The role of the International Treaty on Plant Genetic Resources for Food and Agriculture

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INTRODUCTION

Crop diversity is essential for achieving food security and alleviating poverty. Farmers have always relied on crop genetic diversity to evolve patterns of production and respond to socio-economic and ecological changes.Plant genetic resources are the raw materials for breeding the next generation of crops to respond to the biotic and abiotic stresses brought about by climate change. Nations are already interdependent in terms of their crop diversity; all depend on the genetic diversity from other countries and regions. The world's agriculture is now dangerously reliant on a narrow genetic base of a limited number of food crops, as much of the crop diversity was permanently lost to the world in the last century. The International Treaty on Plant Genetic Resources for Food and Agriculture (International Treaty) has been established as a direct response to these global challenges.

This paper describes the relevance of the International Treaty for building resilience to climate change and introduces relevant work being undertaken by the Governing Body of the International Treaty. It focuses on the work of the Benefit-sharing Fund (BSF) of the International Treaty. More information about the BSF and its relevance to climate change adaptation can be found in the background study prepared by authoritative experts in 2010.[1]

The work of the International Treaty is complementary to other international efforts being made by FAO on managing agricultural biodiversity to respond to climate change.[2] Recently, the intergovernmental Commission on Genetic Resources for Food and Agriculture agreed on the need for a roadmap or work programme on climate change and genetic resources for food and agriculture based on the following four main elements:

[1] Expert advice on the second call for proposals, including a strategy and programme for the BSF. The paper contains a brief presentation of the professional and scientific background of each of the experts engaged by the Secretary (ftp://ftp.fao.org/ag/agp/planttreaty/funding/experts/bsf_exp_p01_en.pdf).

[2] In 2008, FAO organized a technical workshop on climate change and biodiversity for food and agriculture together with the Platform for Agrobiodiversity Research and the Secretariat of the Convention on Biological Diversity. The outputs of this workshop contributed to the High-Level Conference on World Food Security: the Challenges of Climate Change and Bioenergy (http://www.fao.org/foodclimate/expert/em8/en/).

strategies and policies; tools and technologies for genetic resources and climate change; forging partnerships; and monitoring progress.[3]

Climate change in agriculture: the unique role of plant genetic diversity

At least since the release of the 4th Report of the Intergovernmental Panel on Climate Change (IPCC) it is globally accepted that climate change is an unequivocal fact. Its impacts are already perceptible today and will intensify over the current century. According to the IPCC, the global average temperature will rise between 1.8 and 4 °C by the end of the century (compared with an increase of about 0.75 °C over the past century). Global and regional weather conditions will become more variable, with more frequent extreme events, expansion of areas with high climate variability and significant changes in precipitation patterns.

The impact of climate change on agriculture will vary from region to region. Generally, changes in precipitation and rising temperatures are likely to lead to increased incidence and intensity of weeds, pests and diseases in cultivated areas. Higher temperatures are expected to increase the length of the growing season and the total area suitable for cultivation in temperate latitudes, especially in Europe and North America. However, possible yield gains in these regions have to be set against losses owing to the spread of weeds, pests and diseases. Regions in lower latitudes will be most severely affected by a decline in land suitable for cultivation, especially sub-Saharan Africa and the Caribbean. In tropical and subtropical regions, extreme seasonal heat is expected to severely lower agricultural outputs.

Whatever the overall impact, one thing is clear: climate change will profoundly alter the present conditions of agriculture in almost all countries. Projections indicate that by 2050 many countries – making up about 35 percent of the global land area – will experience novel climates they have not been exposed to within their borders before. This suggests that climate change is happening so fast that crops and forage varieties in these areas are very unlikely to adapt to it on their own. Crops that have historically been doing especially well in a given region may no longer be of use and will have to be substituted by other crops: in many areas of sub-Saharan Africa, for example, where maize is a major staple food crop at present, the land may no longer be suitable for its cultivation by 2050.

Besides substituting and introducing new crops, there is an increasing urgency for adapting crop varieties to future climate conditions. The development of varieties with greater tolerance to drought, flooding and extreme temperatures, as well as resistances to pests and diseases, is key in the context of climate change. Because of the likelihood that climate change will result in future growing conditions beyond the parameters in which local crop diversity has developed, adaptation breeding will increasingly require access to appropriate crop genetic resources from outside national borders. Exchange of crop genetic material among countries is thus of paramount importance for climate change

[3] More information can be found in the Report of the Thirteenth Regular Session of the Commission on Genetic Resources for Food and Agriculture: http://www.fao.org/docrep/meeting/024/mc192e.pdf . The background documentation for the meeting can be accessed at: http://www.fao.org/nr/cgrfa/cthemes/climate- change/en/

adaptation. As future climate conditions are not entirely predictable, it is crucial to conserve as wide a spectrum of crop varieties as possible and to secure a genetic base that is in itself as broad as possible.

Once a crop variety or its wild relatives are extinct, its particular traits – which might become vital for future climate change adaptation – will be lost forever.

The interlinkages between crop diversity, food security and climate change

Crop diversity, food security and climate change are closely linked in diverse and complex ways. In fact, the world is facing a triple challenge that consists of countering the loss of crop diversity and using it more effectively to achieve and maintain food security under the growing pressures of climate change. Agricultural crop varieties, and the particular traits they contain, form the very base of our food security. In this sense, crop diversity is a precondition for food security, so the challenge of food security cannot be met if crop diversity is not conserved.

The challenge of food security consists of simultaneously lifting one billion people out of poverty and hunger while increasing global food production to meet the needs of a larger and wealthier world population. New plant breeding strategies will therefore have to aim at improving economic and environmental sustainability by developing crop varieties that produce higher yields with less use of expensive and potentially harmful industrial inputs. All of this will place increased demands on the availability of a wide range of crop genetic material.

While climate change is one of the drivers of crop diversity loss, it is also an important reason to conserve agricultural crop varieties, exchange them and use them in a sustainable way. The broader the genetic base our civilization can rely on, the better equipped it will be to adapt to changing climate conditions and to guarantee global food security. But there is urgency to act: whereas climate change is occurring at a fast pace, the process for breeding a new crop variety may take from seven up to 15 years.

The International Treaty

The International Treaty on Plant Genetic Resources (ITPGRFA) involves 126 Governments and the European Commission working together as Contracting Parties to use crop diversity for food security.

The International Treaty has established itself as the global leader in responding to the challenges of crop diversity preservation, global food security and climate change adaptation. It is in fact the only operational international agreement of a legally binding nature with the overall goal of achieving global food security through the management of crop diversity. The International Treaty provides an effective policy response to global challenges through:

- its comprehensive provisions providing guidance to countries regarding the measures and activities to be undertaken at the national level for the conservation and the sustainable use of crop diversity;
- its provisions on Farmers' Rights which aim at supporting farmers and local and indigenous peoples in conserving crop diversity on their farms;

- the Multilateral System that facilitates access to a global gene pool of crop genetic resources for agricultural research and breeding of new crop varieties that may achieve higher yields and nutritional values and that are adapted to new climate conditions; and,
- the Leading the Field initiative and its BSF that supports initiatives for the conservation and the sustainable use of crop diversity in developing countries, with a focus on helping ensure sustainable food security by assisting farmers adapt to climate change.

The following sections describe how the key operational systems of the International Treaty are supporting climate change adaptation.

THE MULTILATERAL SYSTEM OF ACCESS AND BENEFIT-SHARING TO PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE: RELEVANCE TO CLIMATE CHANGE ADAPTATION

Global interdependence with regard to plant genetic resources for food and agriculture (PGRFA) will increase as a result of climate change, and the wide, international exchange of agricultural genetic materials will become ever more necessary (see Fujisaka, Williams and Halewood, 2009). Many agroecological zones, and sometimes whole regions, will be unable to ensure food security with the crops and varieties they currently grow and will be forced to rely on resources from elsewhere, often from abroad. In turn, the resources these areas currently hold are likely to be of great importance for farmers in yet other areas (Burke, Lobell and Guarino, 2009). The International Treaty is an instrument that is uniquely designed to promote and facilitate such essential international germplasm exchanges.

With a fully operational multilateral system that has established an ever-expanding global gene pool of more than 1.2 million samples, the Treaty will continue to facilitate the exchange of the vital material needed to enhance farmers' resilience to climate change. In addition, the Treaty's implementation is supported by an extensive network of institutions in more than 127 countries, as well as with significant prior partnerships with FAO, CGIAR and the Global Crop Diversity Trust in support of Treaty implementation.

The gene pool of the multilateral system consists of samples of genetic material from a set of crops, which are listed in Annex 1 to the Treaty. Samples are included in the gene pool by the contracting parties to the Treaty (that is, the governments) and the institutions that they control. Samples also come into the gene pool from international institutions, such as the international gene banks of the Consultative Group on International Agricultural Research (CGIAR), as well as from natural and legal persons, i.e. anyone within the jurisdiction of the contracting parties. These samples are pooled in that they are administered under a common set of rules. These rules are contained in the Treaty and further specified in a contractual instrument, namely the Standard Material Transfer Agreement (SMTA). The rules apply to individual transfers of these samples (for example, from a gene bank to a breeder) for certain purposes, namely utilization and conservation for research, breeding and training for food and agriculture. The rules regulate not only how to obtain access to the plant genetic material but also how to share the results of research and breeding on that material.

In practice, the multilateral system works as a common pooling, distributing and benefit-sharing system for the genetic material that it covers. Access to such resources is facilitated in the sense that those who want to access the genetic material in the system do not need to negotiate access agreements on a case-by-case basis with national competent authorities. Instead, the resources are available to anyone who wants them under a standard contract, the SMTA. The use of the SMTA cuts out all the costs involved in the bilateral process, including the negotiations, legal contracts and other transactions, for the benefit of farmers and gene bank managers, who typically provide the genetic material, and for the plant breeders and researchers who typically seek access to this material to develop new climate-ready plant varieties.

As much as access is multilateral, so is benefit sharing. Since genetic material in the multilateral system is treated as pooled goods, there is no individual owner with whom individual contracts for access and benefit sharing must be negotiated. As such, benefits resulting from their use do not go back to the provider but, rather, must be shared in multilateral ways.

THE BENEFIT-SHARING FUND: "LEADING THE FIELD" IN CLIMATE CHANGE ADAPTATION

The International Treaty leads the "Leading the Field" initiative by creating a multilateral fund referred to as the BSF, supported by member governments, the private sector and international foundations. This multilateral fund is currently supporting high-impact projects aimed at keeping farmers ahead of the climate change challenge and food secure. The operation of the initiative is facilitated by the Treaty that issues a call for proposals supported by the Treaty's extensive network of National Focal Points in more than 126 countries.

The Governing Body, at its second meeting in 2007, identified three priority areas for support from the BSF (FAO, 2007), building on the Global Plan of Action for the Conservation and Sustainable Utilization of Plant Genetic Resources for Food and Agriculture:

- information exchange, technology transfer and capacity-building;
- managing and conserving plant genetic resources on farm; and
- the sustainable use of plant genetic resources.

Thematic focus

There is widespread agreement that one of the areas of greatest concern currently confronting agriculture is how to ensure sustainable food security in the face of climate change. The Declaration of the World Summit on Food Security (FAO, 2009), for example, states in paragraph 5:

> *"Climate change poses additional severe risks to food security and the agriculture sector. Its expected impact is particularly fraught with danger for smallholder farmers in developing countries, notably the Least Developed Countries (LDCs), and for already vulnerable populations. Any recipe for confronting the challenges of climate change must allow for mitigation options and a firm commitment to the adaptation of agriculture, including through the conservation and sustainable use of genetic resources for food and agriculture."*

Following the World Food Summit, at the invitation of the Italian Government, international experts met in Bari, Italy, in December 2009, at a Policy Seminar on the International Treaty on Plant Genetic Resources for Food and Agriculture: Global Challenges and Future Direction. The participants stressed the importance of PGRFA in responding to food security challenges resulting from climate change. Because of the importance and urgency of taking steps to help agriculture adapt to climate change, the Seminar recommended that the BSF should, in the near future, focus on climate change adaptation and plant genetic resources.

These recommendations are also consistent with the First Assessment Report of the IPCC (IPCC-FAR), which indicated, albeit without much detail, the need for, and possibilities of, breeding improved varieties of key staple crops to help meet the impact of climate change (Easterling *et al*., 2007). A recent publication by Lobell (2009) reported that there is a growing consensus among agriculturalists that the development of new varieties will be critical for successful adaptation to climate change.

In this context, the Bureau of the Governing Body of the International Treaty requested the Secretary to seek expert advice on a strategy and programme for the BSF. This expert advice, which was the basis for the Call for Proposals 2010 of the BSF, was prepared by a team of leading international authoritative experts in the fields of genetics and climate change (see footnote 1).

The high-level experts agreed that the major thematic focus of the BSF, at least over the coming years, should be on the conservation and use of PGRFA to help ensure food security in the face of climate change. Notwithstanding the concerns cited above, to date relatively little attention has been given to this subject nationally or internationally and there is only limited scientific information on the topic. The IPCC-FAR assessment provided only scant information on the impact of climate change on genetic resources and on the role of genetic resources in helping agriculture adapt to climate change.[4] While the Copenhagen Climate Summit recognized the relationship between climate change and agriculture and food security, no major international programme has yet been mounted to counter the threat. The field is thus wide open and much remains to be done. It is, therefore, highly appropriate that the BSF should take a leading role in initiating a major global programme to address this issue, in particular focusing on the use of genetic resources in helping agriculture to adapt to climate change for the benefit of the most vulnerable farmers and rural populations.

The experts recognized that the International Treaty, because of its mandates and operational systems, is exceptionally well placed in the international policy landscape to create such a programme, but it cannot act alone or in isolation. The work needs to be carried out through close collaboration with a wide range of stakeholders and partner organizations – and fortunately there are substantial opportunities for such cooperation. While, in line with the Governing Body's priorities, the primary beneficiaries of the programme should be vulnerable farmers and rural communities in developing countries, and a principal focus

[4] It has been suggested that the International Treaty might consider commissioning a review of the scientific evidence relating climate change with PGRFA and make this available as an input to the 5th IPCC Assessment Report.

should be at the local and national levels, it will also be important to work with regional and international partners who bring similar and complementary resources and skills to address the problem. Potential partner institutions at the international level include, for example, the United Nations Framework Convention on Climate Change (UNFCC), the United Nations Development Programme (UNDP) and the Convention on Biological Diversity (CBD) as well as the CGIAR centres, the Program on Climate Change, Agriculture and Food Security (CCAFS). Furthermore the Global Crop Diversity Trust is already funding climate change activities in relation to ex-situ conservation and there is a large potential for developing integrated and coordinated activities linking ex-situ conservation to use and in-situ conservation, funded through close collaboration between the Trust and the BSF.

Implementation of the thematic focus

Enabling farmers to adapt to climate change is a medium- and long-term activity that requires the development and regular update of strategic plans and, based on these, the proactive development of the means to adapt, before irreversible disasters occur. Activities should not be piecemeal, but conceived and implemented within the framework of overarching strategies. Such a strategic approach would also greatly facilitate the mobilization of the necessary financial resources by the Treaty, and provide the basis for the development of cooperation between the Treaty and other relevant funds, institutions and programmes.

The BSF is operating in two overlapping phases: first, the development of overarching strategic plans and second, a role-out, or implementation phase. The first phase (that would occur in parallel with some initial 'quick win' projects) would fund, through projects, analyses of the challenges posed by climate change and opportunities for meeting these challenges, through the development of spatially appropriate priorities, strategies and action plans. The second phase would fund specific projects to implement these strategies and priorities. The strategic plans should provide the framework in which activities supported by the BSF can be developed and future Calls for Proposals articulated.

It is likely that applicants will both require, and seek, some kind of technical support to assist them to develop proposals, especially with regard to development of strategic plans. It would thus be highly desirable for the Treaty Secretariat to draw upon existing institutions and programmes that support the implementation of the Treaty to facilitate technical assistance and coaching through a Help Desk function to applicants, upon request.

Strategic plans

While much of the individual action within projects is expected to be targeted locally and nationally, in order to capture synergies and complementarities, and recognizing the shift of agro-ecological zones that will occur with climate change, strategic plans should set out clear priorities and action plans on a regional, subregional, ecoregional, or other basis.[5] For example, strategic plans could focus on agro-ecological zones, such as the marginal dry lands of the sub-Saharan Africa region, southern Africa, tropical mountain areas or Asian flood

[5] This might include, for example, strategic plans formulated on the basis of specific crops or crop group (cereals, food legumes, vegetables, etc.).

plains and coastal saline areas – all areas where the IPCC-FAR has predicted major disruptions will occur as a result of climate change (Parry *et al*., 2007). A pragmatic approach that makes it possible for relatively large-scale integrative strategies to be developed, and within which groups of potential recipients can jointly find a role, will be needed.

The BSF is, at least initially, aiming to fund the development and implementation of strategic plans through existing national, regional and international institutions, through existing national and regional networks where these are effective, or through encouraging the creation of new consortia or other multistakeholder groupings. The identification of coherent and representative recipient groups to carry out the work, with clearly defined roles and responsibilities agreed among the partners concerned, should be a priority for the BSF. It is expected that in many cases these consortia or multistakeholder groups would continue in existence beyond the development of the strategic plans and have a role in their implementation.

Ideally these strategic plans are integrated or coordinated with broader local, regional, national and international agriculture and/or climate change adaptation strategies and action plans. They would be implemented as part of broader approaches to low emission, climate resilient development. This would have the advantage of leveraging synergies in both action and financial resources.

Implementation/immediate action projects

Projects to implement the strategic plans should involve multiple stakeholders from different sectors. Most projects are expected to be international in scope and may involve institutions and individuals from several countries and from local, national and international organizations.

In order to have the desired impact, implementation projects are substantially larger and more comprehensive than the 11 small-scale projects supported in the first cycle.[6] Target beneficiaries and the expected outputs and outcomes of the projects should be identified and impact pathways and milestones, including verifiable indicators of success, should be made clear from the outset.

Given the importance of the materials developed as a result of investment by the BSF, all such material arising from projects funded by the BSF, including any that are not included in Annex 1 or Article 15 of the Treaty, should be made available through the multilateral system of access and benefit sharing under the International Treaty.

Implementation/immediate action projects supported in this next round demonstrate, in addition to the selection criteria approved by the Governing Body:

a) that they address the major goal of achieving sustainable food security through the conservation and use of PGRFA to assist farmers to adapt to climate change;
b) that they have the potential for a short-term impact (‘quick win’);
c) that they respond to a clear priority need, as expressed through already existing strategies or plans; and
d) that they are country-driven and demonstrate a clear engagement with, and participation by, relevant stakeholders.

[6] See ftp://ftp.fao.org/ag/agp/planttreaty/gb3/gb3i11e.pdf

Current project portfolio of the Benefit-sharing Fund: Call for Proposals 2010

Following the expert advice, a unique global competitive process was launched by the Bureau of the Governing Body of the Treaty to select a portfolio of projects based on quality and technical merit. More than 300 institutions participated in the competition and an independent Panel of Experts undertook the appraisal of more than 100 full proposals. The Panel consists of independent regional experts selected from a roster of experts on plant genetic resources, climate change adaptation and rural development.[7]

The Benefit-sharing Fund is now disbursing around USD6 million in projects approved for immediate funding from the Benefit-sharing Fund. There are 14 country projects and five multicountry projects approved, in 34 countries participating in four FAO Regions (Africa, Asia, Latin American and Caribbean countries, Near East). The project portfolio promotes innovative planning and adaptive solutions for the intertwined challenges of food insecurity, climate change and biodiversity loss. This portfolio will enable the Treaty to generate a unique global understanding on key priorities for training, capacity building and technology transfer in the sustainable use of the crop diversity that feeds the world and will make agriculture resilient to climate change.

Projects support vulnerable farmer and rural communities in at least one of the following geographic areas:

- centres of origin or diversification of cultivated plants;
- areas with high levels of rural poverty or food insecurity of targeted countries;
- regions where climate change is severely affecting food security and agriculture in the next decades.

Examples of non-profit groups being funded include:

- governmental: the national biodiversity centre of Bhutan and the Indonesian biotechnology centre;
- partnerships: among universities, non-governmental organizations (NGOs) and an international research centre in Near East (Syrian Arab Republic, Jordan, Iran) and Africa (Ethiopia);
- non-governmental: a community-based platform working in 11 countries or a local NGO working with smallholder farmers in Guatemala.

CONCLUSIONS

Given its potential to contribute to coping with climate change, the sustainable management of biodiversity for food and agriculture should be made a basic component of strategies dealing with climate change adaptation in the rural sectors. Still, biodiversity for food and agriculture and climate change have rarely been discussed in the same context. There is a need to improve cooperation between the United Nations Framework Convention on Climate Change and relevant biodiversity forums, such as the International Treaty.

The International Treaty that has been established as a direct response to global challenges such as climate change is now a fully operational global system. It provides

[7] For more information on the Panel of Experts see: http://www.itpgrfa.net/International/content/members-panel-experts-call-proposals-2010

multilateral mechanisms for facilitating access to the genetic diversity needed to enable climate change adaptation and for enabling benefit sharing directed to address global challenges through local impact. The Treaty provides a unique policy forum of the United Nations to advance international cooperation in the conservation, exchange and use of the crop diversity so crucial to feed the world at a time of climate change.

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