefore, are problematic. Nor should the use of the existing flexibilities by States be nullified by private barriers, whether under the form of genetic use restriction technologies or that of 'seedwrap' licences. These barriers should be prohibited in the domestic legislation on IP rights.

2. Farmers' seed systems and the right to food

In South Asia and Sub-Saharan Africa, the overwhelming majority of farmers still rely on traditional farmers' seeds systems in order to grow their crops. Women play a key role in these systems : up to 90% of planting material used in smallholder agriculture is seed and germplasm is produced, selected and saved by women, and it is predominantly women who grow and preserve underutilised species which local communities use to supplement their diets.[72] The replacement of farmers' seed systems to commercial seeds systems may therefore shift decision-making about which crops to grow and to sell to men. Reliance by farmers on farmers' seed systems allows them to limit the cost of production, by preserving a certain degree of independence from the commercial seed sector. The system of unfettered exchange in farmers' seed systems ensures the free flow of genetic materials, thus contributing to the development of locally appropriate seeds and to the diversity of crops. In addition, these varieties are best suited to the difficult environments in which they live. They result in reasonably good yields without having to be combined with other inputs such as chemical fertilizers. And because they are not uniform, they may be more resilient to weather-related events or to attacks by pests or diseases. It is in therefore in the interest of all, including professional plant breeders and seed companies who depend on the development of these plant resources for their own innovations, that these systems be supported.

a) Promoting and protecting farmers' rights

One means to restore an adequate balance between the rights of plant breeders and the needs of farmers is by strengthening the protection of farmers' rights under domestic and international law. The IT-PGRFA recognizes 'the enormous contribution that the local and indigenous communities and farmers of all regions of the world, particularly those in the centres of origin and crop diversity, have made and will continue to make for the conservation and development of plant genetic resources which constitute the basis of food and agriculture production throughout the world' (art. 9.1.). It refers to the responsibility of the States parties to realize farmers' rights, by (a) protecting traditional

[70] For instance, the Central America-Dominican Republic-United States Free Trade Agreement, which was signed on August 5, 2004, states in a footnote to 15.1 para. 5: 'The Parties recognize that the UPOV Convention 1991 contains exceptions to the breeder's right, including for acts done privately and for non-commercial purposes, such as private and non-commercial acts of farmers. Further, the Parties recognize that the UPOV Convention 1991 provides for restrictions to the exercise of a breeder's right for reasons of public interest, provided that the Parties take all measures necessary to ensure that the breeder receives equitable remuneration. The Parties also understand that each Party may avail itself of these exceptions and restrictions. Finally, the Parties understand that there is no conflict between the UPOV Convention 1991 and a Party's ability to protect and conserve its genetic resources'.

[71] See G. Dutfield, 'Making TRIPs work for developing countries', in G. Sampson & W.B. Chambers (eds), *Developing Countries and the WTO: Policy Approaches*, United Nations University Press, 2008.

[72] In Yemen, women grow crops such as ground nuts, pumpkins, leafy vegetables, cowpeas, cucumbers and sweet potatoes, raising biodiversity and improving food security on the farm. Andean women choose a variety of potato that has the characteristics they want for cooking. Rwandan women are reported to grow more than 600 varieties of beans and Peruvian Aguarun women plant more than 60 varieties of manioc. See Gabriela Mata and Adél Anna Sasvári, 'Integrating gender equality and equity in access and benefit-sharing governance through a rights-based approach', in Jessica Campese, Terry Sunderland, Thomas Greiber and Gonzalo Oviedo (eds), *Rights-based approaches. Exploring issues and opportunities for conservation*, CIFOR and IUCN, 2009, pp. 251-268.

knowledge relevant to plant genetic resources for food and agriculture; (b) ensuring that farmers can equitably participate in sharing benefits arising from the utilization of plant genetic resources for food and agriculture; and (c) protecting their right to 'participate in making decisions, at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture' (art. 9.2). Consistent with Article 1 of the IT-PGRFA, this provision should be read with Article 8j) of the CBD, which states that each Party should, 'subject to its national legislation, respect, preserve and maintain knowledge, innovations and practices of indigenous and local communities embodying traditional lifestyles relevant for the conservation and sustainable use of biological diversity and promote their wider application with the approval and involvement of the holders of such knowledge, innovations and practices and encourage the equitable sharing of the benefits arising from the utilization of such knowledge, innovations and practices'.

The recognition of farmers' rights is vital to the preservation of agrobiodiversity. The commercial use of plant genetic resources and biotechnologies are leading to a reduction of the number of domesticated plant varieties, and only by better protecting farmers' rights can we counteract this tendency.[73] However, Article 9 IT-PGRFA by itself will not suffice. It refers to farmers' "rights", but in the absence of remedies, no such rights exist in fact. The provision remains vague, and its implementation of this provision is highly even across the States parties. Whereas plant breeders' rights and biotech-industry patents are defined and enforced at international level through UPOV and all WTO Members must ensure some protection of plant varieties under Article 27.3(b) of the TRIPs Agreement, farmers' rights are only recognized in principle, and in vague terms, in the IT-PGRFA. Furthermore, there exists no forum in which the implementation of farmers' rights in various settings is discussed, in order to provide benchmarks and examples of good practices which Governments could seek inspiration from.[74]

It is therefore to be welcomed that, at the Third Meeting of the Governing Body held in Tunis on 1-5 June 2009, it was agreed that member countries should review all measures affecting Farmers' Rights and remove any barriers preventing farmers from saving, exchanging or selling seed; and that they should involve farmers fully in national and/or regional workshops on the implementation of Farmers' Rights and to report back on the implementation of farmers' rights at the next meeting, to be held in late 2010. This should encourage States to fully implement Article 9 of the IT-PGRFA. It should be clear that the removal of barriers to the saving, exchange or selling of seeds shall suffice : for farmers' rights to be truly realized, Governments should accept that they have duties to support farmers' seed systems, as described below.[75]

b) From direct and bilateral benefit-sharing to indirect and multilateral support for agrobiodiversity maintenance

There is another problem to which Article 9 IT-PGRFA does not offer a solution. Despite the wording used in Article 9.2(b), seeking to protect traditional knowledge following the model of IP rights may be misguided. While protection against the misappropriation of genetic resources is of course important, both as a matter of equity and as a means of preserving agrodiversity, it should not result in new enclosures preventing access to genetic resources as a common heritage: the sharing of genetic resources not only promotes diversity, it also can contribute to food security by allowing research on new varieties to make progress, a process of sharing of, and improvement on, genetic resources in which farmers should be actively involved.[76]

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[73] See in particular Regine Andersen, *Governing Agrobiodiversity: Plant Genetics and Developing Countries* (Aldershot, UK: Ashgate, 2008).

[74] For a collection of 17 'success stories' in the implementation of farmers'rights as defined in Article 9 of the IT-PGRFA, covering 11 countries, see Regine Andersen and Tone Winge, *The Farmers' Rights Project – Background Study 7: Success Stories from the Realization of Farmers' Rights Related to Plant Genetic Resources for Food and Agriculture*, FNI Report 4/2008 (Lysaker, Norway: The Fridtjof Nansen Institute, 2008). See also, for a very valuable collection of resources on this issue, www.farmersrights.org (site of the Farmers' Rights Project, Fridtjof Nansen Institute).

[75] See section III, 2, c), below.

[76] S. Safrin, 'Hyperownership in a time of biotechnological promise: The International conflict to control the building blocks of life', *American Journal of International Law*, vol. 98 (2004), pp. 641-685.

This is something that countries should take into account in their implementation of the CBD, keeping in mind that the CBD may not be appropriate for the management of PGRFA – something which States recognized when they adopted the IT-PGRFA, although crops not listed in annex I to the IT still remain within the CBD framework. It is also relevant for the implementation of farmers' rights under the IT-PGRFA. Article 9.2(b) of the IT concerns the right to participate equitably in the sharing of benefits arising from the utilization of plant genetic resources for food and agriculture. However, such benefits should not only accrue to those few farmers who happen to have plant varieties that are utilized by commercial breeding companies: in recognition of the fact that genetic resources constitutes a common heritage which generations of farmers across the globe have contributed to, they should be shared with farmers in all countries engaged in the conservation and sustainable use of agrobiodiversity.

Indeed, this has traditionally been the approach of the FAO, since the adoption on 29 November 1989 of Resolution 5/89 of the FAO Conference on farmers' rights. That resolution is based on the recognition that 'plant genetic resources are a common heritage of mankind to be preserved, and to be freely available for use, for the benefit of present and future generations', and that the contribution of farmers, 'unnumbered generations of [whom] have conserved, improved and made available plant genetic resources', needs to be better recognized and rewarded. This justifies the recognition of farmers' rights, 'vested in the International Community, as trustee for present and future generations of farmers, for the purpose of ensuring full benefits to farmers, and supporting the continuation of their contributions'.

Such an approach differs from the approach to benefit-sharing under the Convention on Biological Diversity, which is instead 'bilateral and direct' insofar as 'benefits are to be shared between purported 'owners' and buyers of the resources'.[77] But benefit-sharing as conceived under the CBD has failed : in spite of the existence of a number of legislations in developing countries which foresee forms of direct benefit sharing between the 'owners' and 'buyers' of genetic resources, often upon prior informed consent on mutually agreed terms, as set out in the CBD, 'so far there have been no examples of direct benefit sharing between providers and recipients of plant genetic resources for food and agriculture resulting from such legislation'.[78] In addition, should the approach favored under the CDB succeed, this could have perverse consequences. Since the demand for farmers' varieties among commercial breeders remains limited, so would the number of beneficiaries among farmers, and the vast majority of farmers would remain uncompensated for their contribution to the maintenance and improvement of the common pool of genetic resources. And a system of direct benefit-sharing between 'suppliers' owning the resources and 'buyers' commercializing them could lead to 'disincentives to share seeds and propagating material among farmers, because of expectations of personal benefit, or the expectations of individual communities to benefit'.[79]

c) Supporting farmers' varieties and associated knowledge

Rather than preventing access to traditional varieties and associated knowledge by creating a new system of enclosures, what is required is proactive support for their development.[80] In order to encourage farmers who conserve and sustainably use plant genetic resources for food and agriculture, extension services could be provided to them specifically, and other incentives could be put in place, such as to facilitate the marketing of their produce or to provide them easier access to credit. In the absence of proactive policies aimed at preserving and encouraging the development of farmers' seed systems and associated traditional knowledge and practices, such systems risk disappearing, as a result of three kinds of pressures. First, seed regulations (national seed certification schemes) may only

[77] Information Paper on Farmers' Rights submitted by the Fridtjof Nansen Institute to the Secretariat of the Plant Treaty, 20 May 2009, para. 2.2. (available on www.farmersrights.org)
[78] Information Paper on Farmers' Rights, cited above, para. 2.2.
[79] Ibid.
[80] See IFPRI and FAO, *Local Markets, Local Varieties. Rising Food Prices and Small Farmers' Access to Seed*, IFPRI Issue Brief 59, February 2009 (based on case-studies from Mali, Kenya and India).

catalogue commercial varieties which are PVP protected (since only these present the stability and uniformity required for cataloguing), and either explicitly exclude the trade of non PVP-protected seeds or lead to *de facto* exclusion of traditional varieties, since these are normally not genetically homogeneous enough to meet the requirements for approval and certification.[81] Second, government-sponsored programmes seeking to improve access to seeds may promote certain types of seeds only, such as hybrids, although they often may require to be combined with the use of expensive inputs, which may be unsustainable for cash-strapped farmers, and may not be best suited to local agronomic conditions. Third, the buyers of crops, particularly for the export sector, may require from their suppliers that they use certain seeds which guarantee uniformity and stability, at the expense of diversity and variability, leading to progressive genetic erosion.

A number of measures could be adopted by States in order to ensure that traditional knowledge is kept alive and can further develop among farmers.[82] The reform of seed regulations is one possibility. Traditional varieties and associated knowledge could be documented in catalogues and gene banks, and farmers contributing to these banks could be compensated. In the EU, the existing seed certification scheme[83] was amended in 2008 in order to encourage *in situ* conservation and the sustainable use of plant genetic resources, landraces and varieties which are naturally adapted to local and regional conditions and threatened by genetic erosion. The purpose of this amendment is to allow such varieties (referred to as 'conservation varieties') to be grown and marketed even where they would not otherwise comply with the general requirements as regards the acceptance of varieties and the marketing of seed and seed potatoes. Derogations are therefore provided for the inclusion of conservation varieties in the national catalogues of varieties of agricultural plant species as well as for the production and marketing of seed and seed potatoes of those varieties.[84] While these derogations are still subject to extremely restrictive conditions, and should be significantly expanded in the future before they can truly encourage these varieties to be maintained, the reform goes in the right direction. Other encouraging developments have been reported. Farmers' rights are protected under chapter VI of the Indian Protection of Plant Varieties and Farmers Rights Act of 2001. Under s 39, farmers may apply for registration of any new variety they have bred or developed, under the same conditions as breeders; farmers who are engaged in the conservation of diverse varieties of plants may apply to be rewarded through the National Gene Fund ; and 'a farmer shall be deemed to be entitled to save, use, sow, resow, exchange, share or sell his farm produce including seed of a variety protected under this Act in the same manner as he was entitled before the coming into force of this Act', although he or she 'shall not be entitled to sell branded seed [any seed put in a package or any other container and labeled in a manner indicating that such seed is of a protected variety] of a variety protected under this Act'. The preservation of a traditional system of farmers' seed systems alongside the formal seed system, ensures that poor farmers will not have to spend on buying seeds; it also favors the maintenance and development of diversity in plant varieties and seeds, which as we have seen is vital for agricultural development and long-term food security. In Senegal, peasant-farmers hold community registers of peasant varieties since 2003, a similar initiative where interesting or rare peasant varieties are described and listed so they can be circulated and disseminated more easily.[85] International support for such programmes, for instance through the FAO, should be expanded in the future.

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[81] See Shabnam Anvar, *Semences et droit. L'emprise d'un modèle économique dominant sur une réglementation sectorielle*, doctoral thesis, Université de Paris I-Panthéon-Sorbonne, 2008.

[82] Information Paper on Farmers' Rights, cited above, para. 2.1.

[83] Council Directive 2002/53/EC of 13 June 2002 on the common catalogue of varieties of agricultural plant species, OJ L 193, 20.7.2002, p. 1 (as last amended by Regulation (EC) No 1829/2003 of the European Parliament and of the Council (OJ L 268, 18.10.2003, p. 1)) ; see also Council Directive 2002/54/EC of 13 June 2002 on the marketing of beet seed (OJ L 193, 20.7.2002, p. 12 (as last amended by Directive 2004/117/EC (OJ L 14, 18.1.2005, p. 18) ; and Council Directive 2002/56/EC of 13 June 2002 on the marketing of seed potatoes (OJ L 193, 20.7.2002, p. 60 (as last amended by Commission Decision 2005/908/EC (OJ L 329, 16.12.2005, p. 37)).

[84] See Commission Directive 2008/62/EC of 20 June 2008 providing for certain derogations for acceptance of agricultural landraces and varieties which are naturally adapted to the local and regional conditions and threatened by genetic erosion and for marketing of seed and seed potatoes of those landraces and varieties (JO L 162 of 21.6.2008, p. 13).

[85] IIED – CNOP – BEDE, *Peasants seeds, the Foundation of Food Sovereignity in Africa. Reports on the international workshop on the 'privatisation of seeds'*, Preparatory process for the Nyéléni International forum on Food Severeignity – Bamako, February 2007.

Local seed exchange is an important component of seed supply and diffusion in regions where the seeds of traditional varieties are not available on the markets. It also helps the exchange of knowledge associated with its conservation and use. Initiatives favoring the development of local seed exchanges could be scaled up, by the support of community seed banks and seed fairs. Seed fairs bring together local farmers who have surplus seed of traditional food crops to sell or trade with other farmers looking for such seed. The poorest seedless farmers receive vouchers from the government, which can be exchanged for seed at the fair. This allows the farmers to select and buy their preferred seed varieties. Community seed banks pool the seed material from member farmers. Appropriate institutional arrangements should ensure the availability of planting material at the appropriate time as well as an adequate diversity of varieties.[86] Such community seed banks exist in countries such as the Philippines or India and frequently emanate from grassroots organizations. In India, the organization 'Navdanya' has established 34 seed banks in 13 states across the country in the last two decades. Operating through a network of community seed banks in different ecozones assists the maintenance and improvement of agricultural biodiversity. In Mali, some seed banks contain more than 350 samples of 70 different species.

These systems could be helped to prosper for a larger contribution to food security. Incentives for the use of food products that emanate from these systems in processing and marketing, or through public procurements schemes, are the next steps forward in maintaining and enhancing agrobiodiversity. They would bring much needed additional incomes to vulnerable groups. In addition, seed banks may be expensive and are not sufficient, in isolation, to develop the world's genetic material and the associated traditional knowledge. Instead, it is in everyone's interests (including that of the seed industry) to conserve seeds *in situ*, i.e. within smallholder agroecosystems. Local farmer-run seed banks must be combined with local grain reserves of landraces, and smallholders should be supported by improved land security, fair markets, access to credit, and extension services.

3. Bridging the systems

States face the distinct challenge of having to organize the coexistence between a commercial seeds system, which is growing in importance, and the farmers' seeds systems, which must be supported and are a vital source of innovation from which all benefit. This challenge can be met by actively involving farmers in the design and implementation of seed policies, and by putting science in the service of farmers.

a) Participatory rights of farmers

The right to participate in decisions is one of the important human rights principles, most explicitly mentioned in Article 25 ICCPR (see also E/C.12/1999/5, in the context of the right to food). Among the elements of farmers' rights as defined in the IT-PGRFA is 'the right to participate in making decisions, at the national level, on matters related to the conservation and sustainable use of plant genetic resources for food and agriculture' (art. 9.2(c)). Farmers should be actively involved in the design of legislation covering the certification and trade of seeds or the conservation of plant genetic resources, as well as of plant variety protection laws and laws regarding patents. This active participation should also be ensured for legislation or policies relating to the rest of agriculture (as opposed to the stewardship of plant genetic resources), since choices made in that area can significantly alter the structure of incentives for farmers who conserve genetic resources. In order to be effective, such participation presupposes capacity-building, which in turn may call for information being provided to farmers' organisations and for the preparation of impact assessments accompanying proposals for all important changes in legislation or policies. Institutional innovations can contribute both to ensuring such participation and to building the capacity of farmers' organizations to take part in the decisions affecting them. In Thailand for instance, a 'Local Wisdom Learning Centre' has been

[86] FAO - Swaminathan Research Foundation, *Rural and Tribal Women in Agrobiodiversity Conservation: An Indian Case Study*, RAP Publication 2002/08.

established under the Ministry of Agriculture and Cooperatives, encouraging experience sharing between farmers and improving their ability to contribution to the identification of the solutions to the obstacles they face; in addition, a National Farmers' Council is being established, in order to enable farmers to participate in policy making processes and systematic planning of agricultural development as well as to protect and promote their interests.

b) Putting science at the service of farmers

While there exists a tension between the strengthening of IP rights and farmers' rights, it is at the same time important to identify the considerable contributions that scientific research can make to improve the livelihoods of the most marginalized farmers. Participatory plant breeding (PPB), as for instance in Nepal, exemplifies the potential complementarities between the most advanced science and the needs of local communities. PPB intends to answer the needs of small farmers living in poor and marginal areas for which conventional breeding has offered few suitable varieties. PPB emanates from the regions which were neglected by the Green Revolution model of agriculture, which indeed focused on breadbasket regions and consequently did not deliver new plant varieties for farmers living on small farms under unstable and difficult growing conditions.

In PPB, farmers are treated as partners by researchers who work directly with them, often combining traditional seeds with modern varieties, and most of the testing takes place on the farm. This not only should ensure that the research undertaken is relevant to the farmers' needs and that, since local varieties are used, the varieties resulting from PPB will be suited to the local environment, it also is empowering – particularly for poor rural women who often preserve the best seed for planting and therefore play a key role in managing plant genetic resources. And it gives farmers a greater measure of control over their livelihood. PPB programs already exist in Syria, Egypt, Eritrea, Mali, Nepal, Yemen, Nicaragua and Honduras[87,88].

PPB programs can be started in Farmer Field Schools (FFS), which aim to make farmers experts in their own fields. Originally introduced as part of the integrated pest management approach that emerged in the 1980s as a reaction to the environmental and social consequences of the Green revolution model, FFS enable farmers to reduce their use of pesticides and rely instead on endogenous skills, knowledge and resources. Indeed, varieties are only on element in productive farming systems. Better soil management techniques, composting, water management, and agronomic practices may have an equal or greater impact upon productivity than the variety itself.

IV. CONCLUSIONS AND RECOMMENDATIONS

We must at once ensure the coexistence of the commercial seeds system and of the farmers' seeds system, each of which has a different function to fulfill in the food system ; and ensure that innovation in both systems works for the benefit of the poorest and most marginalized farmers, particularly in the developing countries. Only by seeking to achieve both can we hope to arrive at a system which adequately balances the needs for innovation, for the preservation and enhancement of crop diversity, and for improving the livelihoods of smallscale farmers in developing countries, who overwhelmingly still rely on seeds which they save from their own crops and which they donate, exchange or sell, often informally. The linear idea of progress favouring the replacement by high-yielding varieties of traditional crop varieties in the most productive areas embodies a vision of food security as primarily a problem of production. But violations of the right to food stem today, for the most part, from lack of accessibility and insufficient incomes for the poorest, including smallholders. In addition, guaranteeing food security in the future requires that we protect crop genetic diversity, including agrobiodiversity.

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[87] Gerry Toomey, *Farmers as Researchers: The Rise of Participatory Plant Breeding*, International Development Research Centre (IDRC), 1999, available at: http://www.idrc.ca/ev_en.php?ID=5559&ID2=DO_TOPIC

[88] M.L. Morris & M.R. Bellon, Participatory plant breeding research: Opportunities and challenges for the international crop improvement system, *Euphytica* 136(1), 2004, 21-35.

Our paradigm of agricultural development must therefore be redefined, and such redefinition must be guided by the normative requirements of the right to adequate food.

The following recommendations are made in order to ensure that the development of the IP rights regime and the implementation of seed policies at the national level are compatible with and conducive to the realization of the right to adequate food :

All States should:

- **Make swift progress towards the implementation of farmers' rights, as defined in Article 9 of the IT-PGRFA and consider expanding the list of crops subject to the Multilateral System of Access and Benefit Sharing (MLS), contained in annex I to the Treaty, in order to encourage the shift from direct and bilateral benefit-sharing as envisaged in the CBD to indirect and multilateral support for agrobiodiversity enhancement. States not yet parties to the IT-PGRFA should consider joining it;**
- **Consider using antitrust legislation in order to combat excessive concentration in the input providers' market, which entails the risk of abuse of dominant position by the seed companies concerned and the setting of prices at levels which may be unaffordable for poor farmers ;**
- **In case they have not implemented the TRIPS Agreement yet, prepare right to food impact assessments prior to doing so, in order to ensure that the regime of IP rights protection which will be chosen will correspond to their development needs and shall not result in depriving smallholders from access to their productive resources;**
- **Ensure that protection of patent-holders or plant breeders' rights does not discourage innovation in the name of rewarding it, by introducing barriers to the use of patented material. In particular, States should not allow patents on plants and establish research exemptions in legislation protecting plant breeders' rights. If States do allow patents on plants, they should establish research exemptions based on Article 30 of the TRIPS Agreement;**
- **Ensure an efficient diffusion of improved commercial varieties which can truly benefit poor farmers through adequate information on the characteristics of such varieties;**
- **Seek to overcome the problems of delayed or blocked access to needed research tools and plant material, and encourage innovative mechanisms such as patent pools, clearinghouses and open source experiments in order to overcome barriers to research on patented material, particularly where multiple patents exist on a same plant variety. States may wish to resort to compulsory licensing or the use of eminent domain doctrines where patents create obstacles to the development of varieties that can contribute to food security;**
- **Ensure that their seed regulations (seed certification schemes) and their programmes to support access to seeds do not lead to an exclusion of farmers' varieties. Instead, the development of such varieties should be encouraged by including efficient traditional seed varieties in government-approved seed lists as well as subsidized seed distribution programmes, as well as by participatory plant breeding and farmer field schools;**
- **Support and scale-up local seed exchange systems such as community seed banks and seed fairs, community registers of peasant varieties, and use them as a tool to improve the situation of the most vulnerable groups, i.e. through the granting to the poorest seedless farmers of seed vouchers which can be exchanged for seed at the fair. States should develop incentives for the wider use of food products made out of farmers' varieties in processing and marketing, or through public procurements schemes as in school-feeding programmes;**
- **Put in place mechanisms ensuring the active participation of farmers in decisions related to the conservation and sustainable use of plant genetic resources for food and agriculture, particularly in the design of legislation covering the certification and trade of seeds or the protection of plant varieties, so as to strike the right balance between the development of commercial and farmers' seed systems;**

- **Increase the resources allocated to public agricultural research and create new incentives for the private sector, in order to encourage research into the crops that benefit poor farmers in developing countries.**

Donors and international institutions, including CGIAR and FAO, should assist States in implementing the recommendations above. They should, in particular :

- **Support efforts by developing countries to establish a regime for the protection of IP rights which suits their development needs and is based on independent and participatory human rights impact assessments: (i) by refraining from imposing on these countries that they go beyond the minimum requirements of the TRIPs Agreement, particularly by the insertion of 'TRIPS-plus' provisions in free trade agreements ; (ii) by encouraging the provision of technical advice to developing countries that facilitates the adoption of sui generis systems for the protection of plant varieties, including by UPOV and WIPO, consistent with the status of WIPO as a specialized agency of the United Nations and with its Development Agenda, which impose a duty on WIPO to mainstream human rights into its activities and to enhance the development dimension of its activities; and (iii) by prohibiting the use of contractual clauses (technology use agreements) or genetic use restriction technologies (GURTs) in genetically-modified seeds by seed suppliers, in order to strengthen the protection of their privileges beyond the balance adopted by the legislator;**
- **Fund breeding projects on a large diversity of crops, including orphan crops, as well as on varieties for complex agro-environments such as dry regions and not only in breadbasket regions, in order to address the needs of the most vulnerable groups ;**
- **Put farmers at the centre of research through participatory research schemes such as participatory plant breeding;**
- **Channel an adequate proportion of funds towards research programmes and projects that aim at improving the whole agricultural system and not only the plant (agroforestry, better soil management techniques, composting, water management, good agronomic practices), as well as towards institutional innovations (such as community seed banks, seed fairs and farmer field schools).**