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GENETIC RESOURCES FOR FOOD AND AGRICULTURE AND THE INTERNATIONAL CLIMATE CHANGE POLICY AGENDA

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I. INTRODUCTION: INTERNATIONAL POLICY INSTRUMENTS ADDRESSING CLIMATE CHANGE

1. This paper examines the international policy landscape for addressing climate change and the extent to which genetic resources for food and agriculture (GRFA) – including the genetic diversity of crops, livestock, forests, fish/aquatic genetic resources, micro-organisms and invertebrates – are considered within the climate change policy agenda.

2. Although the problem of climate change was identified as early as the nineteenth century, the issue did not appear on the international scientific and political agenda until the first World Climate Conference convened in 1979 (Gupta, 2010). In 1991, in anticipation of the Rio Earth Summit, the UN General Assembly established the Intergovernmental Negotiating Committee to oversee negotiations towards an international agreement on climate change. In 1992, the Rio Earth Summit adopted the United Nations Framework Convention on Climate Change (UNFCCC), as well as the Convention on Biological Diversity (CBD). With momentum building for collective global action on climate change, parties to the UNFCCC took steps to accelerate the implementation process by continuing the meetings of the Intergovernmental Negotiating Committee until the treaty was ratified and entered into force on 21 March 1994.

3. The UNFCCC was the first major milestone in the history of climate diplomacy and is the primary instrument for long-term cooperative action on climate change (see Annex 1 of this document). The ultimate objective of the UNFCCC is to stabilize greenhouse gas (GHG) concentrations at levels that will prevent dangerous, human-induced climate change. The first addition to the Convention, the Kyoto Protocol (adopted in 1997, entered into force on 16 February 2005), sets legally binding targets for 37 industrialized countries and the European community for reducing emissions of six GHGs.¹ The work of the UNFCCC is introduced in more detail in Section 2 below.

4. The Intergovernmental Panel on Climate Change (IPCC) is the leading intergovernmental body for the scientific assessment of climate change. The IPCC was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO).

5. In addition to UNFCCC, two UN Conventions emerging from the Rio Earth Summit have adopted decisions or programmes of work related to climate change and biodiversity/genetic resources. The CBD is an international legally binding treaty that was adopted at the Rio Earth Summit in 1992 and entered into force on 29 December 1993. The objective of the CBD is 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. The UN Framework Convention to Combat Desertification (UNCCD) was adopted in Paris in 1994 and entered into force in 1996. The objective of the UNCCD is to combat desertification and mitigate the effects of drought in countries experiencing serious drought and/or desertification, particularly in Africa, through effective action and international cooperation at all levels, with the aim of achieving sustainable development in affected areas.

6. A Joint Liaison Group (JLG) between the secretariats of the CBD, UNCCD and UNFCCC was established in 2001 with the aim of enhancing coordination between the three Conventions. The JLG is addressing adaptation to climate change as a focus of joint activities and working to enhance synergies in this area. The overall goal is to increase synergies in the common areas of climate change adaptation, combating desertification, and biodiversity conservation and sustainable use. The coordinated work of the JLG does not have an explicit focus on GRFA and climate change. The work of the CBD is introduced in more detail in Section 2.

7. The Committee on World Food Security (CFS) is the central international and intergovernmental platform for food security and nutrition. In October 2009, as an essential element in the reform of the CFS, the High Level Panel of Experts for Food Security and Nutrition (HLPE) was created, as an independent advisory body, to assess and analyse the current state of food security

¹ Kyoto Protocol To The United Nations Framework Convention On Climate Change.
<http://unfccc.int/resource/docs/convkp/kpeng.pdf>

and nutrition and its underlying causes. The HLPE is entrusted by the CFS to provide scientific and knowledge-based analysis on specific policy-relevant issues.

8. At its 36th Session (11–16 October 2010) the CFS requested that the HLPE undertake a study on climate change and food security. Specifically, the HLPE was asked to “review existing assessments and initiatives on the effects of climate change on food security and nutrition, with a focus on the most affected and vulnerable regions and populations and the interface between climate change and agricultural productivity, including the challenges and opportunities of adaptation and mitigation policies and actions for food security and nutrition.”² It will report at the 37th Session of the CFS in October 2011.

9. The legally binding International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), negotiated by the Commission on Genetic Resources for Food and Agriculture, entered into force on 29 June 2004. Its objectives are the conservation and sustainable use of plant genetic resources for food and agriculture (PGRFA) and the fair and equitable sharing of benefits derived from their use, in harmony with the CBD. Through the ITPGRFA, contracting parties agree to a multilateral system for facilitating access to PGRFA and sharing the benefits in a fair and equitable way. Although the text of the ITPGRFA does not include the words “climate change” – its Benefit-Sharing Fund strives to help farmers achieve sustainable food security and adapt to climate change by supporting *in situ* conservation of GRFA in developing countries. The Fund has received official recognition as an Adaptation Funding Mechanism under the Adaptation Funding Interface of the UNFCCC.³ At its Fourth Meeting in March 2011 the Governing Body of the ITPGRFA approved the dedication of US\$10 million for the second round of funding projects. The Benefit-sharing Fund aims to mobilize US\$116 million by December 2014.

10. Multilateral bodies and initiatives that discuss climate change outside the UN system include the Major Economies Forum on Energy and Climate (MEF)⁴ and the G-20,⁵ but neither is constituted as a forum for negotiation on climate change and policy implementation, nor have they addressed GRFA. Initiatives that fall under the category of private governance of climate change are not considered within this report.⁶

II. UNFCCC, IPCC AND CBD – AN OVERVIEW

The United Nations Framework Convention on Climate Change

11. The UNFCCC is the primary instrument for long-term cooperative action on climate change. It entered into force on March 21 1994. With 194 Parties, the UNFCCC has near universal membership. Its Secretariat is based in Bonn, Germany. The Convention’s core objective is to achieve “... stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.”⁷ Parties to the Convention strive to achieve this objective “within a time-frame sufficient to allow ecosystems to adapt naturally to

² CFS:2010/ FINAL REPORT, October 2010.

³ http://unfccc.int/adaptation/implementing_adaptation/adaptation_funding_interface/items/5736.php

⁴ The Major Economies Forum on Energy and Climate (MEF) was launched by President Barack Obama of the United States of America in March 2008. The Forum was established to facilitate dialogue among major developed and developing economies in advance of the UN climate change conference in Copenhagen. The 17 major economies participating in the Major Economies Forum include: Australia, Brazil, Canada, China, the European Union, France, Germany, India, Indonesia, Italy, Japan, Mexico, the Republic of Korea, the Russian Federation, South Africa, the United Kingdom, and the United States of America.

⁵ The Group of Twenty (G-20) Finance Ministers and Central Bank Governors was established in 1999 to bring together important industrialized and developing economies to discuss key issues in the global economy. The inaugural meeting of the G-20 took place in Berlin in December 1999. Energy Security and Climate Change is one of the G-20’s areas of work.

⁶ Private governance can take several forms, including self-regulation by private sector firms and non-state actors; creation and operation of carbon markets outside of the international climate regime; private regulation through codes of conduct, standards or certification.

⁷ UNFCCC, Article 2.

climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner.”⁸

12. **Guiding Principles:** The UNFCCC recognizes that industrialized countries are the source of most past and current GHG emissions. Under the principle of “common but differentiated responsibilities”, the Convention places the heaviest burden for fighting climate change on industrialized nations.⁹ Article 3.1 of the Convention states that “developed country Parties should take the lead in combating climate change and the adverse effects thereof.”¹⁰ Parties to the Convention agree to develop national programmes to slow climate change, and take climate change into account in sectors such as agriculture, industry, energy, natural resources and coastal areas. Acknowledging that developing countries are especially vulnerable to climate change impacts, industrialized nations agree to provide financial support to ease the consequences of climate change – above and beyond any financial assistance they already provide to developing countries. A system of grants and loans, though limited, has been set up through the Convention and is managed by the Global Environment Facility (GEF). Industrialized countries also agree to share technology with developing nations. The UNFCCC acknowledges that the share of GHG emissions produced by developing nations will grow in the future and it seeks to help such countries limit emissions in ways that will not compromise their economic progress. As a framework convention, the UNFCCC is designed to evolve with new and updated information that enables Parties to incrementally develop policies and strategies to address climate change.

UNFCCC Party groupings:

Annex I Parties include industrialized countries (original members of the Organization for Economic Co-operation and Development), plus 14 countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States.

Annex II Parties consist of the OECD members of Annex I, but not the EIT Parties. They are required to provide financial resources to enable developing countries to undertake emissions reduction activities under the Convention and to help them adapt to adverse effects of climate change. In addition, they have to “take all practicable steps” to promote the development and transfer of environmentally friendly technologies to EIT Parties and developing countries. Funding provided by Annex II Parties is channelled mostly through the Convention’s financial mechanism.

Non-Annex I Parties are mostly developing countries. Certain groups of developing countries are recognized by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others include countries that depend on income from fossil fuel production/trade. The Convention emphasizes activities that respond to the special needs and concerns of these vulnerable countries, such as investment, insurance and technology transfer. The Convention gives special consideration to the 49 countries classified as **least developed countries** (LDCs) because of their limited capacity to respond to climate change and adapt to its adverse effects.

13. **The Kyoto Protocol:** The first addition to the treaty, the Kyoto Protocol (adopted in 1997, entered into force on 16 February 2005), sets legally binding targets for 37 industrialized countries and the European community for reducing emissions of six GHGs by an average 5.2 percent for the target period 2008 to 2012.¹¹ The Kyoto Protocol was adopted as the first step towards a global emissions reduction regime to stabilize GHG emissions (the Protocol’s first commitment period began in 2008 and expires at the end of 2012). As of January 2011, the Kyoto Protocol has been ratified by 191 of the UNFCCC Parties.

⁸ UNFCCC, Article 2.

⁹ UNFCCC, Article 4.

¹⁰ <http://unfccc.int/resource/docs/convkp/conveng.pdf>

¹¹ Kyoto Protocol To The United Nations Framework Convention On Climate Change (<http://unfccc.int/resource/docs/convkp/kpeng.pdf>).

14. Under the UNFCCC, industrialized countries agree to meet emission reduction targets primarily through national-level measures. The Kyoto Protocol offers three additional mechanisms for governments to meet their targets. These market-based mechanisms include:

- emissions trading – known as “the carbon market”¹²
- clean development mechanism (CDM)¹³
- joint implementation (JI).¹⁴

15. Under the Kyoto Protocol, only industrialized countries (so-called Annex 1 countries) are bound by mandatory emission reduction targets. So-called “emerging emitters”, such as China and India, are not bound by mandatory reductions – an issue that has proved controversial for some Parties in climate change negotiations. Notably, in 2001, the United States of America withdrew from the Protocol.

16. **UNFCCC structure and subsidiary bodies:** The Climate Change Secretariat based in Bonn, Germany serves both the UNFCCC and the Kyoto Protocol. The Conference of the Parties to the UNFCCC (COP) is the highest governing body of the Convention; the Meeting of the Parties to the Kyoto Protocol (CMP) is the highest governing body of the Kyoto Protocol. The COP and CMP hold parallel meetings at least once per year. The intergovernmental negotiation process at UNFCCC takes place in the COP and CMP, and in meetings of two ad hoc working groups:

- i) Since 2006, the **Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol** (AWG-KP) has been discussing post-2012 emission reduction commitments for industrialized countries under the Kyoto Protocol.
- ii) **The Ad Hoc Working Group on Long-term Cooperative Action** (AWG-LCA) was established by the COP/CMP in 2007 as part of the “Bali Action Plan.”¹⁵ The Plan launched a comprehensive process to enable full implementation of the Convention through long-term cooperative action, with a mandate to focus on key elements – mitigation, adaptation, finance and technology transfer– up to and beyond 2012. The mandate of the AWG/LCA was extended by COP 16 in Cancún.

The Convention has established two permanent subsidiary bodies:

- i) **The Subsidiary Body for Scientific and Technological Advice (SBSTA)** provides advice to the COP on scientific, technological and methodological matters. It promotes the development and transfer of low-carbon technologies, and conducts technical work to improve the guidelines for national communications and GHG inventories.
- ii) **The Subsidiary Body for Implementation (SBI)** focuses on all matters related to the implementation of the Convention. Using information submitted by Parties (national communications and GHG emission inventories) the SBI reviews steps taken by each Party to implement its commitments and thus assesses the Convention’s overall effectiveness.

17. **Recent milestones in the UNFCCC process:** In 2007, COP 13 in Indonesia adopted the **Bali Action Plan** – a comprehensive process and timetable to promote full implementation of the Convention through long-term cooperative action, with a mandate to focus on key elements –

¹² A mechanism through which an Annex I Party (developed country) may transfer Kyoto Protocol units to or acquire units from another Annex I Party. An Annex I Party must meet specific eligibility requirements to participate in emissions trading.

¹³ A mechanism through which Annex I Parties may finance GHG emission reduction or removal projects in developing countries and receive credits (sometimes called “carbon offsets”) for doing so, which they may use towards meeting mandatory limits on their own emissions.

¹⁴ A mechanism through which an Annex I Party can receive “emissions reduction units” when it helps to finance projects that reduce net GHG emissions in another developed country (in practice, the recipient state is likely to be a country with an “economy in transition”).

¹⁵ Decision 1/CP.13 (the Bali Action Plan).

mitigation,¹⁶ adaptation,¹⁷ finance, technology, capacity building and forests – and to develop the parameters of a second commitment period of the Kyoto Protocol beyond 2012.

18. Despite enormous expectations, the December 2009 climate conference in Copenhagen (COP 15) was marred by disputes over transparency and process, and deep divisions between developed and developing countries. Ultimately, the COP “took note” of a non-binding, non-consensus statement of intent, the **Copenhagen Accord**, that contained no binding GHG reduction commitments by industrialized countries – and no assurance that the Kyoto Protocol would continue.

19. **Cancún Climate Conference:** Expectations were considerably lower when the UNFCCC/Kyoto Protocol Climate Conference convened in Cancún, Mexico (COP 16/CMP¹⁸), 30 November to 12 December 2010. Deep divisions persisted between the positions of some developed and developing countries. Ultimately, Parties meeting in Cancún revived the multilateral process and agreed to continue negotiations under the Kyoto Protocol (UNFCCC, 2010a). Negotiations focused on building essential architecture to advance some of the key elements of the Bali Action Plan, including mitigation, adaptation, finance, technology transfer and forests. The Cancún Agreements (UNFCCC, 2010a; UNFCCC, 2010b) include a number of substantive outcomes:

- The actions of developing countries to reduce emissions are formally recognized under the UNFCCC process. A registry will be set up to record developing-country mitigation actions and to match them with enhanced financial and technological support provided by industrialized countries.
- Industrialized countries confirm their pledge of a total of US\$30 billion in fast-start finance to support climate action in the developing world up to 2012, with a balanced allocation between adaptation and mitigation. Funding for adaptation will be prioritized for the most vulnerable developing countries. Developed countries commit, in the context of meaningful mitigation actions, to a goal of mobilizing collectively \$100 billion per year by 2020 to address the needs of developing countries.
- Recognition of the need for enhanced action on adaptation activities, and the establishment of a process to create a Green Climate Fund to provide new multilateral funding for adaptation and mitigation. The board of the Green Climate Fund will have equal representation from developed and developing countries. The COP invites the World Bank to serve as interim trustee of the Fund.
- REDD+: Agreement to boost action to curb emissions from deforestation and forest degradation in developing countries. UNFCCC is negotiating policy approaches and positive incentives for developing countries that contribute to climate change mitigation through reducing emissions from deforestation and forest degradation, conservation and enhancement of forest carbon stocks and sustainable management of forests. UNFCCC agreed on a set of safeguards to avoid negative impacts of REDD+ actions on the livelihoods of indigenous and local peoples and on biodiversity. (See discussion of REDD+ below.)
- The establishment of a Technology Mechanism, including a Climate Technology Centre and Network, to facilitate enhanced action on technology development and transfer in support of mitigation and adaptation activities.

¹⁶ In the UNFCCC context, mitigation refers to a human intervention to reduce the sources or enhance the sinks of greenhouse gases (http://unfccc.int/essential_background/glossary/items/3666.php).

¹⁷ In the UNFCCC context, adaptation refers to adjustment in natural or human systems in response to actual or expected climatic changes or their effects, which moderates harm or exploits beneficial opportunities (http://unfccc.int/essential_background/glossary/items/3666.php).

¹⁸ The Cancún meeting is known officially as the sixteenth Conference of the Parties (COP) and the sixth Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP), as well as the thirty-third sessions of both the Subsidiary Body for Implementation (SBI) and the Subsidiary Body for Scientific and Technological Advice (SBSTA), and the fifteenth session of the AWG-KP and thirteenth session of the AWG-LCA.

The Intergovernmental Panel on Climate Change (IPCC)

20. The IPCC is the leading intergovernmental body for the scientific assessment of climate change; it was established in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO). As a scientific body, IPCC reviews and assesses the most recent scientific, technical and socio-economic information produced worldwide relevant to the understanding of climate change. Since 1990, hundreds of scientific experts from all over the world have contributed to the preparation of IPCC reports as authors or reviewers. IPCC has published four major assessment reports; the fifth will be published in 2013.

21. At the request of the CBD, the IPCC published a technical report entitled *Climate change and biodiversity* in April 2002 (UNFCCC, 2002). None of the assessment reports to date have included in-depth discussion of the implications of climate change for biodiversity at the genetic level. However, the impacts of climate change on biodiversity loss – including crop, fish/aquatic, forest and livestock – have been mentioned in the published volumes. The 4th Assessment, Working Group II, includes a chapter on food, fibre and forest products (Easterling, 2007); Working Group III prepared a chapter on agriculture (Smith, 2007).

The Convention on Biological Diversity

22. The CBD is an international legally binding treaty that was adopted at the Rio Earth Summit in 1992 and entered into force on 29 December 1993. The objective of the CBD is 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. The scope of the CBD's work – the diversity of life on earth – includes “diversity within species, between species and of ecosystems.”¹⁹ As of February 2010, 193 governments are Parties to the CBD. The Conference of the Parties (CBD COP) usually meets biennially. The CBD Secretariat is based in Montreal, Canada, and operates under the UN Environment Programme.

23. **The CBD's Cartagena Protocol on Biosafety** covers the safe transfer, handling and use of living modified organisms – including transboundary movement of genetically modified animals and products derived from them. The Cartagena Protocol was adopted in January 2000 and entered into force in September 2003.

24. In October 2010 the governing body of the Cartagena Protocol on Biosafety adopted **The Nagoya–Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety**. The Supplementary Protocol provides international rules and procedure on liability and redress for damage to biodiversity resulting from living modified organisms. The new treaty is open for signature and will enter into force 90 days after being ratified by at least 40 Parties to the Cartagena Protocol on Biosafety.

25. **The Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity** was adopted at the tenth CBD COP in October 2010, in Nagoya, Japan. The Nagoya Protocol sets terms for how countries will permit access to genetic resources, share the benefits arising from their use, and cooperate with one another in the event of allegations of misuse. The Protocol is open for signature by Parties and will come into force 90 days after it has been ratified by at least 50 Parties. With regard to GRFA, the Protocol recognizes pre-existing norms for access and benefit sharing established by the ITPGRFA. The Nagoya Protocol explicitly creates space for the development of future specialized access and benefit-sharing regimes that are consistent with the objectives of the CBD and the Protocol.

26. The CBD's **Subsidiary Body on Scientific, Technical and Technological Advice** (SBSTTA) is a committee of experts from member governments that gives timely advice and makes recommendations to the CBD COP on scientific, technical and technological issues.

¹⁹ Convention on Biological Diversity, Article 2. <http://www.cbd.int/convention/articles/?a=cbd-02>

III. INTERNATIONAL CLIMATE CHANGE POLICY PROCESSES AND GENETIC RESOURCES FOR FOOD AND AGRICULTURE

27. The following section examines the extent to which GRFA have been considered under existing climate change policy processes. It provides a general overview of GRFA under the UNFCCC and the CBD, and then examines how each sector of GRFA has been addressed (in the context of climate change policy) under these conventions.

Overview: GRFA and the UNFCCC process

28. GRFA have received little explicit consideration within the UNFCCC process. Forests have been discussed in the context of mitigation-related activities, primarily under REDD (reducing emissions from deforestation and forest degradation). However, there is no explicit reference to forest genetic resources (see discussion in the following section on forests and UNFCCC). Similarly, crop and livestock genetic resources, aquatic genetic resources, invertebrates and soil micro-organisms have been largely absent from the UNFCCC policy debate.

29. The lack of recognition for GRFA is due, in part, to the Convention's emphasis on mitigation activities; efforts to reduce GHGs have historically played a central role in the UNFCCC process. A modest Adaptation Fund was established under the Kyoto Protocol, but it did not become operational until 2009. In the view of some observers, adaptation – and funding to support these activities – was initially viewed as a lower priority because it was assumed that climate change impacts would emerge slowly and that adaptation measures could be managed at the national or local level (Burton, 2008).

30. Recent years have seen a shift in decision-making at UNFCCC towards greater recognition of adaptation (i.e. activities that aim to reduce vulnerability and build resilience in developing countries) and new funding mechanisms to support them. This shift comes in response to growing awareness that: 1) climate change impacts transcend national boundaries; 2) climate change impacts are serious, widespread and advancing more quickly than anticipated; and 3) minimal progress has been achieved in reducing emissions of GHGs and stabilizing GHG concentrations in the atmosphere (Burton, 2008). Under the 2007 Bali Action Plan, adaptation became one of four pillars – together with mitigation, finance and technology – in combating climate change. In the Cancún Agreements adopted by the 2010 Climate Change Conference, Parties to the UNFCCC affirmed that adaptation must be addressed with the same level of priority as mitigation (see further discussion below).²⁰

31. **Agriculture under the UNFCCC:** Although soils represent the earth's largest carbon sink that can be controlled and improved, consideration of the agricultural sector has been slow to develop within the UNFCCC process. And despite the fact that agriculture is the mainstay of livelihoods for a majority of the world's poor, agriculture and food security have not appeared in negotiating texts at UNFCCC until recently, and then only in a fragmented manner. In the Cancún Agreements adopted by COP 16/CMP 6 in December 2010, agriculture and food security is referenced only in a footnote (see discussion below). Although agriculture is a major driver of deforestation, discussions on land use, land-use change and forestry have been dominated by forestry. Under current rules, project activities implemented in agricultural, forestry and other land-use sectors are limited to narrowly defined afforestation/reforestation activities.

32. According to some observers, the low profile of agriculture and development at the Convention stems, in part, from its origins as an environmental treaty. Initially, climate change was viewed primarily as an “environmental” issue. Government delegates typically came from environmental ministries and meteorology departments, with relatively little background in agriculture and development (Ensor and Berger, 2009). As one scholar of climate governance notes: “... the Convention [UNFCCC] sees climate change clearly more as an environmental rather than a development issue, more as an economic and technological challenge rather than as a social and political issue...” (Gupta, 2010, p. 642). In general, climate change did not feature as a central issue in mainstream development circles until the early part of the twenty-first century (Ensor and Berger, 2009). In addition, the agricultural community “has only recently become active in the discussions

²⁰ http://unfccc.int/adaptation/cancun_adaptation_framework/items/5852.php

and negotiations of international climate change policies that could have profound impacts on the sector” (FAO, 2010a, p. 18).

33. The Clean Development Mechanism (CDM) established by the Kyoto Protocol is the principal financing and investment instrument to support GHG mitigation projects in developing countries. Although soil carbon sequestration represents 89 percent of agriculture’s mitigation potential (Smith, 2007), soil carbon sequestration is not eligible through the CDM. Barriers to including carbon sequestration in soils have been mainly technical, relating to disagreements and difficulties in the development of accounting methodologies (FAO, 2009b). As of August 2010, approximately 4.5 percent of all registered CDM projects were designated as relating to agriculture, but these mainly address bioenergy through the use of agricultural residues, biofuels from crops and manure management (FAO, 2010a).

34. In the view of some experts, the CDM may be structurally limited in its ability to meet the needs of some developing countries to realize agricultural mitigation projects. A recent report observes:

“CDM’s project-based and offset approaches may be inadequate to generate the breadth and scale of incentives required for agricultural mitigation. CDM incentives appear too weak to stimulate transformation in the economy and have not enabled developing countries to move towards low-emission development pathways that do not threaten economic growth. CDM projects also tend to have high transaction costs for many developing countries, long approval periods and a narrow geographic spread” (FAO 2010a, p. 28).

35. **Agriculture-related NAPAs and NAMAs:** The low profile of the agricultural sector within UNFCCC mitigation financing mechanisms stands in contrast to the recent interest shown by developing countries in agricultural-related mitigation and adaptation projects at national level, as expressed through the National Action Programmes for Adaptation (NAPAs), and the Nationally Appropriate Mitigation Actions (NAMAs) submitted by developing countries. For example, developing country interest in agricultural activities was apparent when the Copenhagen Accord called on developing countries to inform the UNFCCC Secretariat of NAMAs. While many Parties did not respond, of the 35 submissions received from developing countries as of April 2010, 15 explicitly stated plans to adopt mitigation actions in the agricultural sector (FAO, 2010b).²¹

36. In the area of *adaptation* actions, a number of least developed countries (LDCs) have identified agriculture and food security projects as priority activities for enhancing national-level adaptive capacity to climate variability. NAPAs provide a process through which LDCs can identify priority activities that respond to their urgent and immediate needs for adaptation to climate change. The Least Developed Countries Fund was established as a financial mechanism under the UNFCCC to assist LDCs prepare and implement NAPAs.²² As of November 2010, 45 LDCs had prepared and submitted NAPAs to the UNFCCC Secretariat. Although there is no sector-specific area designated as “agricultural genetic resources”, 17 of the 45 LDCs that submitted NAPAs identify a total of 19 adaptation projects related to use of crop, livestock or marine genetic resources. A summary of the NAPA projects that identify genetic resources-related adaptation activities appears in Annex 2. Adaptation activities related to GRFA were identified by the following countries: Bangladesh, Burundi, Central African Republic, Comoros, the Democratic Republic of the Congo, Eritrea, Guinea,

²¹ <http://unfccc.int/home/items/5265.php>

²² Decision 3/CP.11.

Guinea-Bissau, Liberia, Mali, Mauritania, Niger, Rwanda, Solomon Islands, Tuvalu, the United Republic of Tanzania and Yemen.

37. Unfortunately, financial resources to implement NAPAs have thus far been inadequate. As of August 2010, 22 donors had pledged US\$290 million to the Least Developed Countries Fund. As of May 2010, net funding allocated, committed or dispersed by the GEF amounted to just US\$135 million – far short of the US\$2 billion that was initially estimated as the amount required to implement NAPAs fully (UNFCCC, 2010d).

38. **Advancing agriculture and GRFA under the UNFCCC:** In recent years, some Parties to the UNFCCC, with input from a coalition of agriculture and development specialists, have actively promoted the important role of agriculture in adaptation and mitigation efforts, and greater understanding of the impacts of climate change on agriculture as an essential element of post-Kyoto climate negotiations. Agriculture has been discussed in both the Ad Hoc Working Group on Long-term Cooperative Action (AWG-LCA) and the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP).

39. In 2008, at the request of Parties, the UNFCCC Secretariat prepared a technical paper on the challenges and opportunities for mitigation in the agricultural sector for the AWG-LCA (UNFCCC, 2008). A dedicated group within the AWG-LCA subsequently negotiated text entitled “Cooperative sectoral approaches and sector-specific actions in agriculture” (FAO, 2010b). Parties noted the synergy among agriculture, food security and poverty alleviation, and stressed the need to address inter-related issues of mitigation and adaptation activities simultaneously. In its draft negotiating text, the AWG-LCA reached broad agreement on the establishment of a SBSTA work programme on agriculture.²³ A COP mandate for a SBSTA programme of work on agriculture could provide a vehicle for consideration and debate of technological methodologies to underpin action and support for agricultural mitigation and adaptation activities, and provide a crucial focal point for agriculture-related issues within the UNFCCC process (FAO, 2010b). A dedicated work programme on agriculture could provide a starting point for addressing how agriculture in general, and GRFA in particular, could be incorporated into the broader climate agreement. Despite broad agreement in the working group negotiations, Parties at COP 16 did not give SBSTA a mandate to develop a work programme for agriculture.

40. However, in the decisions emerging from COP 16, “agriculture and food security” are recognized in a footnote as areas that deserve priority consideration in projects and programmes for enhancing action on adaptation. This small but significant step could provide an important toehold for advancing agriculture and its significance for adaptation activities in future negotiations. In the view of some experts, however, both higher levels of financing and more innovative approaches will ultimately be required:

“For agriculture to be part of the solution to climate change, financing approaches and mechanisms need to make sure that agriculture is eligible to receive resources from existing or future climate funding mechanisms, that the specificities of agriculture are taken into account and that agricultural producers are rewarded for the generation of multiple services benefiting food security, development, adaptation and mitigation” (FAO, 2010a, p. 29).

41. **Next steps:** With the adoption of the Cancún Agreements in December 2010, there is stronger emphasis on the role of adaptation in confronting climate change, and a commitment by developed countries to provide new and additional funds for adaptation actions in the developing world. As noted above, this includes “fast-start” finances approaching US\$30 billion for the period 2010–2012, with balanced allocation between adaptation and mitigation. Parties also agreed on the establishment of the Green Climate Fund to provide long-term multilateral funding for adaptation and mitigation.

42. The Cancún Adaptation Framework promotes the implementation of enhanced action on adaptation and establishes an Adaptation Committee. Parties requested that the AWG-LCA elaborate

²³ FCCC/AWGLCA/2009/L.7/Add.9.

the composition, modalities and procedures for the Adaptation Committee and to establish a programme of work to “consider approaches to address loss and damages associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change” (UNFCCC, 2010c).

43. In a recent submission to the UNFCCC,²⁴ FAO notes that slow-onset impacts²⁵ of climate change and their effects on food security have received little attention in UNFCCC negotiations thus far: “It is both important and urgent that developing countries are made aware of and supported in addressing slow-onset dimensions of adaptation that affect their food security” (FAO, 2011a). FAO suggests that, in the context of developing a work programme to address loss and damage, UNFCCC give greater attention to risk management and to slow-onset events – noting the need to broaden the vision of risk management beyond “approaches for addressing rehabilitation measures associated with slow-onset events”. The concern is that an excessive focus on “rehabilitation measures” fails to capture the slow-onset climate changes that are expected to have potentially catastrophic effects on agriculture, forestry and fisheries in many developing countries. To build resilience in agricultural production systems, action is urgently needed now – in order to reduce risks *ex ante* rather than respond to problems *ex post*. In other words, actions taken now can build capacity to reduce vulnerability in the short term and enhance resilience in the long term. Among other strategies, FAO specifically mentions the importance of conservation and sustainable use of GRFA to enhance the capacity of developing countries to develop and disseminate crop varieties and animal breeds that are adapted to changing climate conditions.

44. Another FAO submission²⁶ to the UNFCCC Secretariat underscores the vulnerability of agricultural production systems to slow-onset events, and highlights the critical role of genetic resources in addressing loss and damages:

“Adaptation and/or rehabilitation ... will also require supporting the development and dissemination of technologies and practices, as well as international cooperation for promoting the conservation and sustainable management of biodiversity, including ecosystem services to maintain and/or enhance ecosystem resilience, and breeding of crops, trees, livestock and fish adapted to changed climate conditions and enhancing in-situ and ex-situ conservation and sustainable use of genetic resources” (FAO, 2011b).

Genetic resources and intellectual property concerns in the negotiating text

Explicit reference to genetic resources has appeared in negotiating texts related to technology transfer under the UNFCCC. Since 2009, in negotiations in the Ad Hoc Working Group on Long-term Cooperative Action (AWG-LCA), developing country Parties have raised concerns about intellectual property (IP) as a potential barrier to access to genetic resources and technologies that could play a vital role in adapting to climate change (Global Donor Platform for Rural Development, 2009). The negotiating text forwarded by the eleventh session of the AWG-LCA for consideration by Parties at the twelfth session in Cancún (2010) included the following option: “Parties shall take all necessary steps in all relevant forums to exclude from Intellectual Property Rights protection, and revoke any such existing intellectual property right protection in developing countries and least developed countries on environmentally sound technologies to adapt to and mitigate climate change, including those developed through funding by governments or international agencies and those involving use of genetic resources that are used for adaptation and mitigation of climate change.”²⁷ Ultimately, the decisions on technology development and transfer adopted by COP 16/CMP 6 contain no reference to genetic resources or IP. However, IP is one of the issues that will be taken up by the Technology

²⁴ Submitted to the 14th Session of the AWG-LCA, in accordance with paragraph 1 of the Bali Action Plan.

²⁵ Slow onset events include, for example: sea level rise, increasing temperatures, ocean acidification, glacial retreat and related impacts, salinization, land and forest degradation, loss of biodiversity and desertification.

²⁶ Submitted in response to the invitation (article 28 of Decision FCCC/AWGLCA/2010/L.7) for relevant organizations to submit views on what elements should be included in the work programme on approaches to loss and damages associated with climate change.

²⁷ FCCC/AWGLCA/2010/14.

Executive Committee (TEC) when it begins to address obstacles and enabling conditions for technology transfer and development.

Will IP promote or inhibit innovation in climate technologies? Will patents on so-called “climate-proof” genes and traits prevent poor farmers and public breeders from gaining access to genetic resources that are critical for adaptation to climate change? The answer to these questions is unclear – but there is little doubt that patent activity related to environmental stress tolerance in plants (i.e. abiotic stress traits) is increasing. A review of recent patenting activity (March–December 2010) related to plant biotechnology at the United States Patent and Trademark Office reveals that patent applications on traits associated with abiotic stress in plants are the subject of more patent applications than any other plant biotech area (AGROW World Crop Protection News, 2011).²⁸ A 2010 report identifies patent documents published worldwide between 30 June 2008 and 30 June 2010 that make specific claims to abiotic stress tolerance (drought, heat, flood, cold and salt-tolerance, etc.) in plants – genetic traits that will theoretically enable crops to withstand environmental stresses associated with climate change (ETC Group, 2010). The report identifies 262 patent families (which include a total of 1 663 patent documents – both applications and issued patents – filed in patent offices worldwide). The study found that just three companies – DuPont, BASF and Monsanto – account for 173 (66 percent) of the 262 patent families identified, while the public sector accounts for only 9 percent. In some cases, the patent claims extend to gene sequences that are responsible for endowing similar abiotic traits across multiple plant genomes (known as homologous DNA). Because of the similarity in DNA sequences between individuals of the same species or among different species – “homologous sequences” – a single patent may claim rights that extend not just to stress tolerance in a single engineered plant species, but also to a substantially similar genetic sequence in numerous species of transformed plants.

GRFA, climate change and the CBD

45. For the CBD agricultural biodiversity is “a broad term that includes all components of biological diversity of relevance to food and agriculture, and all components of biological diversity that constitute the agro-ecosystem: the variety and variability of animals, plants and micro-organisms, at the genetic, species and ecosystem levels, which are necessary to sustain key functions of the agro-ecosystem, its structure and processes.”²⁹ The CBD’s programme of work on agricultural biological diversity and its three objectives were endorsed by CBD COP 5 in 2000:

- to promote the positive effects and mitigate the negative impacts of agricultural practices on biological diversity in agro-ecosystems and their interface with other ecosystems;
- to promote the conservation and sustainable use of genetic resources of actual or potential value for food and agriculture; and
- to promote the fair and equitable sharing of benefits arising out of the utilization of genetic resources.

46. CBD COP 10 in 2010 adopted the Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets.³⁰ The Strategic Plan includes Target 13: “By 2020, the genetic diversity of cultivated plants and farmed and domesticated animals and of wild relatives, including other socio-economically as well as culturally valuable species, is maintained, and strategies have been developed and implemented for minimizing genetic erosion and safeguarding their genetic diversity.”³¹

47. The CBD’s programme of work on agricultural biodiversity is carried out in close collaboration with FAO.³² The CBD and the Secretariat of the FAO Commission on Genetic

²⁸ For example, there were 132 patent applications related to abiotic stress tolerance compared to just 15 for herbicide tolerance; 80 for pest or pathogen resistance, 35 for altered lignin, and 51 for altered phenotype.

²⁹ COP 5 Decision V/5, appendix <http://www.cbd.int/decision/cop/?id=7147>

³⁰ COP 10 Decision X/2, Annex.

³¹ COP 10 Decision X/2, Annex

³² In 1997, FAO and the CBD Secretariat entered into a Memorandum of Cooperation to advance biodiversity initiatives of mutual interest. A revised Memorandum of Cooperation was signed in 2005 to ensure continued collaboration. It recognizes

Resources for Food and Agriculture (Commission) engage in the “Joint Work Plan of the Secretariats of the Convention on Biological Diversity and of the Food and Agriculture Organization of the United Nations and its Commission on Genetic Resources for Food and Agriculture” that aims to enhance synergies in the implementation of the Commission’s Multi-Year Programme of Work and the CBD’s programme of work.³³

48. The issue of **climate change and genetic resources for food and agriculture** is one of five areas of focus jointly undertaken by the Commission and the CBD Secretariats.³⁴ Both Secretariats are collaborating to explore the links between climate change and GRFA in the following areas:

- threats to GRFA resulting from climate change;
- lessons learned about ways and means to conserve and use genetic diversity to build resilience and adaptation to climate change in food and agricultural systems;
- integration of genetic diversity considerations into climate change adaptation and mitigation planning;
- considerations of how climate change will impact existing conservation practices for GRFA: and
- integration of climate change consideration in sectoral and cross-sectoral planning for GRFA.

49. Although “climate change” does not appear in the articles of the CBD, since 2000 the Parties to the CBD have raised global awareness of the serious impacts of climate change on biodiversity while also emphasizing that conserving and sustainably managing biodiversity is critical to addressing climate change. As a cross-cutting issue, climate change is being integrated into the CBD’s seven thematic programmes of work as well as all other cross-cutting issues. Because of the CBD’s broad mandate, the climate change focus encompasses biodiversity at all levels. CBD COP decisions have included specific reference to conservation and sustainable use of GRFA in a number of thematic areas: 1) agricultural biodiversity; 2) forest biodiversity; 3) marine and coastal biodiversity; 4) dry and subhumid lands biodiversity. The CBD’s work related to climate change and genetic resources in each area is briefly summarized below.

50. The CBD and its subsidiary bodies have:

- established two Ad Hoc Technical Expert Groups (AHTEG) on biodiversity and climate change;
- provided technical information on biodiversity and climate change to the UNFCCC process, especially with regard to impacts, vulnerability and adaptation to climate change, as well as the role of forests in climate change mitigation;
- identified ways and means to integrate conservation and sustainable use of biodiversity into climate change mitigation and adaptation activities;
- integrated biodiversity–climate change–land degradation links into joint work between the three Rio Convention Secretariats, including through a series of outreach and awareness-raising activities; and
- created a database on ecosystem-based approaches to climate change adaptation to provide guidance on the integration of biodiversity within national adaptation planning.

51. The **Working Group on the Review of Implementation** (WGRI), established by the Parties to the CBD to address the need for more effective processes for evaluation, reporting and reviewing

that the FAO Commission on Genetic Resources for Food and Agriculture is the international forum where governments specifically address all components of biological diversity of relevance to food and agriculture. The revised memorandum also provides for development of a Joint Work Plan aimed at specific objects of cooperation of mutual relevance. Initially covering the period 2009-2011, the Joint Work Plan is now initiating a second phase for the period 2012-2020.

³³ UNEP/CBD/SBSTTA/14/11, 24 January 2010, p. 7.

³⁴ CGRFA-12/09/Inf. 8, October 2009. The other major areas of focus include: assessments of biodiversity of relevance to food and agriculture; targets and indicators; best practices for the management of agricultural biodiversity; micro-organisms and invertebrates, including the international initiatives on soil biodiversity and pollinators.

implementation of the Convention and the Strategic Plan,³⁵ also provided clear indications on the need to address climate change as part of the CBD programme. The Third Meeting of the WGRI,³⁶ which was mandated by CBD COP 9 to prepare a proposal for the updated Strategic Plan, with biodiversity targets for the period 2011–2020, for consideration at CBD COP 10, identified a plan and targets that provide many references to climate change,³⁷ although not specifically in relation to genetic resources.

52. The CBD has prepared a series of technical reports on climate change and biodiversity:

- *Interlinkages between biological diversity and climate change – advice on the integration of biodiversity considerations into the implementation of the UNFCCC and its Kyoto Protocol* (2003),³⁸
- *Guidance for promoting synergy among activities addressing biological diversity, desertification, land degradation and climate change* (2006),³⁹
- *Connecting biodiversity and climate change mitigation and adaptation* (2009),⁴⁰
- *Review of the literature on the links between biodiversity and climate change impacts, adaptation and mitigation* (2009)⁴¹
- *Forest resilience, biodiversity and climate change: a synthesis of the biodiversity/resilience/stability relationship in forest ecosystems* (2009),⁴²
- *Scientific synthesis of the impacts of ocean fertilization on marine biodiversity* (2009);⁴³ and
- *Scientific synthesis of the impacts of ocean acidification on marine biodiversity* (2009).⁴⁴

53. In 2008 CBD COP 9 gave the CBD Secretariat a broad mandate on biodiversity and climate change. The CBD Secretariat's cross-cutting work on climate change and biodiversity issues focuses on:

- identifying possible negative impacts of climate change-related activities on biodiversity, the role of biodiversity in climate change mitigation and adaptation, opportunities for achieving climate change and biodiversity co-benefits, and building the knowledge base on biodiversity–climate change links;
- reviewing the extent to which Parties have integrated climate change considerations in various programmes of work and cross-cutting issues; and
- promoting synergies between the Secretariats of the CBD and other international processes (including UNFCCC, Ramsar Convention, IPCC, Joint Liaison Group) (CBD, 2009a).⁴⁵

54. During its in-depth review of the programme of work on agricultural biodiversity, CBD COP 9 requested continued collaboration with FAO and others to gather and disseminate information on the links between climate change, agriculture and biodiversity. CBD COP 9 also invited FAO and other relevant organizations, in collaboration with the Executive Secretary, to continue to provide Parties and other governments with data, tools and information with which to adapt their agricultural

³⁵ Decision VII/30.

³⁶ Nairobi, Kenya, 24–28 May 2010.

³⁷ UNEP/CBD/COP/10/4, Report of the Ad Hoc Open-Ended Working Group on Review of Implementation of the Convention on the work of its third meeting.

³⁸ <http://www.cbd.int/doc/publications/cbd-ts-10.pdf>

³⁹ <http://www.cbd.int/doc/publications/cbd-ts-25.pdf>

⁴⁰ <http://www.cbd.int/doc/publications/cbd-ts-41-en.pdf>

⁴¹ <http://www.cbd.int/doc/publications/cbd-ts-42-en.pdf>

⁴² <http://www.cbd.int/doc/publications/cbd-ts-43-en.pdf>

⁴³ <http://www.cbd.int/doc/publications/cbd-ts-45-en.pdf>

⁴⁴ <http://www.cbd.int/doc/publications/cbd-ts-46-en.pdf>

⁴⁵ CBD, Biodiversity and climate change action: activities of the CBD, Information Note 2 for UNFCCC COP15, November 2009.

policies and practices to changing climate, and to improve the capacities of farmers, livestock keepers, plant and animal breeders, relevant organizations and other stakeholders to reduce the risks associated with climate change.

55. As its primary framework for action, the CBD emphasizes ecosystem-based approaches⁴⁶ to climate change adaptation. This approach aims to integrate the use of biodiversity and ecosystem services into an overall adaptation strategy that is cost-effective, generates social, economic and cultural co-benefits, and contributes to the conservation of biodiversity (CBD, 2009b).

Highlights – the CBD, climate change and biodiversity

2000 – CBD COP5 highlights the risks posed by climate change, in particular to coral reefs and forest ecosystems.

2001 – SBSTA establishes AHTEG on Biological Diversity and Climate Change to carry out assessment of inter-linkages between biodiversity and climate change.⁴⁷

2003 – First AHTEG report published.

2004 – CBD COP 7 encourages Parties to take measures to manage ecosystems in order to maintain resilience to extreme climate events and to help mitigate and adapt to climate change.⁴⁸

2004 – The Joint Liaison Group between the three Rio Conventions (established in 2001) identifies climate change adaptation as one of three priority issues for joint collaboration.

2006 – CBD COP 8 highlights the importance of integrating biodiversity considerations into all relevant national policies, programmes and plans in response to climate change, and to develop tools for implementing biodiversity conservation activities that contribute to climate change adaptation; and notes the need to identify mutually supportive activities to be conducted by the Secretariats of the three Rio Conventions (UNFCCC, UNCCD, CBD).⁴⁹

2008 – CBD COP 9 establishes second AHTEG on Biodiversity and Climate Change to provide biodiversity-relevant information to the UNFCCC;⁵⁰ and adopts precautionary stance on ocean fertilization.

2010 – CBD COP 10 offers guidance to Parties on ways to sustainably use and restore biodiversity and ecosystem services while contributing to climate change mitigation and adaptation, and among other strategies, invites Parties to take specific measures to “maintain genetic diversity in the face of climate change”.⁵¹

2010 – CBD COP 10 proposes to the UNFCCC and the UNCCD the development of joint activities (between the three Rio Conventions) related to climate change, biodiversity, and land degradation and ecosystem-based approaches to climate change mitigation and adaptation. The proposal includes a request to explore the possibility of convening, prior to Rio+20, a joint preparatory meeting between the three Rio Conventions.

2010 – In accordance with the precautionary approach, CBD COP 10 requests Parties to ensure that geo-engineering activities do not take place until there is an adequate scientific basis on which to justify such activities, and until a global, transparent control and regulatory system is in place. CBD COP 10 calls on SBSTTA to carry out additional technical work.

⁴⁶ In the CBD context, the ecosystem approach includes twelve steps for the integrated management of land, water and living resources to promote conservation and sustainable use in an equitable way (<http://www.cbd.int/ecosystem/>).

⁴⁷ AHTEG Report published as Technical Series No. 10.

⁴⁸ Decision VII/15.

⁴⁹ Decision VIII/30.

⁵⁰ AHTEG Report published as Technical Series No. 41.

⁵¹ UNEP/CBD/COP/DEC/X/33, para. 8 (g).

56. At CBD COP 5, in 2000, Parties adopted a programme of work on dry and subhumid land biodiversity, which was reviewed in 2006.⁵² At CBD COP 8, in 2006, Parties called for increased attention to climate change and governance, and adopted a joint work programme with the UNCCD, which seeks to address the multiple and increasing threats – including climate change – to dry- and subhumid-land biodiversity. The CBD’s programme of work on the biological diversity of dry and subhumid lands includes the goal of promoting the conservation of species diversity and the target of conserving “genetic diversity of crops, livestock, harvested species of trees, fish and wildlife and other valuable dry and sub-humid lands” and the protection and maintenance of associated indigenous and local knowledge.⁵³ At CBD COP 9, Parties recognized the importance of biodiversity in dry and subhumid lands for improved livelihood and food security and climate change adaptation and mitigation. CBD COP 9 also requested the Executive Secretary, in cooperation with FAO, UNCCD and other relevant organizations, to prepare a compilation of experiences in the field of climate change mitigation and adaptation, soil management and pastoralism in dry and subhumid lands.⁵⁴ In 2010, the CBD Secretariat, in collaboration with FAO, the International Union for the Conservation of Nature (IUCN) and other partners, produced a good practice guide on *Pastoralism, nature conservation and development*, which *inter alia* discusses the challenges posed by climate change and the potential roles of pastoralism in adaptation and mitigation (CBD Secretariat, 2010).

IV. SECTOR-SPECIFIC GENETIC RESOURCES FOR FOOD AND AGRICULTURE AND CLIMATE CHANGE POLICY

Plant genetic resources and the international climate change policy agenda

57. The continuous availability of crop genetic diversity is critical for any strategy that aims to address the many challenges that climate change presents to food and livelihood security. Together with the conservation of plant genetic diversity in land races and crop wild relatives, both *in situ* and *ex situ*, their access for breeding improved varieties and making available quality seeds through functional seed systems must be a seamless continuum.

58. However, analysis of global trends⁵⁵ reveals that while progress has been made in gene bank conservation, much of the diversity of crop wild relatives and underutilized species still needs to be secured. Local diversity found in farmers’ fields is still largely inadequately documented and managed, and actions are required before they are lost as a consequence of climate change. Plant breeding capacities overall are in decline in most national programmes and are not linked with seed systems development, which are also characterized by several gaps that impede access to improved varieties and seeds. Greater linkage and collaboration is needed between plant breeding, seed systems and conservation stakeholders to make available climate-ready crops and seeds worldwide.

59. There is a limited understanding of the impacts and implications of climate change for the management and use of PGRFA and the novel use of these resources in the future. These, and related discussions on policies and options that facilitate adaptation to and mitigation of climate changes, are absent, but urgently required, at the international, region and national levels.⁵⁶

Animal genetic resources and the international climate change policy agenda

60. Animal genetic diversity enables farmers, pastoralists and animal breeders to meet current and future production challenges resulting from environmental changes, including climate change; to

⁵² Arid and semi-arid regions, grasslands, savannahs and Mediterranean landscapes account for approximately 47 percent of the Earth’s terrestrial area.

⁵³ COP8 Decision VIII/2, Annex.

⁵⁴ This report was submitted to the Subsidiary Body on Scientific, Technical and Technological Advice as an information note.

⁵⁵ The Second Report on the State of the World’s Plant Genetic Resources for Food and Agriculture FAO 2010, <http://www.fao.org/docrep/013/i1500e/i1500e00.htm>

⁵⁶ Climate Change and its Effect on Conservation and Use of Plant Genetic Resources for Food and Agriculture and Associated Biodiversity for Food Security ; Jarvis *et al*, 2010.

enhance resistance to disease and parasites; and respond to changing consumer demand for animal products. After an era of dramatic transformation and growth, today's livestock sector is characterized by a growing dichotomy between large-scale industrial livestock production that serves global commercial markets, and traditional pastoralism and small-scale livestock keeping, primarily in the developing world, that contribute directly to livelihoods and food security for over 1 billion people. Demand for cheap and safe animal products is soaring, especially in the developing world, but there is also increasing alarm about the risks and negative externalities associated with livestock, including: global public and animal health risks; the production of GHGs, land degradation, water pollution and the destruction of biodiversity; and the marginalization of smallholder producers. In the near term, climate change impacts and mitigation efforts are likely to exacerbate the existing dichotomy within the livestock sector (FAO, 2011c).

61. Climate change will increase the importance of genetically well-adapted livestock in production systems where the animals cannot be isolated from the local environment – especially for poor livestock keepers in marginal areas who face harsh conditions and have limited access to external inputs. But climate change will also pose additional uncertainty – and potential threats to sustainability – for industrial-scale livestock producers who utilize sophisticated technologies and high levels of external inputs. In both scenarios climate change impacts underscore the importance of ensuring animal genetic resources that are well adapted to their production environments, and the critical need to maintain the diversity that will be needed to adapt to future challenges (FAO, 2011c).

62. **Animal genetic resources under the UNFCCC:** The Clean Development Mechanism (CDM) under the UNFCCC supports a number of livestock-related mitigation projects, but does not include reference to conservation and use of animal genetic resources. The principal livestock-related activity under CDM is manure management – primarily animal waste used for generating biogas energy. As of December 2010, approximately 5 percent of all registered CDM projects were classified as biogas projects involving animal waste – 135 of the 2 560 projects registered (IGES, 2010).

63. **Animal genetic resources under the CBD:** The CBD's programme of work on agricultural biodiversity includes animal genetic resources. In the area of animal genetic resources, CBD COP 6 in 2002 expressed its early support for the preparation of the FAO's first report on the state of the world's animal genetic resources, encouraged all Parties to participate fully in its preparation and encouraged Parties to implement follow-up actions.⁵⁷ During the in-depth review of its programme of work on agricultural biodiversity, CBD COP9 welcomed the publication of *The State of the World's Animal Genetic Resources for Food and Agriculture*⁵⁸ and also welcomed the Global Plan of Action for Animal Genetic Resources⁵⁹, adopted by the first International Technical Conference on Animal Genetic Resources held in Interlaken, Switzerland, in September 2007, as the internationally agreed framework that contains the strategic priorities for the sustainable use, development and conservation of animal genetic resources for food and agriculture, and provisions for implementation and financing. CBD COP 9 invited Parties, other governments, indigenous and local communities, farmers, pastoralists, animal breeders, relevant organizations and other stakeholders to ensure the effective implementation of the Global Plan of Action.⁶⁰

Forest genetic resources and the international climate change policy agenda

64. Forest genetic diversity provides the fundamental basis for evolution and adaptation of forest tree species. Without this diversity, trees cannot survive, evolve and adapt to rapidly changing climate and environmental conditions. Sustainable use and conservation of forest genetic resources is thus a critical component of sustainable forest management.⁶¹ Safeguarding forest genetic resources is

⁵⁷ <http://www.cbd.int/decision/cop/?id=7179>

⁵⁸ <http://www.fao.org/docrep/010/a1250e/a1250e00.htm>

⁵⁹ <http://www.fao.org/docrep/010/a1404e/a1404e00.htm>

⁶⁰ UNEP/CBD/COP/DEC/IX/, 19 October 2008. <http://www.cbd.int/decisions/cop/?m=cop-09>

⁶¹ Sustainable forest management, as a dynamic and evolving concept, aims to maintain and enhance the economic, social and environmental values of all types of forests, for the benefit of present and future generations. Non-legally binding instrument on all types of forests, A/C.2/62/L.5, III. 4.

a subject of global concern, but the critical role of forest genetic diversity in the context of climate change has not been reflected in international policy instruments to date.

65. **UNFCCC and forests:** The UNFCCC recognizes the important role of forests in tackling climate change, but most efforts to date have focused on mitigation activities. Due in large part to the emphasis on a limited number of mitigation goals and narrowly prescribed financing opportunities, there have been no entry points for discussion of forest genetic resources under the UNFCCC process to date.

66. A 2009 global assessment, *Adaptation of forests and people to climate change*, prepared by the International Union of Forest Research Organizations (IUFRO) for the United Nations Forum on Forests, notes the dominant role played by mitigation goals under the UNFCCC and its Kyoto Protocol:

“Action [on climate change] at the international level presently consists of a number of poorly coordinated programmes directed mainly at reducing deforestation and mitigating climate change rather than addressing the full range of climate-change adaptation issues and options” (Glück *et al.*, 2009, p. 202).

67. Under the Kyoto Protocol, protection and enhancement of forests, promotion of sustainable forest management practices and afforestation and reforestation are listed among possible actions for achieving emission reduction commitments by industrialized countries.⁶² However, Article 3.3 of the Kyoto Protocol limits the eligibility of land use, land-use change and forestry (LULUCF) projects under the Clean Development Mechanism to afforestation and reforestation.⁶³ Forest conservation and sustainable forest management practices are thus excluded (FAO, 2004).

68. Under the CDM, developed countries may finance afforestation and reforestation activities in developing countries to earn carbon offsets. However, the rules for afforestation and reforestation projects are complicated and the implementation of forest carbon mitigation projects has been limited to date (Glück *et al.*, 2009). As of February 2011, only 19 forest-related projects had received CDM accreditation – accounting for less than 0.7 percent of the 2 805 registered CDM projects.⁶⁴

69. In the AWG-KP, Parties are considering the possibility of broadening the scope of LULUCF activities eligible under the CDM beyond the afforestation and reforestation activities that are now included. Proposals to expand the scope of CDM-eligible activities have included, for example, REDD, wetlands and sustainable forest management (FAO, 2011d). A broader scope for LULUCF activities could open up opportunities for a broader definition of eligible land-based activities.

70. **REDD:** Further options for realizing the mitigation potential of forests in developing countries continue to be negotiated under the UNFCCC. “Reducing emissions from deforestation and degradation” (REDD) is a mechanism that aims to provide financial benefits/incentives for countries that take steps to slow, halt and reverse forest loss and hence reduce carbon emissions. Following nearly three years of negotiations, COP 16 in Cancún agreed that the scope of REDD+⁶⁵ activities will go beyond deforestation and forest degradation to include conservation and enhancement of forest carbon stocks, and sustainable management of forests. The Agreement on REDD+ also includes the promotion of safeguards to ensure that REDD actions are “consistent with the conservation of natural

⁶² Art. 2.1.

⁶³ Articles 3(3) and 3(4) of the Kyoto Protocol establish the eligibility of different activities relating to the land-use, land-use change and forestry (LULUCF) sector under the Kyoto Protocol. However, 16/CMP.1, Annex, paragraph 13 limits the eligibility of LULUCF projects under the CDM to afforestation and reforestation: “The net changes in greenhouse gas emissions by sources and removals by sinks resulting from direct human-induced land-use change and forestry activities, limited to afforestation and reforestation.” (16/CMP.1, Annex, paragraph 13). Source: <http://www.cdmmrulebook.org/497>.

⁶⁴ <http://www.conservation.org/newsroom/pressreleases/Pages/ColombiaCDMproject.aspx>

⁶⁵ Actions under paragraph 1(b)(iii) of the Bali Action Plan of the UNFCCC (issues related to policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forests stocks in developing countries) are collectively known as “REDD+.”

forests and biological diversity” and respect “the knowledge and rights of indigenous peoples and members of local communities ...”⁶⁶

71. While the scope, principles and safeguards for REDD+ activities are outlined in the decisions emerging from COP 16, many details must be hammered out before REDD+ activities can be recognized and supported in the UNFCCC context. To make the REDD+ framework operational, rules and definitions related to safeguards, finance, and methodological issues must be clarified. For example, most of the REDD+ activities are still undefined by the UNFCCC. Without definitions it is not possible to measure progress in reducing emissions or pay for performance. Decisions about what types of finance will ultimately be used to support REDD+ activities (fund-based or market-based approaches) must also be determined. COP 16 gives the SBSTA a mandate to continue work on many of these unresolved questions.

72. **REDD+ and biodiversity co-benefits:** Observers note that the “co-benefits” generated by REDD+ activities will include maintaining ecosystems, enhancing biodiversity, improving livelihoods and enabling adaptation. As REDD+ implies a decline in forest habitat destruction and degradation and a possible increase in forest rehabilitation, the mechanism could have “significant positive impacts on biodiversity” (OECD, ENV/WKP, 2009). Safeguards adopted in the Cancún Agreements specify that REDD+ activities “are not used for the conversion of natural forests, but are instead used to incentivize the protection and conservation of natural forests and their ecosystem services, and to enhance other social and environmental benefits.”⁶⁷ However, it remains to be determined whether and how countries, in addressing REDD+, will address activities that enhance conservation and utilization of forest genetic resources or their role in adaptation to climate change.

73. Ultimately, broad forest governance reform, the participation of indigenous peoples and local communities, and the sharing of benefits from REDD-related activities will be crucial to the success of REDD+ (FAO, 2011d). According to FAO’s report on the *State of the World’s Forests*: “It is crucial that climate change resources, including funds for REDD+, LULUCF and adaptation are used to build the foundation for SFM, which can contribute to climate change adaptation and mitigation, as well as the continued delivery of the full range of goods and ecosystem services over the long term” (FAO, 2011d).

74. **The CBD, forest genetic resources and climate change:** The CBD’s programme of work on forest biological diversity was adopted in 2002 and reviewed in 2008. The programme includes the objective of mitigating the negative impacts of climate change on forest biodiversity.⁶⁸ Specific activities include:

- promoting monitoring and research on the impacts of climate change on forest biological diversity and investigating the interface between forest components and the atmosphere;
- developing coordinated response strategies and action plans at global, regional and national levels;
- promoting the maintenance and restoration of biodiversity in forests in order to enhance their capacity to resist, recover from and adapt to climate change;
- promoting forest biodiversity conservation and restoration in climate change mitigation and adaptation measures; and
- assessing how the conservation and sustainable use of forest biological diversity can contribute to the international work relating to climate change.

75. At its Ninth Meeting in 2008, the CBD COP reviewed the programme of work on forest biodiversity and agreed to address human-induced threats to forest biodiversity, including climate

⁶⁶ UNFCCC/CP/2010/7/Add.1, Annex 1.

⁶⁷ UNFCCC/CP/2010/7/Add.1, Annex 1.

⁶⁸ Decision VI/22, Annex.

change, forest degradation, unsustainable use of forest products and resources, illegal land conversion, forest fires and invasive alien species.⁶⁹

76. Most of the 130 activities listed under the CBD's programme of work on forests focus on reducing forest degradation and deforestation. Synergies between the CBD's work on forest biodiversity and the activities of the UNFCCC are mostly centred on REDD+. However, CBD and its partners in the Strategic Framework for Forests and Climate Change, under the coordination of FAO, stress that forest-based adaptation and mitigation measures must proceed concurrently (CBD, 2009a). The Strategic Framework provides information on the linkages between the conservation and sustainable use of forest biodiversity (through sustainable forest management – SFM) and climate change. The CBD also collaborates with the Global Forest Expert Panels, an initiative of the Collaborative Partnership for Forests.⁷⁰

77. In 2008, CBD COP 9 invited Parties to “recognize and increase understanding of the potential of forest genetic diversity to address climate change, maintain forest ecosystems resilience and lead to the discovery of new timber and non-timber forest resources.”⁷¹ At CBD COP 10, in 2010, Parties recognized “the importance of forest genetic diversity for the conservation and sustainable use of forest biodiversity, including in the context of addressing climate change and maintaining the resilience of forest ecosystems.”⁷²

Highlights – CBD, climate change and forest biological diversity

1998 – CBD COP 4 adopts forest biological diversity as one of the CBD's thematic programme areas.

2000 – CBD COP 5 requests the SBSTTA, in collaboration with UNFCCC and IPCC, to consider the impact of climate change on forest biological diversity.

2002 – CBD COP 6 expands the programme of work on forest biological diversity to include the impacts of climate change on forest biodiversity.

2008 – CBD COP 9 urges Parties to address human-induced threats to forest biodiversity, including climate change;⁷³ and to promote research on the impacts of climate change including environmental degradation on ecosystem resilience, conservation and sustainable use of forest biodiversity and impacts on the livelihoods of indigenous and local communities. It invites Parties to “recognize and increase understanding of the potential of forest genetic diversity to address climate change, maintain forest ecosystems resilience and lead to the discovery of new timber and non-timber forest resources.”

2010 – CBD COP 10 “*recognizes* the importance of forest genetic diversity for the conservation and sustainable use of forest biodiversity, including in the context of addressing climate change and maintaining the resilience of forest ecosystems; and welcomes the preparation by the FAO of the country driven report *The State of the World's Forest Genetic Resources*.”

2010 – CBD COP 10 requests the CBD Secretariat, in collaboration with Secretariat of UNFF, to implement capacity-building on how forest biodiversity and climate change could be better addressed in national biodiversity and forest policies, and in sustainable forest management practices.⁷⁴

Aquatic genetic resources and the international climate change policy agenda

78. Aquatic ecosystems, especially oceans, are the planet's largest carbon sink and play a key role in regulating the world's climate. Aquatic ecosystems are critical to global food security. An estimated 520 million people depend on fisheries and aquaculture as a source of protein and income. Aquatic genetic resources underpin the productivity, sustainability and adaptability of all aquaculture,

⁶⁹ COP 4, Decision IV/5.

⁷⁰ The CPF is a partnership composed of 14 forest institutions, organizations and convention secretariats. It was created following a recommendation of the Economic and Social Council of the United Nations (ECOSOC).

⁷¹ COP 9, Decision IX/5, 1.b

⁷² COP 10 Decision X/36

⁷³ COP 9, Decision IX/5, 1.b

⁷⁴ COP 10 Decision X/36

culture-based and capture fisheries (FAO, 2011e). The issue of conservation and sustainable use of aquatic genetic resources for food and agriculture has not been explicitly addressed in the UNFCCC process.

79. **Marine and coastal diversity under the CBD:** The CBD's programme of work on the conservation and sustainable use of marine and coastal biodiversity was first adopted in 1998, and further elaborated in 2004. In accordance with Article 6, the Convention assists Parties to develop national strategies, plans and programmes that will promote the conservation and sustainable use of marine and coastal biodiversity. At its Seventh Meeting in 2004 the CBD COP decided that its work on marine and coastal biodiversity should address issues related to biodiversity and climate change.⁷⁵ CBD COP 7 encouraged Parties to take measures to manage coastal and marine ecosystems, including mangroves, seagrass beds and coral reefs in order to maintain their resilience to extreme climatic events. The programme seeks to halt the loss of marine and coastal biological diversity nationally, regionally and globally and secure its capacity to provide goods and services. Programme elements include:

- integrated marine and coastal management;
- marine and coastal living resources;
- marine and coastal protected areas;
- mariculture; and
- invasive alien species.

80. Because of its broad mandate, the CBD's work encompasses marine and coastal biodiversity at all levels – genes, species and ecosystems. While some elements of the work programme refer specifically to conservation and use of marine genetic resources, these references are not necessarily linked to GRFA and climate change. (For example, CBD COP 8 took up the issue of conservation and sustainable use of high-seas biodiversity, specifically deep seabed genetic resources beyond the limits of national jurisdiction.)

81. At its Tenth Meeting, the CBD COP requested that the CBD Secretariat convene, with an invitation to the UNFCCC to collaborate, an expert workshop on the role of marine biodiversity and ecosystems in climate change adaptation and mitigation.

Highlights – CBD, climate change and marine genetic resources

1998 – CBD COP 4 adopts the programme of work on the conservation and sustainable use of marine and coastal biodiversity.

2004 – CBD COP 7 agrees that the programme of work on marine and coastal biodiversity should address issues related to biodiversity and climate change, and encourages Parties to take measures to manage coastal and marine ecosystems, including mangroves, seagrass beds and coral reefs so as to maintain their resilience to extreme climatic events.

2006 – CBD COP 8 considers the issue of deep seabed genetic resources beyond the limits of national jurisdiction.⁷⁶

2008 – CBD COP 9 requests that Parties ensure that ocean fertilization activities do not take place until there is an adequate scientific basis to justify such activities. Parties request that the Executive Secretary bring the issue of ocean fertilization to the attention of the Joint Liaison Group.⁷⁷

2010 – CBD COP 10 requests the CBD Secretariat to convene, with an invitation to the UNFCCC to collaborate, an expert workshop on the role of marine biodiversity and ecosystems in climate change adaptation and mitigation.

⁷⁵ COP 7 Decision VII/5.

⁷⁶ CBD, COP8, Decision VIII/21.

⁷⁷ In August 2001, a The Joint Liaison Group (JLG) was established in 2001 as an informal forum for coordinating joint work, and exchanging information on synergistic activities between the three Rio Conventions – the UNFCCC, CBD, UNCCD.

2010 – CBD COP 10 expresses serious concern about increasing ocean acidification and its impacts on marine biodiversity and habitats; and requests the CBD Secretariat to develop, in concert with FAO, UNFCCC, IOC/UNESCO and other relevant organizations, a series of joint expert review processes to monitor and assess the impacts of ocean acidification on marine and coastal biodiversity.

2010 – CBD COP 10 welcomes the report on scientific information on potential impacts of ocean fertilization on marine biodiversity and reaffirms the precautionary approach; it requests Parties to implement Decision IX/16C to ensure that ocean fertilization activities do not take place until there is an adequate scientific basis to justify such activities.

2010 – CBD COP 10 adopts a revised Strategic Plan for Biodiversity (2011–2020) which includes a 2015 target to minimize “the multiple anthropogenic pressures on coral reefs, and other vulnerable ecosystems impacted by climate change or ocean acidification” so as to maintain their integrity and functioning.⁷⁸

2010 – CBD COP 10 invites Parties to further integrate climate change-related aspects of marine and coastal biodiversity into relevant national strategies and action plans, including National Adaptation Programmes of Action (NAPAs).

2010 – CBD COP 10 decides that, in the absence of science-based, global, transparent regulatory mechanisms for geo-engineering, no climate-related geo-engineering activities that may affect biodiversity should take place until there is adequate scientific basis on which to justify such activities.

82. **Ocean fertilization:** In the context of reducing the potential negative impacts of climate change mitigation activities on marine and coastal biodiversity, the Ninth Meeting of the CBD COP in 2008 addressed the issue of ocean fertilization (see box on ocean fertilization, below). Although the CBD COP decision does not explicitly refer to the implications of ocean fertilization activities for conservation and use of genetic resources, the decisions on ocean fertilization are significant because they relate to biodiversity and international governance of climate change mitigation activities that have not been addressed by the UNFCCC to date. In 2010, the CBD went beyond the issue of ocean fertilization to consider the potential biodiversity implications of broader climate change mitigation activities known as “geo-engineering” (see box).

Ocean fertilization, climate change and biodiversity impacts

In recent years, the CBD has played an important role in raising international awareness of emerging technologies that might be used to mitigate climate change and could pose threats to biodiversity. To reduce the potential negative impacts of climate change mitigation activities on marine and coastal biodiversity, COP 9 (in 2008) addressed the issue of ocean fertilization. Ocean fertilization refers to commercial and scientific ventures that seek to deposit nutrients (e.g. iron, nitrogen) in the ocean to stimulate phytoplankton growth in order to sequester carbon dioxide from the atmosphere. With global warming, ocean temperatures are rising, and phytoplankton populations in the world’s ocean are declining as a result. Proponents of ocean fertilization believe that dumping a missing nutrient will restore phytoplankton populations, and increase the ocean’s capacity to absorb carbon dioxide . Recognizing the “current absence of reliable data” on ocean fertilization activities, CBD COP 9 requested that Parties and other governments, in accordance with the precautionary approach, “ensure that ocean fertilization activities do not take place until there is an adequate scientific basis on which to justify such activities” and until a global, transparent and effective regulatory mechanism is in place to govern such activities.⁷⁹ The CBD COP decision does not extend to small-scale scientific research studies within coastal waters.

In 2010, CBD COP 10 went beyond ocean fertilization to consider the biodiversity impacts of geo-engineering activities. The United Kingdom’s Royal Society defines geo-engineering as “the deliberate large-scale intervention in the Earth’s climate system, in order to moderate global warming

⁷⁸ CBD, COP 10 Decision X/2.

⁷⁹ COP 9 Decision IX/16.

...” (UK Royal Society, 2009, p. ix). CBD COP 10 decided that in the absence of science-based, global, transparent and effective regulatory mechanisms for geo-engineering, “that no climate-related geo-engineering activities that may affect biodiversity take place, until there is an adequate scientific basis on which to justify such activities ...”⁸⁰ The decision exempts small-scale scientific research studies, if they are justified to gather scientific data, subject to a prior assessment of potential environmental impacts.

83. **The CBD’s programme of work on biological diversity of inland water ecosystems, climate change and genetic resources:** According to the IPCC, the relationship between climate and freshwater resources is of primary concern, and water resource issues have not been adequately addressed in climate change policy analyses and climate policy formulations (Bates *et al.*, 2008). The CBD defines inland waters as aquatic-influenced environments located within land boundaries. Of the world’s total water resources, less than 3 percent is represented by freshwater, but this supports a disproportionately high level of biodiversity at the species level – not only the organisms living within water, but those that depend upon inland water habitat.

84. In 1998, CBD COP 4 adopted a programme of work on the biological diversity of inland water systems. A revised programme of work adopted by CBD COP 7 includes the following elements:

- i) conservation, sustainable use and benefit sharing;
- ii) institutional and socio-economic enabling environment; and
- iii) knowledge, assessment and monitoring.

85. The programme of work adopted by CBD COP 7 states that particular attention should be given to the impacts of climate change and the role of inland waters in mitigation of and adaptation to climate change.⁸¹ However, there is no explicit reference to the genetic resources of inland water ecosystems. At CBD COP 10, Parties noted the importance of inland water species in determining the status and trends of these ecosystems, including, *inter alia*, new initiatives such as the State of the World’s Aquatic Genetic Resources, being undertaken by FAO.

Genetic diversity of micro-organisms and invertebrates and climate change

86. Micro-organisms and invertebrates are “hidden” components of biodiversity, which make invaluable – though frequently unrecognized – contributions to sustainable agriculture and food security. Invertebrates (e.g. insects, spiders and earthworms) and micro-organisms (e.g. yeasts, bacteria and fungi) – are responsible for pollinating crops and trees, recycling soil nutrients, helping to sequester carbon, fermenting and preserving foods, and controlling crop and livestock pests – among other vital contributions to the ecosystem services that are critical for agriculture and food production. Micro-organisms and invertebrates also include microbes and pests that attack plants and animals and carry diseases. The dual nature of these organisms – as both helpful and harmful to agriculture – underscores the importance of understanding and managing them.

87. Climate change is one of many factors that affect the ability of micro-organisms and invertebrates to contribute to ecosystem services, a scenario that compromises the future adaptive capacity of agriculture in the face of climate change. Micro-organisms and invertebrates are the most diverse and least studied component of agricultural ecosystems. The precise impacts of climate change on this largely invisible realm of diversity is complex and unpredictable, but FAO concludes that climate change will influence the distribution and functioning of micro-organisms and invertebrates (FAO, 2011f). There are few international programmes dedicated to ensuring the long-term conservation and availability of micro-organisms and invertebrates, and there is a void in terms of international climate change policies that address the issue.

88. **UNFCCC and biodiversity of micro-organisms and invertebrates:** Due in part to the low profile of soil carbon sequestration strategies under the UNFCCC, and the limited focus on

⁸⁰ COP10, Decision X/33.

⁸¹ COP7, Decision VII/4, Annex.

adaptation activities, the conservation and use of invertebrates and micro-organisms has so far not been addressed by the UNFCCC.

89. **The CBD and biodiversity of micro-organisms and invertebrates:** Within the context of its programme of work on agricultural biodiversity, FAO has taken a lead role in the development of two cross-cutting initiatives focused on invertebrates and micro-organisms:

- i) International Initiative for the Conservation and Sustainable Use of Pollinators; and
- ii) International Initiative for Conservation and Sustainable Use of Soil Biodiversity.

90. At the request of the CBD, FAO facilitates and coordinates both global initiatives. Many partner organizations collaborate with FAO on these initiatives. Both initiatives strive to enhance cooperation and strengthen the work of international partners and existing efforts concerned with the conservation and sustainable utilization of invertebrates and pollinators of relevance to food and agriculture.

91. A 2010 progress report on the International Initiative for the Conservation and Sustainable Use of Pollinators examines a specific case of climate change impacts on crop pollinators in the United Kingdom.⁸² FAO's Global Action on Pollination Services for Sustainable Agriculture commissioned a review of the potential effects of climate change on crop pollination⁸³. The review concluded that climate change may have a significant impact on the provisioning of pollination services in the future. The most likely effect of climate change on pollinators will result from an increase in temperature. While it may be possible to shift the cultivation of crops to more suitable areas under changing climates, there are few species of managed pollinators, and wild pollinators that may not be able to follow the movement of crops.

92. At the regional level, in 2009 the European Commission's Joint Research Centre Institute for Environment and Sustainability established a working group to investigate the relationships between soil biodiversity, soil functions and climate change.⁸⁴

General considerations

93. With partners, the Commission is uniquely positioned to advance understanding and integration of GRFA in the climate change policy context.

94. The low profile of GRFA in international climate change policy points to the need for closer coordination and communication between international policy-makers who are grappling with the related challenges of agriculture, climate change and food security. Consideration of the inter-linkages between climate change, agriculture and food security could contribute to greater coherence across these policy areas. This effort has already begun. At the invitation of UNFCCC, for example, FAO has submitted suggestions for promoting the effective integration of agriculture and food security within the UNFCCC negotiations – including the potential role of GRFA. The HLPE study on food security and climate change will inform the CFS process, and it could also play an important role in informing climate change negotiations.

95. Specific entry points could be identified (e.g. agriculture-related NAPA and NAMAs) through which developing countries could incorporate strategies for conservation and sustainable use of GRFA in nationally appropriate ways.

96. The Rio+20 preparation process may offer additional opportunities for the Commission, in close collaboration with partners, to advocate for integration of GRFA and food security in international climate change policy. In 2010 the CBD COP 10 proposed the development of joint activities between the three Rio Conventions related to climate change, biodiversity, land degradation and ecosystem-based approaches to climate change mitigation and adaptation. The proposal includes the possibility of convening, prior to Rio+20, a joint preparatory meeting between the three Rio conventions. The Commission may wish to explore the possibility of collaborating with partners in a

⁸² <http://www.cbd.int/doc/meetings/sbstta/sbstta-14/information/sbstta-14-inf-31-en.pdf>

⁸³ Kjøhl, M. Nielsen A. & Stenseth, N.C. 2011. Potential effects of climate change on crop pollination. FAO, Rome.

⁸⁴ http://eusoils.jrc.ec.europa.eu/esdb_archive/eusoils_docs/Poster/Soil_ClimateChange.pdf

Rio+20 preparation process in order to advance consideration of GRFA in climate change mitigation and adaptation activities.

97. The impacts of climate change on agriculture are expected to increase the interdependence of all nations with respect to access to and exchange of GRFA, suggesting the need for policies that reduce barriers to collection and to facilitate wider exchange and use of GRFA. Climate change implications need to be considered, for example, in all planning and decision-making related to GRFA and policies governing access and exchange. The needs and priorities of each GRFA sector will be different. The Commission is uniquely situated to identify policies (e.g. related to collecting GRFA, *in situ* and *ex situ* conservation, and intellectual property) that could act as potential barriers to collection and wider use of GRFA. Priorities will differ, according to the sector-specific context and needs.

98. The Commission has a potential role to play in advocating and ensuring that climate change policies involving GRFA incorporate the insights and proposals of those they are intended to support. Farmers, livestock keepers, fisher people and forest dwellers offer enormous adaptive capacity – but their efforts must be recognized and supported at all levels. Climate change adaptation and mitigation measures involving GRFA must be designed and undertaken in a participatory process involving all stakeholders, especially smallholder farmers, livestock keepers, fisher people and forest-dependent people. The reformed CFS offers one example of the importance of including diverse and independent voices and expertise. FAO has also taken important steps to facilitate the active participation of civil society, including people's movements, through collaboration with the International Civil Society Planning Committee for Food Sovereignty.

V. CONCLUSIONS

99. The role of GRFA, and the need to conserve and utilize these resources for strategic climate change adaptation and mitigation activities, is not currently reflected in the major international instruments addressing climate change.

100. The near absence of GRFA in international climate change policy instruments is due, in part, to the emphasis on mitigation activities and the low profile of agriculture and food security – including the potential role of agriculture in climate change mitigation and adaptation –in the UNFCCC process.

101. The agriculture community has only recently engaged in the discussion of international climate change policies under the UNFCCC framework.

102. Recent decisions to enhance adaptation activities under the UNFCCC – and pledges to increase financing to support them – could provide new opportunities for advancing the consideration of agriculture (including GRFA) and food security in the climate change policy debate.

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APPENDIX I

TIMELINE: GLOBAL GOVERNANCE OF CHANGE AND THE UNFCCC

1979 – First World Climate Conference.

1985 – Advisory Group on Greenhouse Gases established (the first cooperative framework for scientific assessment of climate change).

1987 – The Brundtland Report (World Commission on Environment and Development) discusses climate change in the context of environment and development.

1988 – Intergovernmental Panel on Climate Change (IPCC) established to provide authoritative scientific assessment of climate change.

1990 – Second World Climate Conference.

1990 – IPCC publishes *First Assessment Report* of climate change (impacts of climate change on GRFA mentioned).

1991 – Intergovernmental Negotiating Committee set up under the UN General Assembly to oversee negotiations towards an international agreement.

1992 – The Rio Earth Summit (UN Conference on Environment and Development) adopts the UNFCCC.

1994 – UNFCCC enters into force on 21 March.

1996 – IPCC publishes its Second Assessment Report.

1997 – Over 150 countries sign Kyoto Protocol.

2001 – United States of America withdraws from Kyoto Protocol.

2001 – IPCC publishes its Third Assessment Report (includes chapter on response of crops and livestock to climate change, and impacts on food and fibre).

2005 – Kyoto Protocol enters into force. Parties adopt the Nairobi Work Programme, a five-year programme of work on impacts, vulnerability and adaptation to climate change.

2007 – IPCC publishes its Fourth Assessment Report (includes chapters on agriculture and food security; GRFA mentioned).

2007 – COP 13 adopts Bali Action Plan, a comprehensive process to implement the Convention through long-term cooperation.

2008 – At the request of Parties, UNFCCC Secretariat prepares a technical paper on the challenges and opportunities for mitigation in the agricultural sector for AWG-LCA.

2009 – AWG-LCA holds a workshop on agriculture; a dedicated drafting group for agriculture seeks to develop sector-specific actions related to mitigation of climate change. The drafting group proposes establishing a SBSTA work programme on agriculture.

2009 – At COP 15 in Copenhagen a coalition of agriculture and development organizations hosts the first “Agriculture and Rural Development Day” to increase the focus on the link between agriculture, food security and climate change, as well as forestry.

2009 – The Copenhagen Accord, a non-binding, non-consensus statement of intent emerges from highly divisive talks in Copenhagen. The Accord does not explicitly mention agriculture or food security or GRFA.

October 2010 – Hague meeting on agriculture and climate change. Conference aims to produce a roadmap of concrete actions linking agriculture-related investments, policies, and measures with the transition to “climate smart” growth.

December 2010 – COP 16 in Cancún, Mexico. Agriculture and Rural Development Day 2010, held in parallel to COP 16, seeks to bring agriculture sector adaptation and mitigation strategies to the forefront of the climate treaty negotiations.

December 2011 – COP 17 will meet in Durban, South Africa, 28 November to 9 December 2011.

APPENDIX II

NATIONAL ADAPTATION PROGRAMMES OF ACTION, PROJECTS IDENTIFIED BY LDC PARTIES THAT ARE RELATED TO GRFA, SUBMITTED TO THE UNFCCC SECRETARIAT AS OF NOVEMBER 2010

	Country	Abbreviated Project Description
1	Bangladesh	Research on drought, flood and saline tolerant crop varieties
2	Bangladesh	Adaptation to fisheries via culture of salt-tolerant fish species
3	Burundi	Drought resistant crops
4	Central African Republic	Climate change resistant varieties
5	Comoros	Drought-resistant varieties
6	Democratic Republic of the Congo	Multiplication of improved seeds
7	Democratic Republic of the Congo	Biodiversity conservation and restoration of Mangroves Marine Park
8	Eritrea	Selecting suitable sheep and goat breeds
9	Guinea	Protection of spawning areas in three estuaries
10	Guinea-Bissau	Conservation and enhancement of fishing and coastal resources project
11	Liberia	Enhancing resilience to rainfall variability via crop diversification and small ruminants
12	Mali	Introduction of animal and plant species w/adaptation potential
13	Mauritania	Genetic improvement of local bovine breeds
14	Mauritania	Protection of diversity of fish population
15	Niger	Dissemination of adapted animal and crop species
16	Rwanda	Promotion of resistant varieties of crops
17	Solomon Islands	Fisheries and marine resources
18	Tuvalu	Introduction of salt-tolerant pulaka species
19	United Republic of Tanzania	Promotion of drought-tolerant crops
20	Yemen	Promotion of drought, heat and salinity tolerant varieties

Source: National Adaptation Programmes of Action: Index of NAPA Projects by Sector, UNFCCC-Secretariat, November 2010.

APPENDIX III

POTENTIAL PARTNERS AT THE INTERNATIONAL LEVEL FOR ADVANCING GRFA IN THE CLIMATE POLICY DEBATE*

Consultative Group on International Agricultural Research (CGIAR) – At COP 16 in Cancún, the CGIAR and the Earth System Science Partnership (ESSP) announced a new ten-year research initiative, the Climate Change, Agriculture and Food Security Programme (CCAFS) that hopes to put agriculture on the post-2012 international climate-change agenda. The objectives of the CGIAR Research Program 7 (CRP7) are: 1) to identify and test pro-poor adaptation and mitigation practices, technologies and policies for food systems, adaptive capacity and rural livelihoods; and 2) to provide analysis to ensure cost-effective investments, the inclusion of agriculture in climate change policies, and the inclusion of climate issues in agricultural policies, from the subnational to the global level (<http://www.ccafs.cgiar.org/>).

Under CCAFS, the **International Commission on Sustainable Agriculture and Climate Change**, seeks to identify policy changes and actions. The Commission commences its work in mid-February 2011 and will deliver its findings for use by decision-makers on climate change and agricultural policies by December 2011.

The **Global Crop Diversity Trust (GCDT)** is recognized as an essential element of the Funding Strategy of the ITPGRFA in relation to the *ex situ* conservation and availability of PGRFA. The Trust's mission is to ensure the conservation and availability of crop diversity for food security worldwide. Its goal is to advance an efficient and sustainable global system of *ex situ* conservation by promoting the rescue, understanding, use and long-term conservation of valuable plant genetic resources. It provides funding to support the operation of the Svalbard Global Seed Vault, which conserves over 150 million crop seeds. From 2007 to 2010 the Trust co-hosted (with Stanford University and the Rockefeller Foundation) three international meetings of agricultural scientists and climate science experts to examine the management of global crop genetic resources in the face of climate change (<http://www.croptrust.org/main/climatechange.php>).

Global Research Alliance on Agriculture and Greenhouse Gas Emissions. Founded on the sidelines of COP 15 in Copenhagen in 2009, 21 developed and developing nations pledged US\$150 million to the Alliance. The Alliance consists of three research groups, covering the broad areas of cropping, paddy rice and livestock, as well as two cross-cutting issues: soil carbon and nitrogen cycling, and inventories and measurement. The interim secretariat is based in New Zealand; the organization's draft charter will be finalized in 2011 (<http://www.globalresearchalliance.org/about-us.aspx>).

Global Partnership Climate, Fisheries and Aquaculture (PaCFA) is a voluntary global-level initiative among 20 international organizations and sector bodies, including FAO, that share a common concern for climate change interactions with global waters and living resources and their social and economic consequences. PaCFA was involved at the UN Climate Change Conference in Copenhagen in December 2009, and seeks to alert and inform decision-makers and climate change negotiators about the need for concerted action on fisheries, aquaculture and climate change. <http://www.climatefish.org>

* Note: this is not an exhaustive list and does not include stakeholders in the private sector, civil society and social movements.

The Collaborative Partnership on Forests (CPF) is a voluntary collaboration among 14 international organizations and secretariats with substantial programmes on forests (FAO, CBD, UNCCD, UNFCCC, United Nations Forum on Forests, Center for International Forestry Research, International Tropical Timber Organization, Global Network for Forest Science Cooperation, Global Environment Facility, United Nations Development Programme, United Nations Environment Programme, World Agroforestry Centre, World Bank, International Union for Conservation of Nature). The CPF's mission is to promote the management, conservation and sustainable development of all types of forest and strengthen long-term political commitment to this end. The CPF initiative on climate change, through the Expert Panel on Adaptation of Forests to Climate Change, prepared a global assessment report on "Adaptation of Forests and People to Climate Change" and the policy brief "Making forests fit for climate change."