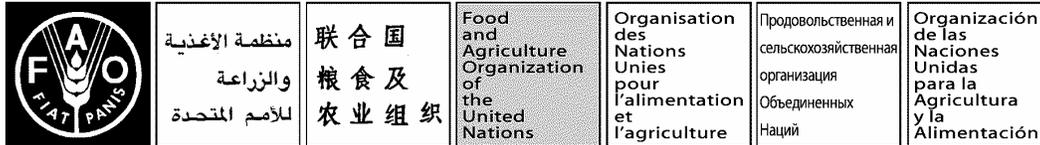


April 2011

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Item 2.1 of the Provisional Agenda
COMMISSION ON GENETIC RESOURCES FOR FOOD AND AGRICULTURE
Thirteenth Regular Session
Rome, 18-22 July 2011
AGRICULTURAL BIOTECHNOLOGIES IN DEVELOPING COUNTRIES: OPTIONS AND OPPORTUNITIES IN CROPS, FORESTRY, LIVESTOCK, FISHERIES AND AGRO-INDUSTRY TO FACE THE CHALLENGES OF FOOD INSECURITY AND CLIMATE CHANGE (ABDC-10) REPORT

The Commission, at its Twelfth Regular Session, welcomed the convening of the international technical conference, *Agriculture biotechnologies in developing countries: Options and opportunities in crops, forestry, livestock, fisheries and agro-industry to face the challenges of food insecurity and climate change (ABDC-10)*, which was organized by FAO on 1-4 March 2010 in Guadalajara, Mexico. The Commission requested FAO to provide a report on the outcomes of the conference and relevant follow-up activities at its next regular session. The report of the conference is contained in this document.

Further information is available in *Biotechnologies for agricultural development*, the FAO publication that constitutes the ABDC-10 proceedings which will be available in mid-2011. It contains an extensive series of FAO background documents prepared for the conference, focusing on the current status and options for biotechnologies in developing countries in crops, forestry, livestock, fisheries/aquaculture and food processing/safety, as well as on related policy issues and options, in particular on targeting agricultural biotechnologies to the poor; enabling research and development (R&D) for agricultural biotechnologies; and ensuring access to the benefits of R&D. One chapter is also dedicated to the e-mail conference that took place as part of the build up to the conference. In addition, it also contains the reports from the 27 parallel sessions held at the conference, most of which were organized by different intergovernmental and non-governmental organizations and regional fora, as well as keynote presentations and, finally, the conference report adopted by delegates in Guadalajara on the final day.

This document is printed in limited numbers to minimize the environmental impact of FAO's processes and contribute to climate neutrality. Representatives and observers are kindly requested to bring their copies to meetings and to avoid asking for additional copies. Meeting documents for this meeting are available on the Internet at: www.fao.org



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联合国
粮食及
农业组织

Food
and
Agriculture
Organization
of
the
United
Nations

Organisation
des
Nations
Unies
pour
l'alimentation
et
l'agriculture

Продовольственная и
сельскохозяйственная
организация
Объединенных
Наций

Organización
de las
Naciones
Unidas
para la
Agricultura
y la
Alimentación

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FAO International Technical Conference

Agricultural biotechnologies in developing countries: Options and opportunities in crops, forestry, livestock, fisheries and agro-industry to face the challenges of food insecurity and climate change (ABDC-10)

Guadalajara, Mexico, 1 – 4 March 2010

Report

I. OPENING OF THE CONFERENCE

1. The International Technical Conference on Agricultural Biotechnologies in Developing Countries: Options and Opportunities in Crops, Forestry, Livestock, Fisheries and Agro-industry to Face the Challenges of Food Insecurity and Climate Change (International Technical Conference), met in Guadalajara, Mexico, from 1 to 4 March 2010. The list of delegates and observers is attached as *Appendix D*.

II. INTRODUCTORY REMARKS BY FAO AND THE GOVERNMENT OF MEXICO

2. Mr Alvaro García Chávez, Secretario de Desarrollo Rural del Gobierno del Estado de Jalisco (Mexico), welcomed delegates and observers to the beautiful city of Guadalajara, noting that the state of Jalisco is a leading agriculture producer. He stressed the importance of this timely global Conference indicating that agriculture needed improved technologies and tools to meet the challenges imposed by global food insecurity and poverty. Mr García Chávez stated that the tools and products of biotechnologies had to be used and produced in a responsible manner to achieve food security while ensuring biosafety and protection of the environment.

3. Mr Modibo Traoré, Assistant Director-General, Agriculture and Consumer Protection Department, of the Food and Agriculture Organization of the United Nations (FAO), welcomed delegates and observers. On behalf of Dr Jacques Diouf, FAO Director-General, he thanked the Government of Mexico for hosting the event and FAO's partners in the initiative, including: the Mexican Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA), the International Fund for Agricultural Development (IFAD), the Consultative Group on International Agricultural Research (CGIAR), the Global Forum on Agricultural Research (GFAR), the International Centre for Genetic Engineering and Biotechnology (ICGEB) and the World Bank. The Conference has brought together policy makers, scientists, civil society and the private sector from FAO member states to take stock of the applications of biotechnologies across the different food and agricultural sectors in developing countries, to learn from the past successes and failures, and to chart a better course for the future. Mr Traoré stressed that the international community should play a key role in supporting developing countries by fostering partnerships and providing a framework for international cooperation and funding for the generation, adaptation and adoption of appropriate biotechnologies. His statement is attached in *Appendix B.1*.

4. Mr Mariano Ruiz-Funes Macedo, Subsecretario de Agricultura, SAGARPA (Mexico) welcomed delegates and observers. He expressed solidarity with Chile in light of the recent natural disaster and the challenges it was presenting for the country. Mr Ruiz-Funes Macedo noted that the growing human population is increasing the demand for food and other agriculture products and, at the same time, there is need to ensure maintenance of natural resources and the conservation of biodiversity. He indicated that Mexico is investing in developing skilled technicians and scientists in order to develop and effectively use biotechnologies, while recognizing the need to integrate modern and emerging technologies with traditional knowledge and practices. Mr Ruiz-Funes Macedo expressed hope that the Conference would help to improve the availability of biotechnology tools for developing countries to support enhanced agriculture production while protecting the environment. His statement is attached in *Appendix B.2* in the original language in which it was provided.

III. KEYNOTE ADDRESS

5. A representative of FAO read a keynote address on behalf of Mr M.S. Swaminathan, Chairman of the M.S. Swaminathan Research Foundation and Honorary Chair of the Conference Steering Committee. He noted that biodiversity is the feedstock not only for food and health security, but also for the management of climate change, but unfortunately is rapidly being lost. Mr Swaminathan indicated the importance of the Convention on Biological Diversity and the International Treaty on Plant Genetic Resources for Food and Agriculture in addressing the conservation and the sustainable and equitable use of biodiversity, while observing that each nation is responsible for

conserving its biodiversity. In his address, Mr Swaminathan stated that the fields of molecular genetics and genetic engineering have opened up opportunities to meet current global challenges. He also indicated that every country should have an independent National Biotechnology Regulatory Authority to ensure that policies provide for the well-being of farmers and consumers, protection of the environment and the security of trade in farm commodities. Mr Swaminathan hoped the Conference would provide a road map to help achieve sustainable food security. His statement is attached in *Appendix B.3*.

IV. ELECTION OF THE CHAIRPERSON, VICE-CHAIRPERSONS AND RAPPORTEUR

6. Mr Jeffrey McNeely was elected as Chair. Ms Marilia Regini Nutti (Brazil) and Ms Priyanjale K.M. Wijegoonawardane (Sri Lanka) were elected as Vice-Chairs. Mr Fernando Gómez Merino (Mexico) was elected as *Rapporteur*.

V. ADOPTION OF THE AGENDA

7. The Agenda was adopted as given in *Appendix A*.

VI. TARGETING BIOTECHNOLOGIES TO THE POOR

8. The FAO Secretariat presented Section A of the background document, *Policy options for agricultural biotechnologies in developing countries*,¹ which provided a framework for targeting biotechnologies to the poor, emphasizing the importance of placing biotechnologies in the context of wider policies for national agricultural and rural development and science and technology while also stressing the international dimensions of these policies and the importance of priority-setting.

9. The International Technical Conference thanked the Secretariat for the informative document. The Conference noted that the use and adoption of biotechnologies in developing countries is affected by a number of factors, such as the existence or absence of policy and regulatory frameworks for biotechnology, costs, farmer and public awareness of potential benefits of biotechnologies, consumer concerns for food safety and environmental protection, market conditions and product demand and capacity to access and use new biotechnologies. It noted that discussions regarding biotechnologies had often focused on genetically modified organisms, when there were many other biotechnology products in use by farmers, such as biofertilizers and biopesticides, as well as many tools and applications being employed within the agriculture sector.

10. The Conference stressed that diverse situations occur among and within countries as do issues, and that situation analysis of the current use and application of biotechnologies would greatly assist targeting of biotechnologies in developing countries. It also noted that sound biotechnology policies, regulations, management strategies, risk assessments, cost-benefit analysis and communication strategies would contribute to the further development and application of biotechnologies, and that national biotechnologies strategies should be prepared within the overall development strategy context of the country.

11. The Conference noted the need for participatory approaches in advancing consideration of the development and use of biotechnologies. Farmers, farmer organizations, producers, local communities and other stakeholders needed to be fully involved in the processes, and scientists needed to better understand farmer needs and production conditions in undertaking biotechnology research. The Conference stressed that the engagement of smallholder farmers and producers in developing countries was necessary to understand their particular challenges and needs, and to determine appropriate use of biotechnologies to assist small-scale farmers.

¹ ABDC-10/8.1 (synthesized in ABDC-10/8.2)

12. The Conference noted the importance of integrating modern biotechnologies with traditional knowledge and practices, and that new tools, policies and approaches should help farmers and producers to remain resilient and independent, and to continue their ecologically sustainable practices. It also noted that farmer willingness to adopt new tools and practices depended on their understanding of, and participation in, the resulting benefits, such as increased production, productivity or, for example, increasing the shelf life of farm products. The Conference emphasized that the intent is for farmers and smallholders to benefit from biotechnologies.

13. The Conference agreed that the further development and application of biotechnologies in many developing countries would benefit from international and regional cooperation and technical and other assistance from international organizations. It noted the need for public research to continue to be supported in order to develop biotechnology tools, products and best sustainable practices, and that national and regional centres of excellence were potential mechanisms for collaboration, and to better focus biotechnology research on the needs of farmers.

VII. SUMMARIES OF PARALLEL SESSIONS OF DAY 1

14. The Conference received summary reports of the results of sector-specific roundtables on case studies of successful applications of biotechnologies in developing countries in crops, livestock, forestry, fisheries and aquaculture, and agro-industry. It also received summary reports of the results of parallel sessions on sector-specific background documents² describing the current status and options from biotechnologies in developing countries. The summary reports from each of the sessions are available on the Conference website³.

VIII. INVESTING IN AGRICULTURAL RESEARCH AND AGRICULTURAL BIOTECHNOLOGIES

15. Mr Rodney Cooke, Director, Operational Policy and Technical Advisory Division, International Fund for Agricultural Development (IFAD), presented a paper on investing in agricultural research and agricultural biotechnologies. He stressed that the world can ill afford to continue under-investing in agriculture given the levels of food insecurity and poverty and the need for effective adaptation strategies for agriculture in light of the challenges of climate change. Mr Cooke noted the need to focus attention on increasing productivity of smallholders and producers, including women farmers.

16. Mr Cooke stated that while investments in agriculture have proven to be highly effective in reducing poverty, securing consistent levels of funding for agricultural science and technology had been problematic for most developing countries, and this situation needed to be addressed. He stressed that agricultural investment plans must be coherent with overall national plans for economic development and poverty eradication. Mr Cooke called for a farmer-centric participatory approach to agricultural research, whereby the products of strategic and applied research move from trained scientists to farmers in rural communities, and the demands and indigenous knowledge of rural communities flow to the scientists. His paper is attached as *Appendix B.4* in the original language in which it was provided.

IX. ENABLING RESEARCH AND DEVELOPMENT IN AGRICULTURAL BIOTECHNOLOGIES

17. The Conference considered Section B of the background document, *Policy options for agricultural biotechnologies in developing countries*⁴, which dealt with public policies for fostering

² ABDC-10/3.1 to ABDC-10/7.1 (synthesized in ABDC-10/3.2 to ABDC-10/7.2 respectively)

³ www.fao.org/biotech/abdc/parallel/en/

⁴ ABDC-10/8.1 (synthesized in ABDC-10/8.2)

appropriate applications of agricultural biotechnologies, including: scientific and technical capacity-building; approaches to, and mechanisms for, planning and funding; and requirements to ensure the safe use of agricultural biotechnologies through environmental and food/feed safety regulation. A number of delegates indicated that their countries had already established biotechnology policies and legal frameworks, which included biosafety.

18. The Conference stressed the need for capacity building to enable further development of biotechnology policy and legal frameworks in developing countries. Since many developing countries already have significant experience in developing and implementing biotechnology policies and legal frameworks, the Conference called for further collaboration among developing countries in particular, to share experiences and approaches. The Conference also requested that support be provided by FAO and other relevant international organizations in preparing biotechnology policy and legal frameworks, as requested.

19. The Conference noted that policy and legal frameworks could establish clear approval and monitoring procedures and the responsibilities and competencies for developing and using biotechnology, provide clarity and certainty for developers and users of biotechnology, as well as investors. The Conference noted that biotechnology is rapidly advancing and evolving, and biotechnology policies and regulatory frameworks would require ongoing review and updating to ensure they remain current and enabling.

20. The Conference stressed the need for communication strategies in the preparation and implementation of biotechnology policies and legal frameworks to promote involvement in the preparatory processes and awareness of regulatory and other requirements and responsibilities, and the benefits of biotechnologies.

21. The Conference emphasized the critical need for ongoing scientific training and education to advance biotechnologies in developing countries. Training to update scientists through workshops, seminars, electronic conferences, science networks and exchanges, and other means would be beneficial. Establishing or enhancing linkages among research institutions and improving information exchange would also be effective means to build capacity, as would using or establishing centres of excellence and convening regional level training initiatives. The Conference noted that quick training responses would sometimes be required, for example, to respond to disease outbreaks affecting agriculture production and productivity.

22. The Conference also saw the need for long-term educational investments to develop the next generation of biotechnology scientists and agriculture extension workers. Incentives might be required to encourage young scientists to undertake research in developing countries to reduce the flow of scientists to developed countries.

23. The Conference indicated that biotechnology capacity building initiatives should take into account existing expertise and facilities, and strategically target country needs and challenges. Delegates indicated several areas for capacity building, including: to enhance legal expertise to prepare, administer and enforce biotechnology laws and regulations; to build capacity in risk assessment and risk management; to better respond to disease outbreaks affecting agriculture production; to advance sustainable agriculture and meet the needs of smallholder farmers and producers; to better utilize endemic species and develop aquaculture resources; and to enhance support for genebanks to assist in conserving genetic diversity as a basic resource for further development of biotechnologies.

24. Taking into consideration a proposal from a representative from civil society, the concern was expressed that genetically modified organisms should not be imposed on farmers in developing countries, in particular if these genetically modified organisms could adversely impact the livelihoods of smallholder farmers.

X. SUMMARIES OF PARALLEL SESSIONS OF DAY 2

25. The Conference received summary reports on the results of parallel sessions on the following cross-cutting issues: Development of genomic resources: Current status and future prospects; Genomic applications: Molecular breeding in developing countries; Enhancing human capacities: Training and education; Ensuring equitable access to technology, including gender issues; Empowering public participation in informed decision-making; Prioritising the role of the farmer; and Public-private partnerships. The summary reports from each of the sessions are available on the Conference website⁵.

XI. BIOTECHNOLOGIES IN INTERNATIONAL AGRICULTURAL RESEARCH CENTERS

26. Mr Thomas Lumpkin, Director General, International Maize and Wheat Improvement Center, of the Consultative Group on International Agricultural Research (CGIAR), began his presentation by noting the important contributions of the late Norman Borlaug in the Green Revolution and in establishing global agriculture research networks. He provided a brief overview of biotechnology application in CGIAR research, stressing that much more investments in agriculture research and technology are required if we are to meet the challenge of feeding a growing human population, with less land and water, and reduced impacts to the environment.

27. Mr Lumpkin stated that a range of biotechnologies were already in use helping to conserve and characterize genetic resources, enhance agriculture production and productivity, produce vaccines and improve food safety, as examples. He also noted that the further development and use of biotechnologies would need to address a number of issues, such as the use of genetically modified organisms in developing countries, cost effectiveness, and establishing public-private partnerships. Given the potential benefits to agriculture, Mr Lumpkin noted that we must work to address challenges and concerns.

XII. ENSURING ACCESS TO THE BENEFITS OF RESEARCH AND DEVELOPMENT

28. The Conference considered Section C of the background document, *Policy options for agricultural biotechnologies in developing countries*⁶, which dealt with ensuring access to the benefits of biotechnology, and covered the issues of intellectual property rights, public awareness and participation and the roles of extension services. The Conference reiterated the need for effective communication with all stakeholders in advancing the development and use of biotechnologies. Dialogue was essential in order to avoid one-way communication, and various means of communication would need to be employed to reach out to rural people.

29. However, a number of delegates noted that while they had in place biotechnology policies and regulatory frameworks, which include biosafety, ensuring the participation of smallholder farmers and producers in decision-making processes is often difficult, and that empowering local people and identifying community leaders will promote and support effective participation. Lack of access to modern communication means, such as the Internet, and lack of education were cited as challenges to effective involvement in decision-making processes. Lack of resources is also a key impairment to the participation of poor farmers and producers.

30. Some delegates indicated success in communicating awareness of opportunities to utilize biotechnologies with their stakeholders. Examples included providing farmers with hands-on experience with biotechnologies, and having them transfer knowledge to other farmers. Extension services in some countries had also proved effective, as had farmer and producer training courses. Stakeholder forums were used to bring together scientists and producers on a regular basis to discuss

⁵ www.fao.org/biotech/abdc/parallel/en/

⁶ ABDC-10/8.1 (synthesized in ABDC-10/8.2)

opportunities and concerns in some countries. The important role of the CGIAR in building capacity in biotechnology was acknowledged, and further assistance from the Centers was requested.

XIII. TECHNOLOGY TRANSFER ASPECTS OF THE MULTILATERAL SYSTEM OF THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE; SOUTH-SOUTH COLLABORATION

31. Mr Shakeel Bhatti, Secretary of the International Treaty on Plant Genetic Resources for Food and Agriculture, presented an overview of the International Treaty, which entered into force in 2004. He described the scope of the International Treaty and progress made in its implementation, including the use of a Standard Material Transfer Agreement that is being widely used. Mr Bhatti also reported on technology transfer under the Multilateral System of the International Treaty, and other accomplishments to date. Transfer of germplasm within the system is growing and operational procedures are well established, and a number of local level plant genetic resources projects are being supported through the Funding Strategy of the Treaty.

32. Mr Bhatti noted that the International Treaty provides for the transfer of technologies and associated human capacity building. He stated that implementation of the Treaty would contribute to efforts to adapt to climate change by enhancing the conservation of plant genetic resources, facilitating transfer of technology and by providing funding to developing countries. Mr Bhatti outlined some of the needs to further advance the operation of the International Treaty.

XIV. SUMMARIES OF PARALLEL SESSIONS OF DAY 3

33. The Conference received summary reports on the results of parallel sessions on specific regions: Latin America and the Caribbean; Near East and North Africa; Sub-Saharan Africa; Asia and the Pacific; and Eastern Europe and Central Asia. A number of issue papers were considered in these sessions. Summary reports were also received from parallel sessions dedicated to the following cross-cutting issues: Utilization of plants for non-food use: Challenges and perspectives; Policy coherence at the regional level; Biosafety in the broader context of biosecurity; Intellectual property rights in agricultural biotechnology; and Conservation and sustainable use of genetic resources for food and agriculture. The summary reports from each of the sessions are available on the Conference website⁷.

XV. MOVING BEYOND BUSINESS-AS-USUAL: OPTIONS FOR DEVELOPING COUNTRIES; MOVING BEYOND BUSINESS-AS-USUAL: PRIORITIES FOR ACTION FOR THE INTERNATIONAL COMMUNITY

34. The Conference considered the background document, *Agricultural biotechnologies for food security and sustainable development: Options for developing countries and Priorities for Action by the international community*⁸. The Secretariat introduced the document, noting that the conclusions of the Conference would greatly assist in advancing discussions on agricultural biotechnologies within the governing bodies of FAO. The Chair of the Conference had prepared Chair's Text with key conclusions from the Conference to facilitate discussion on options for developing countries as well as priorities for action for the international community.

35. The Conference requested that consideration be given to starting a discussion on the establishment of an international agreement on sharing and using animal genetic resources for food and agriculture.

36. The Conference re-emphasized one of the conclusions of the UN Millennium Project, i.e. that science, technology and innovation underpin every one of the Millennium Development Goals.

⁷ www.fao.org/biotech/abdc/parallel/en/

⁸ ABDC-10/9

KEY CONCLUSIONS

37. The International Technical Conference acknowledged that:
- a) Agricultural biotechnologies⁹ encompass a wide-range of tools and methodologies that are being applied to an increasing extent in crops, livestock, forestry, fisheries and aquaculture, and agro-industries, to help alleviate hunger and poverty, assist in adaptation to climate change and maintain the natural resource base, in both developing and developed countries.
 - b) The various applications of agricultural biotechnologies have not been widely used in many developing countries, and have not sufficiently benefited smallholder farmers and producers and consumers.
 - c) More research and development of agricultural biotechnologies should be focused on the needs of smallholder farmers and producers.
 - d) Governments need to develop their own national vision and policy for the role of biotechnologies, with options and opportunities examined within the context of national economic, social and rural sustainable development and environmental strategies, objectives and programmes.
 - e) Effective communication and participation strategies are necessary to encourage and promote public involvement and empowerment in decision-making processes, regarding the development and use of biotechnologies.
 - f) Stronger partnerships among and within countries will facilitate the development and use of biotechnologies, including south-south and regional alliances; incorporation of traditional knowledge; and public-private and research partnerships for sharing experiences, information and technologies.
38. The International Technical Conference agreed that:
- a) Developing countries should significantly increase sustained investments in capacity building and development and safe use of biotechnologies; integrated with other agricultural technologies, including traditional knowledge, and maintain the natural resource base to support in particular, smallholders, producers and small biotechnology based enterprises; employing effective participatory approaches for the robust input from stakeholders in decision-making processes.
 - b) FAO and other relevant international organizations and donors should significantly increase their efforts to support the strengthening of national capacities in the development and appropriate use of pro-poor agricultural biotechnologies, and that they be directed to the needs of smallholders, consumers, producers and small biotechnology based enterprises in developing countries.
 - c) Both the lack of policies and regulatory mechanisms as well as overly stringent regulations hinder development of, and access to biotechnologies. Effective and enabling national biotechnology policies and science-based regulatory frameworks can facilitate the development and appropriate use of biotechnologies in developing countries; and ongoing reviews, improvement and harmonization of existing biotechnology policies and regulatory frameworks can keep them current and rational.

⁹ The definition is broad and is based on that in Article 2 of the Convention on Biological Diversity, which states that biotechnology is "any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use". The specific kinds of biotechnologies encompassed by the term 'agricultural biotechnologies' are described in the sector-specific documents ABDC-10/3.1 to ABDC-10/7.1.

XVI. CLOSING REMARKS

39. Mr Modibo Traoré, FAO Assistant Director-General, Agriculture and Consumer Protection Department, began his statement by thanking the Government of Mexico and the State of Jalisco for hosting the Conference and for their generous hospitality. He expressed his appreciation to the organizations that had worked in partnership with FAO to organize and convene the Conference, which had brought together about 300 individuals from 68 different countries. Mr Traoré thanked all of the staff that had worked before and during the Conference to ensure the smooth running of the Conference. He noted that the Knowledge Share Fair had significantly contributed to the Conference, and thanked the 22 organizations that had participated in the Fair.

40. Mr Traoré thanked the delegates and observers for their advice and constructive inputs during the Conference, which resulted in clear and practical conclusions. He noted that the Conference had confirmed that the use of biotechnologies in the crop, livestock, forestry, fishery and agro-industry sectors can contribute to alleviating hunger and poverty and in promoting rural development in developing countries. Mr Traoré observed that the Conference had also underlined that countries are committed to assisting poor smallholders, fishers and forest-dependent populations in developing countries by ensuring that they have access to appropriate biotechnologies that focus on their problems and that they are fully involved in the decision-making processes regarding their development and use.

41. Mr Victor M. Villalobos, Director General, Inter-American Institute for Cooperation on Agriculture, noted that achieving and maintaining food security, in light of a growing human population and climate change, imposed numerous challenges for agriculture. He stated that demand for crops as fuels and other non-food uses and rising prices, also are affecting food security in developing countries, especially for poor rural people.

42. Mr Villalobos stressed that much of agriculture production was not currently sustainable and that this situation must change. Employing sound biotechnologies, he stated, could assist in addressing the global challenges of feeding a growing human population with less inputs and less adverse impacts on the environment. He reminded the Conference that we had faced many other challenges in our past, and now needed to work together to resolve current issues.

43. Mr Villalobos observed that the debate on genetically modified organisms had become polarized. He stated that we cannot afford to abandon the use of genetically modified organisms in agriculture, but that we must use them in a sound manner to assist in achieving our sustainability goals, and without adverse impacts on the environment. To achieve this, he stressed that science-based decision making and convergence of all actors on achieving food security and sustainable agriculture would be key. Mr Villalobos indicated that the Conference had provided valuable advice for the development and use of biotechnologies in developing countries, and that all countries now needed to carefully consider this advice in moving forward.

XVII. CLOSURE OF THE CONFERENCE

44. Mr Salvador Fernández Rivera, Coordinador de Investigación, Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP), on behalf of Mr Mariano Ruiz-Funes Macedo, Subsecretario de Agricultura, SAGARPA, thanked FAO and the other partners for organizing this important Conference in Mexico. He noted that many developing countries have common problems, and that the Conference had indicated the willingness of countries and experts to work together to resolve problems and meet the common global goals of achieving food security, without degrading the natural environment, and to address climate change. Mr Fernández Rivera expressed his satisfaction with the conclusions of the Conference, noted that the work is not yet finalized and hoped that in each country mechanisms could be developed to follow up on the conclusions. He emphasized that each country has to take its own decisions regarding use of agricultural biotechnologies and declared the Conference closed.

APPENDIX A

Agenda

I. OPENING AND ORGANIZATIONAL MATTERS

1. Opening of the conference
2. Election of the Chairperson and Vice-Chairpersons
3. Adoption of the Agenda and Timetable
4. Appointment of the Rapporteur
5. Introductory remarks by FAO and the Government of Mexico
6. Keynote address

II. PLENARY SESSION 1

7. Targeting biotechnologies to the poor

III. PARALLEL ROUNDTABLES (presentation and discussion of sector-specific case studies of successful applications of biotechnologies in developing countries)

- a) Crops
- b) Livestock
- c) Forestry
- d) Fisheries and aquaculture
- e) Agro-industry

IV. PARALLEL SESSIONS (presentation and discussion of sector-specific background documents on the current status and options from biotechnologies in developing countries)

- a) Crops
- b) Livestock
- c) Forestry
- d) Fisheries and aquaculture
- e) Agro-industry

V. PLENARY SESSION 2

8. Summary - output of Day 1
9. Investing in agricultural research and agricultural biotechnologies
10. Enabling research and development in agricultural biotechnologies

VI. PARALLEL SESSIONS (Cross-cutting issues)

- a) Genomic applications (in collaboration with the CGIAR)
- b) Enhancing human capacities: Training and education (in collaboration with the International Centre for Genetic Engineering and Biotechnology [ICGEB])
- c) Ensuring equitable access to technology, including gender issues (in collaboration with Oxfam International)
- d) Empowering public participation in informed decision-making (in collaboration with the International Union for Conservation of Nature [IUCN])

- e) Prioritising the role of the farmer; Public-private partnerships (in collaboration with the International Federation of Agricultural Producers [IFAP])

VII. PLENARY SESSION 3

- 11. Summary - output of Day 2
- 12. Biotechnologies in international agricultural research centers (Consultative Group on International Agricultural Research [CGIAR] presentation)
- 13. Ensuring access to the benefits of research and development
- 14. Technology transfer aspects of the Multilateral System of the International Treaty on Plant Genetic Resources for Food and Agriculture
- 15. South-South collaboration

VIII. PARALLEL SESSIONS (Region-specific discussions)

- a) Latin America and the Caribbean (in collaboration with the Inter-American Institute for Cooperation on Agriculture [IICA] and the Technical Cooperation Network on Plant Biotechnology in Latin America and the Caribbean [REDBIO])
- b) Near East and North Africa (in collaboration with the Association of Agricultural Research Institutions in the Near East and North Africa [AARINENA])
- c) Sub-Saharan Africa (in collaboration with the Forum for Agricultural Research in Africa [FARA])
- d) Asia and the Pacific (in collaboration with the Asia-Pacific Association of Agricultural Research Institutions [APAARI])
- e) Eastern Europe and Central Asia

IX. PARALLEL SESSIONS (Cross-cutting issues)

- a) Policy coherence at the regional level (in collaboration with the United Nations Conference on Trade and Development [UNCTAD])
- b) Biosafety in the broader context of biosecurity
- c) Intellectual property rights (in collaboration with the World Intellectual Property Organization [WIPO])
- d) Utilisation of plants for non-food uses: Challenges and perspectives (in collaboration with the United Nations Industrial Development Organization [UNIDO])
- e) Conservation and sustainable use of genetic resources for food and agriculture (in collaboration with the CGIAR)

X. PLENARY SESSION 4

- 16. Summary - output of Day 3
- 17. Moving beyond business-as-usual: Options for developing countries
- 18. Moving beyond business-as-usual: Priorities for Action for the international community
- 19. Adoption of the conference Report
- 20. Closing remarks
- 21. Closure of the conference

APPENDIX B.1 Mr Modibo Traoré, Assistant Director-General, Agriculture and Consumer Protection Department, FAO

*Mr Mariano Ruiz-Funes Macedo, Sub-secretary of Agriculture, SAGARPA,
Mr Alvaro García Chávez, Secretary of Rural Development, State of Jalisco,
Members of the Steering Committee,
Honourable Delegates,
Colleagues,
Ladies and Gentlemen,*

It is my great pleasure to be with you today and to welcome you all to the FAO International Technical Conference on Agricultural Biotechnologies in Developing Countries. I want to begin by thanking the Government of Mexico for hosting this event in such a beautiful city, Guadalajara. I also thank our partners in this initiative including SAGARPA, IFAD, CGIAR, GFAR, ICGEB, and the World Bank. On behalf of the FAO Director-General, Dr Jacques Diouf, I thank all of you for your support and commitment for bringing together the policy makers, scientists, civil society, and private sector from our member states to explore the options and opportunities from biotechnologies for food and agriculture in order to face the challenges of food insecurity, climate change, and natural resource degradation.

A major objective of this Conference is to take stock of the application of biotechnologies across the different food and agricultural sectors in developing countries. We expect to learn from the past successes and failures and chart a better course for the future. The timing for this dialogue is very opportune as it is taking place in the wake of the Declaration of the World Summit on Food Security held last November at FAO headquarters – which noted that agriculture in the 21st century faces multiple challenges for doubling food production by 2050, particularly in developing countries. Concrete and appropriate tools and technologies are needed to underpin national investments and implementation of appropriate policies for addressing these challenges¹.

Modern and conventional biotechnologies provide potent tools for the agriculture sector, including fisheries and forestry. When appropriately integrated with other technologies for the production of food, agricultural products and services, biotechnologies can be of significant assistance in meeting the needs of an expanding and increasingly urbanized population. In the past few decades, the field of biotechnologies has advanced at a formidable speed and generated numerous innovations particularly in the field of pharmaceuticals and some in the field of agriculture. In the food and agriculture sector, it is helping to reduce losses from some pests and diseases and increasing environmental sustainability, especially in developed countries. There are new breakthroughs in genomics and bioinformatics that are expanding our understanding of nature and its diverse functions.

Honourable Delegates, Colleagues, Ladies and Gentlemen,

Despite these contributions from conventional technologies and biotechnologies, the number of underfed in the world is greater today than at any time in our history, standing at around one billion people. Approximately 75% of the world's hungry and poor live in rural areas and derive their livelihoods from agriculture. The current unacceptable level of food insecurity is worsened by the uncertainties of climate change, which hits harder the developing countries. At the same time, there is demand for improved variety, quality and safety of agricultural products, driven by urbanization and rising incomes.

Our challenge is to increase food productivity, through scientific and sustainable practices and efficient resource use, while preserving the natural resource-base and environmental quality. These realities call for adoption of a strategic approach for sustainable production intensification: a

¹ www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Final_Declaration/WSFS09_Declaration.pdf

framework that can provide an adequate supply of food of requisite quality with more efficient and resilient production systems using good farming practices that make efficient use of the natural resources, coupled with enabling policies and institutional framework. Intensification must also deliver benefits to farmer livelihoods and support especially the smallholders who are key to achieving food security.

Scientific and technical advances must underpin the sustainable production intensification. A new approach to agricultural research and development is needed that supports the wider and wiser use of agricultural biodiversity to promote development and improve food security. New technologies should make their contributions also through efficiency gains from better management of inputs and biodiversity. This will require greater involvement of farmers, institutions and communities. It will require other enabling factors, such as policies, institutional support, and investment in human and physical capital and in-country capacity building. FAO focuses its activities on support to smallholders in order to sustainably increase agricultural production, improve access to markets and enhance livelihoods.

Biotechnologies should play a more direct and critical role with their contributions and innovations. When biotechnologies are developed and adopted, they should build upon existing conventional knowledge and technologies. At present, there is a lack of appropriate and useful technologies, policies, technical capacities, and requisite infrastructure for their development, evaluation and deployment in most developing countries. Most biotechnologies often cannot be fully exploited because they are not well integrated with the components of the production systems. Often, there is emphasis on genetically modified organisms only, which overshadows all other biotechnologies and their potential contribution to agriculture. In addition, the synergy between the public and private sector remains to be harnessed to achieve the desired goal. As a result, biotechnologies are not yet making a significant impact in the lives of people in most developing countries.

This conference is about how to redirect biotechnologies in a way that they can benefit poor farmers in poor countries and not only rich farmers in rich countries. The international community should play a key role in supporting developing countries by fostering partnerships and providing a framework for international cooperation and funding for the generation, adaptation and adoption of appropriate biotechnologies. Such a process would involve the leveraging of the outputs, with the existing capacities in the national governments, the CGIAR centres and other partners committed to provision of public goods in order to provide a direct access to biotechnologies for the developing world. FAO will continue to provide all assistance to strengthen national and regional capacities for making informed decisions with respect to use of biotechnologies.

Honourable Delegates, Colleagues, Ladies and Gentlemen,

The Millennium Development Goal to reduce hunger and extreme poverty by half cannot be met five years from now with a “business as usual” approach. Appropriate biotechnologies, if aimed at problems and needs of smallholders in developing countries and supported by the necessary investments in strengthening national technical and policy capacities, can contribute toward meeting that goal. The future for agriculture implies a complex set of challenges, but the battle against hunger must be won.

I wish you a very productive meeting, and look forward to the results of your deliberations. Thank you for your kind attention.

APPENDIX B.2 Mr Mariano Ruiz-Funes Macedo, Subsecretario de Agricultura, SAGARPA, Mexico

Muy buenos días a todos;

- Sr. Secretario De Desarrollo Rural del Gobierno del Estado de Jalisco, **Sr. Álvaro García Chávez;**
- Representante personal del Director General de FAO, **Sr. Modibo Traoré;**
- Honorables miembros del presídium;
- Señoras y señores investigadores y conferencistas, funcionarios y amigos que nos acompañan, sean todos ustedes bienvenidos a México.

Es un honor para mí acompañarlos en la inauguración de esta **Conferencia Técnica Internacional sobre Biotecnologías Agrícolas en los Países en Desarrollo**, de gran relevancia para el sector agroalimentario mundial, y de particular interés del Secretario Francisco Mayorga, quien les envía un cordial saludo.

Agradezco a la FAO haber elegido a México como anfitrión de este evento, lo que es particularmente significativo porque nuestro país fue pionero en la Revolución Verde, que generó un cambio de paradigma en las prácticas agrícolas de numerosas zonas del mundo, con el consecuente incremento de la producción de alimentos. Nuestro recuerdo y reconocimiento para el Dr. Norman Borlaug y al grupo de científicos mexicanos que la hicieron posible.

El reto para producir mas alimentos sigue presente; En congruencia con los objetivos de aumentar la productividad agrícola y la seguridad alimentaria, conservando los recursos naturales y la biodiversidad del planeta, establecidos por FAO, resulta relevante esta Conferencia, que debe ser un ejercicio técnico de análisis sobre las experiencias, situación actual y perspectivas del uso de la biotecnología en el sector agroalimentario, a fin de coadyuvar a la alimentación de millones de personas en el mundo.

Los desafíos no son menores. De acuerdo Naciones Unidas, la población mundial alcanza 6 mil 800 millones de habitantes, más de 2.5 veces que en 1950, y se estima que alcanzará 9 mil millones en 2045, lo que se traducirá en una enorme demanda de alimentos.

Ese reto es aún mayor si se toman en cuenta los efectos negativos del cambio climático en la producción agropecuaria, y el deterioro de los recursos naturales, como resultado de las actividades humanas.

Por ello, las acciones deben orientarse a buscar la seguridad alimentaria mediante la producción de alimentos suficientes, inocuos, accesibles y de calidad, pero cuidando en todo momento los recursos naturales y el medio ambiente. Se requiere aumentar la disponibilidad de semillas, recuperar la fertilidad de los suelos, hacer un uso eficiente del agua y darle valor agregado a la producción primaria.

Esta Conferencia es una oportunidad para analizar la problemática técnica y científica de la producción de alimentos desde diversos puntos de vista. La pregunta relevante es ¿Cómo la biotecnología contribuirá a atender la demanda alimenticia en un contexto caracterizado por consumidores cada vez más exigentes, mejor informados y más preocupados, no sólo por el contenido mismo de los alimentos, sino por cómo se produjeron y comercializaron?

La biotecnología ha permitido el desarrollo de nuevas herramientas que, sumadas al mejoramiento convencional de cultivos y animales, pueden aplicarse con diversos fines, como el mejoramiento genético de variedades vegetales y poblaciones animales; el aumento de rendimientos; la caracterización y conservación de los recursos genéticos; y el diagnóstico y prevención de enfermedades.

La gama de posibilidades que ofrece la biotecnología también debe responder a los cambios en los patrones de consumo, como los alimentos con propiedades nutraceuticas, con más vitaminas y minerales, y que resistan mejor el transporte y el almacenamiento. A la vez, debe propiciar que las actividades productivas sean más rentables, se produzcan en menores superficies y con un uso más racional del agua. Esa es la relevancia y el potencial del tema que hoy nos ocupa.

En México, uno de los principales objetivos del **Plan Nacional de Desarrollo**, es “abastecer el mercado interno con alimentos de calidad, sanos y accesibles provenientes de nuestros mares y campos”, mediante el desarrollo, adaptación y adopción de nuevas tecnologías.

Múltiples de los desafíos que enfrenta el sector agrícola en México son fundamentalmente técnicos, y deben ser abordados con esa orientación. De ahí la importancia de emprender un cambio que, por un lado, se base en la experiencia de nuestros agricultores en el manejo de técnicas tradicionales y reconozca nuestra riqueza y diversidad biológica y, por otro, aplique nuevas tecnologías, para incrementar la productividad.

Actualmente, México cuenta con capital humano e infraestructura para contribuir a los avances de la biotecnología y transformarla en un instrumento estratégico para su desarrollo.

En las últimas tres décadas, en el país se ha generado una red de investigación en biotecnología, con más de mil investigadores de alto nivel y cerca de cien instalaciones con capacidades competitivas internacionalmente, en diferentes disciplinas.

Asimismo, para fortalecer la formación de talentos, el país cuenta con universidades e institutos que ofrecen programas de postgrado en Biotecnología y Ciencias Agrícolas, que han abierto sus puertas a estudiantes e investigadores de otros países.

Por otra parte, el país tiene un elevado potencial de crecimiento industrial, en particular en las áreas relacionadas con recursos biológicos. Existen empresas mexicanas que han incursionado exitosamente en el desarrollo y fabricación de productos a partir de biotecnologías modernas. Ese es el caso de procesos para biofermentación y producción de bioenergéticos alternativos; biofertilizantes; y la mejora de las características agronómicas de cultivos de alta importancia económica, principalmente las relacionadas con la resistencia al estrés biótico.

De acuerdo con la estrategia establecida por el Presidente Felipe Calderón, en el sector agropecuario se trabaja en cuatro ámbitos: uso eficiente de agua, manejo de enfermedades y plagas, mantenimiento de la fertilidad del suelo y mejoramiento genético de variedades.

Como en la década de los sesenta, la biotecnología debe ser un instrumento para que los países en desarrollo, aprovechen su riqueza biológica e, insisto, con respeto al medio ambiente, a la diversidad y a la salud, a fin de impulsar la productividad del sector agropecuario, incrementar la oferta de alimentos y mejorar las condiciones de vida de millones de personas en todo el mundo.

Parte importante del desarrollo de esos países dependerá de su habilidad para adquirir, adoptar, desarrollar y difundir innovaciones de productos y procesos basados en la biotecnología, científicamente sustentada y adecuada al contexto de cada país.

Esta Conferencia es una oportunidad para mirar hacia el futuro, conjuntar esfuerzos e identificar líneas de acción, que sirvan de marco para la cooperación internacional y el financiamiento de desarrollos biotecnológicos.

Por último, quiero hacer un reconocimiento a todos ustedes, investigadores destacados de varias partes del mundo. Gracias a su labor y compromiso, hoy vemos en la biotecnología una herramienta para avanzar en el propósito de poner alimentos disponibles y accesibles para los próximos años, mejorar las condiciones de vida de casi mil millones de personas, que padecen hambre y pobreza en muchas regiones del planeta.

Muchas gracias y les deseo el mayor de los éxitos.

APPENDIX B.3 Mr M S Swaminathan, Chairman, M S Swaminathan Research Foundation, Chennai, India.**Biotechnology and Shaping the Future of Food Security**

Demographic explosion, environment pollution, habitat destruction, enlarging ecological footprint, co-existence of widespread hunger and unsustainable life styles, and potential adverse changes in climate all threaten the future of human food, water, health and livelihood security systems. 2010 appears to mark the beginning of uncertain weather patterns and extreme climate behaviour. Events like temperature rise, drought, flood, coastal storms and rise in sea level are likely to present new challenges to the public, professionals and policy makers. Biodiversity has so far served as the feedstock for sustainable food and health security and can play a similar role in the development of climate resilient farming and livelihood systems. Biodiversity is also the feedstock for the biotechnology industry. Unfortunately, genetic erosion and species extinction are now occurring at an accelerated pace due to habitat destruction, alien species invasion and spread of agricultural systems characterized by genetic homogeneity. Genetic homogeneity enhances genetic vulnerability to biotic and abiotic stresses. To generate widespread interest in biodiversity conservation, the UN General Assembly has declared 2010 as the International Year of Biodiversity.

Biodiversity: Feedstock for the Biotechnology Industry:

The Global Convention on Biodiversity (CBD) adopted at the UN Conference on Environment and Development held at Rio de Janeiro in 1992, and the International Treaty on Plant Genetic Resources for Food and Agriculture adopted by Member Nations of FAO in 2001 provide a road map for the conservation and sustainable and equitable use of biodiversity. CBD emphasises that biodiversity occurring within a Nation is the sovereign property of its people. Hence, the primary responsibility for conserving biodiversity, using it sustainably and equitably and preserving it for posterity rests with each Nation. This implies that all Nations should subject development programmes to a **Biodiversity Impact Analysis** in order to ensure that economic advance is not linked to biodiversity loss. Inter-generational equity demands that we must preserve for posterity at least a representative sample of the biodiversity existing in our planet today.

Initiatives like the recognition of Globally Important Agricultural Heritage Systems of FAO and the World Heritage Sites of UNESCO are important to generate interest in the conservation and enrichment of unique biodiversity sites. Particular attention will have to be given to protecting the protected areas through public education and social mobilization, in addition to appropriate regulation. Unfortunately, many of the protected areas, National Parks and Biosphere Reserves are facing serious anthropogenic pressures. Based on the model of the Biosphere Trust for the conservation of the Gulf of Mannar Biosphere Reserve in India developed by the M S Swaminathan Research Foundation (MSSRF), Biosphere Reserves could be jointly managed by local communities and Government departments. The concept of participatory forest management should be extended to national parks and biosphere reserves.

Special attention should be paid to biodiversity hotspots. Through public cooperation, they should be converted into biodiversity “happy spots”, where the sustainable use of biodiversity helps to generate new jobs and income. Coastal biodiversity has not received adequate attention. Mangrove wetlands are under various degrees of degradation. The Joint Mangrove Forest Management procedure developed by MSSRF should be implemented wherever mangrove genetic resources still occur.

Biodiversity conservation and sustainable management should become a national ethic. Government agencies including local self-government authorities like **Panchayats** in India could play an important role in both spreading biodiversity literacy through Community Biodiversity Registers and by creating the necessary infrastructure like Gene and Seed Banks. Awareness of the relationship between biodiversity and human health and farm animal survival should become widespread.

Women play a lead role in biodiversity conservation and sustainable use. Mainstreaming of the gender dimension in all conservation and food security programmes is a must. Women conservers should be enabled to continue their conservation ethos, by providing support for essential infrastructure. Agro-biodiversity is the result of interaction between cultural diversity and biodiversity. An important aspect of cultural diversity is culinary diversity. Every step should be taken to recognize and preserve cultural diversity and to blend traditional wisdom with modern science.

Biodiversity is the feedstock not only for food and health security, but also for the management of climate change induced alterations in temperature, precipitation and sea level. Gene banks for a warming planet have become urgent for promoting climate resilient farming systems. We must preserve for posterity a sample of the existing genetic variability in all ecosystems. In this context, the initiative of the Government of Norway in establishing a Global Seed Vault under permafrost conditions at Svalbard near the North Pole is a significant milestone in humankind's battle against genetic erosion. The Defence Research and Development Organisation (DRDO) of India have also recently established under permafrost conditions at Chang La in the Himalayas a National Gene Bank. The prospects for climate change have added urgency to efforts designed to save every gene and species now existing in our Planet.

Good Biosafety: Prerequisite for Successful Biotechnology Enterprises:

The role of farmers and farming in the mitigation of climate change has not so far been adequately recognized and appreciated. Farmers can help build soil carbon banks and at the same time improve soil fertility through Fertilizer trees. Mangrove forests are very efficient in carbon sequestration. Biogas plants can help to convert methane emissions into energy for the household. Hence, a movement should be started at the global, national and local levels for enabling all farmers with small holdings and a few farm animals to develop a water harvesting pond, plant a few fertilizer trees and establish a biogas plant, in every farm. A farm pond, few fertilizer trees and a biogas plant will make every small farm contribute to climate change mitigation, soil health enhancement and water for a crop life saving irrigation.

As a scholar in Genetics at the Cambridge University during 1950-52, I have followed the growth of molecular genetics from the time Watson and Crick discovered the Double Helix Structure of the DNA Molecule. Molecular genetics has opened up uncommon opportunities for solving chronic problems in agriculture and medicine. While all aspects of biotechnology like micro propagation and food processing are important, the hard core of biotechnology is recombinant DNA technology. We are now able to transfer genes across sexual barriers with precision. Marker assisted selection (MAS) has accelerated the pace of progress of plant breeding. Varieties developed by MAS are permitted for use in organic farming.

We have now entered an era of climate change leading to potential adverse changes in temperature, precipitation and sea level. We need new genes for meeting the challenges of a warming planet. The development of new strains possessing resistance to biotic and abiotic stresses like salinity and drought needs the help of genetic engineering.

While there are no serious conflicts, other than ethical, in the field of medical biotechnology, there are apprehensions of threats to human health and the environment in the case food biotechnology. Therefore, every country should have a National Biotechnology Regulatory Authority, which is autonomous, professionally led and which inspires public, political, professional and media confidence. **“The bottom line of our national agricultural biotechnology policy should be the economic well being of farm families, food security of the nation, health security of the consumer, biosecurity of agriculture and health, protection of the environment and the security of national and international trade in farm commodities”.**

I hope the Biotechnology Conference will provide a road map for maximising the benefits of the new genetics and minimizing potential risks. Biotechnology can help to shape the future of sustainable food security.

**APPENDIX B.4 Mr Rodney Cooke, Director, Operational Policy and Technical Division,
International Fund for Agricultural Development (IFAD), Italy.**

Investing in agricultural research and agricultural biotechnologies

I. The scale of these challenges and why we need to invest

The climate change negotiations of 2009 looked to political will to secure a future worth living for our children. A future in which there is food security for all. A future in which the challenge of climate change is acknowledged, addressed and overcome. Critical to achieving both of these goals is rural development.

The first MDG which was adopted by the world leaders of the UN in 2000 was an undertaking to reduce the number of hungry people by half by 2015 from 850 million, at that time, to around 400 million. A few years ago, little progress had been made and the food price crisis of 2007-08 actually led this figure to rise to over 1 billion people. Serageldin (2009)¹ referred to this “silent holocaust which causes some 40,000 hunger-related deaths every day”.

In IFAD we believe the world community has learnt important lessons from the recent food price crisis:

First: The world can ill afford to under-invest in agriculture. While the food crisis of 2007/2008 was exacerbated by short-term developments -- such as crop failures in major cereal producing countries - it was fundamentally a reflection of the failure of world supply to keep pace with growing demand, largely due to declining or stagnant agricultural productivity in developing countries after two decades of under investment.

Second: In today’s interconnected world, food crises will undoubtedly have an immediate and massive impact on the poor in developing countries. Recent estimates indicate that more than 100 million people joined the ranks of the hungry as a result of the food and global economic crises.

The world’s population is projected to grow from 6.8 billion to 9.1 billion by 2050. Most of the growth is expected to take place in developing countries. Feeding 9.1 billion will require that overall global food production increases by 70 percent. Production in the developing countries would need to almost double. Over the past three decades, agricultural productivity in developing countries has been stagnant or in decline, as a consequence of under-investment in the sector. Developing countries’ public spending on agriculture declined from 11 per cent of national budgets in the 1980s to 7 per cent in recent years. And the share of ODA allocated to agriculture dropped from about 20 per cent to 4 per cent.

While increased food production is necessary, it is not sufficient on its own to avert food crises. Food security requires distribution mechanisms that enable equal access to food for all people. It is not enough to increase production and productivity; farmers should be linked to markets; not necessarily international markets but the last mile to vibrant and competitive local markets. Smallholder farmers need to increase their production to enhance national food security, but governments have to create the environment to enable them to do so. The crisis has shown that smallholder farmers often find it difficult to respond to sharp increases in demand and higher food prices in the absence of supporting institutions and appropriate infrastructure.

Climate change is expected to put some 49 million more people at risk of hunger by 2020². And in Africa alone, where about 95 per cent of agriculture depends on rainfall, climate change is expected to

¹ I. Serageldin, 2009 National Academy of Sciences, 25 (4) 35-38

² The Intergovernmental Panel on Climate Change (IPCC) 2007

cause severe water shortages that will affect between 75 million and 250 million people by 2020. In some countries yields from rain-fed agriculture could fall by 50 per cent by the same date. In other words, the people that will pay the price of climate change are the poor and vulnerable, and especially the three quarters of the world's poor living in rural areas and depending on agriculture. These people stand to be hit first and hardest.

But agriculture is not just a victim, it is also in part a culprit creating climate change. Agriculture and deforestation together account for an estimated 26 to 35 per cent of greenhouse gas (GHG) emissions. Afforestation and reforestation, better land-management practices such as agro-forestry, rehabilitation of degraded crop and pasture land and better farming practices can all contribute significantly to reducing greenhouse gas emissions.

In other words, agriculture – as well as being part of the problem – can also be part of the solution to climate change and food security. But most of the key players are the poor and vulnerable: rural people in developing countries. There are five hundred million smallholder farms worldwide supporting around two billion people, or one third of the world's population. They farm 80 per cent of the farmland in Asia and Africa. They produce 80 per cent of the food consumed in the developing world and they feed one third of the global population. Our focus should be on increasing smallholder productivity, and reducing their vulnerability.

Rural women in particular need to be able to fulfill their potential. Women are increasingly the farmers of the developing world, performing the vast majority of agricultural work and producing between 60 and 80 per cent of food crops. To boost smallholder productivity and production will require consistent and sustained investment in agriculture. Such investment can pay huge dividends: GDP growth generated by agriculture is at least twice as effective in reducing poverty than growth in other sectors (World Development Report, 2008).

Two key challenges face humanity, namely our ability to meet the goal of food security for all while managing climate change. Both of these simultaneously constitute a tremendous challenge. Old failures in rural development and now these new challenges call for new solutions in approaching rural poverty reduction. This indicates the important role for research, but in effective innovation systems.

II. Innovation Systems: Effective investments in agricultural research

Agricultural investment plans must be coherent with overall national plans for economic development and poverty reduction. They must distinguish between situations which are amenable to economic development through technical advances, and in cases where the lot of the poor can be better or must first be improved by other means, such as support for health, domestic water, education or infrastructure programmes. The planning process will be country specific. An essential need in an agricultural research plan is that it provides for knowledge and information flow in two directions. A farmer-centric participatory approach requires that the products of a strategic and applied research is moved from trained scientists to farmers in rural communities and that the demands and indigenous knowledge of the rural community should flow to the scientists. This is multi-disciplinary in its approach to constraint identification and alleviation and must widen stakeholder participation to engage the contributions of those concerned with the non-technical constraints to poverty reduction. These innovation systems intend to lead to sustainable production systems which include the following attributes³:

- Utilises crop varieties and livestock breeds with high productivity per externally derived input.
- Avoids the unnecessary use of external inputs.
- Harnesses agro-ecological processes such as nutrient cycling, biological nitrogen fixation, etc.
- Minimise the use of practices that have adverse impacts on the environment and health.

³ Adapted from "Reaping the Benefits", The Royal Society 11/09 (2009)

- Makes productive use of human and social capital in the form of knowledge and capacity to adapt and innovate, and to resolve common landscape-scale problems.
- Minimises the impacts on externalities such as GHG emissions, clean water availability, carbon sequestration and conservation of biodiversity.

It is essential that rural people are provided with the means to adapt to climate change. They need seeds that are more resistant to drought or to floods and they need cutting-edge agricultural technologies. This must be linked to rural financial services to allow them to invest in the future and to help tide them over in lean times.

III. What does this mean for agricultural biotechnologies?

Paper ABDC-10/8.1 reminds us that “Science, technology and innovation underpin every one of the MDGs – it is inconceivable that gains can be made without a focused science, technology and innovation policy” (UN Millennium Project, 2005). Yet the almost total neglect of S&T in the Poverty Reduction Strategy Papers emphasizes again the need for more joined-up S&T management. Securing appropriate and consistent levels of funding for agricultural S&T has consistently been hugely problematic for most developing countries.

Options to increase the levels of funding and increase the impact of S&T (derived from Section B of ABDC-10/8.1) include:

- Increased funding:
 - redirecting part of the total public support package for agriculture to innovative technological packages;
 - developing much closer partnerships with R&D supported by other ministries and their donors;
 - encouraging commercialization of agricultural R&D;
 - introducing commodity levies and tax check-offs to support “pro-poor” agricultural R&D.
- Efficiency and targeting of funding:
 - moving progressively away from traditional arrangements for centrally-based national agricultural research organization;
 - changing the criteria for priority setting and procedures for allocating funds;
 - linking research priorities more explicitly to wider social and economic needs;
 - creating formal structures and mechanisms for stakeholder participation in R&D policy;
 - giving increasing priority to research that is jointly formulated and implemented through public-private partnerships;
 - giving increased priority to research projects on local and regional product value chains and production systems;
 - In general establishing S&T and innovation funding windows based on thematic “problem-based” priorities and “value chains”;
 - encouraging and enforcing intellectual property protection.

In the crops background paper (ABDC-10/3.1) priority options for developing countries are brought together under eight headings. But the sequence or flow of these headings should be perhaps recast as follows:

Policy development and priority setting

- Countries should develop expertise to ensure that they can make sovereign decisions about adopting biotechnologies and be able to carry out their own independent, broad based risk/benefit analyses of implementing such technologies

Linkages Biotechnology/Other agricultural R&D

- Biotechnological research should be more effectively linked to strong and well resourced agricultural R&D programmes.

Capacity development

- Countries should develop biotechnology capacities of the National Agricultural Research Systems.

Regulation of biotechnology utilization

- All countries should be encouraged to establish consistent and transparent, evidence-based decision-making processes to regulate crop biotechnology R&D, and its application.

Shared access to technologies

- Effective and equitable mechanisms for PPP and South-South collaboration should be established, where appropriate.

Uptake of biotechnologies

- Biotechnology development should be strongly linked with strategies for its widespread dissemination. Stronger extension services involving participatory crop improvement programmes, should be an integral part of national/regional agricultural support structures, including enhanced seed production and distribution systems.

Documentation of development and impact

- Developing countries should document and analyse the adoption and socio-economic impacts of crop biotechnological innovation to advise policy makers on the cost/benefit implications of biotechnology application.

Investments in Biotechnology R&D

- Developing countries, possibly working in regional groups, should build up indigenous research, development, and advisory capacities for generation, assessment and adoption of appropriate biotechnologies.

In the livestock paper for this conference (ABDC-10/5.1), the way forward notes that the application of such biotechnologies should be supported within the framework of a national livestock development programme. Secondly, that the targeted users of these biotechnologies are normally resource poor farmers with limited purchasing power, therefore appropriate models are needed to ensure that the eventual products are acceptable to them. Thirdly, if biotechnologies are to be adopted they should build upon existing conventional technologies.

IV. Agricultural biotechnologies, sustainable agriculture and agricultural biodiversity

Professor Swaminathan, in his opening message to ABDC-10, observed that Biodiversity has so far served as the feedstock for sustainable food and health security and can play a similar role in the development of climate resilient farming and livelihood systems.

The UN General Assembly has declared 2010 as the International Year of Biodiversity. Sustainable agriculture comes with the notion of financial and institutional viability but also ecological soundness and technological appropriateness. Farmers in climatically unreliable, low-external-input environments usually need to maintain more diversity by default: they plant more than one variety per crop, using traditional varieties that have been adapted to environmental variation and uncertainty as well as to local preferences and socio-economic settings through repeated reproduction and selection.

However, we must recognise that these traditional farm-based systems usually have fewer opportunities for genetic recombination and cross-breeding, and often perform poorly in the production of disease-free seed and in seed storage, which are some of the domains in which formal institutional seed systems appear to be far more effective.

This calls for the development of synergies between formal science and informal knowledge systems and requires the design of new, specific and locally adapted approaches to analyze genetic diversity and farmers' practices – the intellectual property embedded in these which drives the incentive structure of farming communities to sustain such diversity – and ultimately the sustainability of the agricultural production system. There is a need to identify the relevance and the dynamics of genetic variability conservation in the context of small-holders' coping strategies, enhance the use of diversified plant genetic resources for sustainable agriculture and sustained improvements in food

production – towards better household food security. Recent studies indicate that too narrow a range of crops is leading to reduced honey bee populations in many countries - bees seem to require pollen from a diverse range of flowering plants if they are to develop strong immune systems that are essential to survival. This is an example of one of many “knock-on effects” of diminishing plant diversity in rural areas.

IPR and Traditional Knowledge and Germplasm: The Role of CBD

The Convention on Biological Diversity (CBD) mandates that the contracting party shall: “respect, preserve and maintain knowledge, innovations, and practices of indigenous and local communities embodying traditional lifestyle relevant for the conservation and sustainable use of biological diversity”.

Today, IFAD commits three-quarters of a billion dollars annually to loan and grant-financed projects to fight rural poverty. This is set to average around 1 billion US dollars per year in the next three years. All Fund-financed projects and programmes impinge on agricultural production systems and, so, have an impact on agricultural biodiversity. We have long recognised that the rural poor and the farming communities, who our projects are designed to benefit, are in fact the custodians of a diverse gene pool and are the main purveyors of agricultural agro-biodiversity.

Through its focus on a pro-poor innovations agenda, IFAD supports the generation, development and diffusion of sustainable agricultural technologies. This means that we clearly recognise that technological change should not happen at the expense of the natural resource-base. IFAD’s projects and programmes address around 30 million smallholder farmers every year – and a large majority of these eke out a survival in remote, marginalised agro-ecosystems where the conservation of their fragile agricultural biodiversity is critical to the sustainability of their livelihood systems. This requires application of significant local knowledge, skills, ingenuity and innovation to the biophysical resources at hand – and equally to the conservation and utilization of germplasm – local planting material that is adapted to the local conditions.

With financial support from IFAD, Bioversity International has investigated sustainable utilisation of plant genetic resources in desert-prone areas of Mali and Zimbabwe. Through programmes of action-research, scientists worked with farmers to develop innovative methods to identify, protect and utilize endangered traditional crops. These genetic resources were, are and hopefully will continue to be of significant importance to the food security of poor rural communities. Of particular importance was the testing of alternative models for community-based in-situ seed conservation in conjunction with farmers benefiting from development projects financed by IFAD loans. Using participatory methods, appropriate sites rich in crop genetic diversity were identified, selected, and then mapped before drawing up procedures for the conservation of the genetic resources. Farmers were encouraged to build upon their own knowledge to enable them to identify and characterise traditional varieties and seed-systems. This work resulted in prototype models for in-situ gene-banks, on-farm seed production, storage and exchange between small farmers. Replication of successful models have not only led to better on-farm management of crop genetic resources but have promoted sustainable improvement of rural livelihoods through the forging of strategic partnerships between public and private sector entities, such as farmers organisations, government entities and seed companies. Another successful model led to the development of “Seed Diversity Fairs” which provide space for interaction between farmers, development workers and researchers that leads in turn to decentralized approaches in research, training and curriculum development in plant breeding and seed systems. Crops involved in the programmes described included millet, sorghum, cowpea and Bambara groundnut – important crops in desert margin areas.

The impact of intellectual property rights on farmers' seed systems

Pro-poor IPR systems build on the comparative advantage of these communities as custodians of the genetic resources, local know-how and innovation capacity. In order to foster creativity and innovation to promote sustainable agriculture – it is imperative to develop and deploy an appropriate system of intellectual property rights (IPRs) systems for fair and equitable sharing of benefits of new or original knowledge or capital embedded in germplasm – for instance, a landrace.

In general, very few investors in agriculture and rural development have adequately realized the role that agricultural biodiversity can play in addressing poverty and household food security, in an eco-sustainable way. One way forward is the link between IPRs, incentives and agricultural biodiversity-conservation-based sustainable production systems.

Farmers often receive commercial varieties as part of a package that includes, credit, seed and agro-chemicals. In many cases accepting such packages is the only way farmers can access credit in rural areas. The end result is a progressive marginalization or disappearance of local varieties. This follows the questionable idea of progress favouring the replacement by high yielding (“improved”) varieties of traditional crop varieties in the most productive areas. And farmers' seed systems are important to resource poor farmers in poor agro-ecological environments because of the importance of locally adaptive varieties. In other words, intellectual property rights are working to reward standardization and homogeneity, when what should be rewarded is agro-biodiversity particularly in the face of climate change and the need to build resilience by encouraging farmers to rely on a diversity of crops. For this reason member states should promote innovation in both the commercial seed systems and the farmers' seed systems, ensuring that innovation in both works for the benefit of the rural poor.

APPENDIX C

LIST OF DOCUMENTS

FAO Documents

- ABDC-10/1 Rev.1 Agenda and timetable
- ABDC-10/2 Provisional annotated agenda and timetable
- ABDC-10/3.1 Current status and options for crop biotechnologies in developing countries
- ABDC-10/3.2 Synthesis: Current status and options for crop biotechnologies in developing countries
- ABDC-10/4.1 Current status and options for forest biotechnologies in developing countries
- ABDC-10/4.2 Synthesis: Current status and options for forest biotechnologies in developing countries
- ABDC-10/5.1 Current status and options for livestock biotechnologies in developing countries
- ABDC-10/5.2 Synthesis: Current status and options for livestock biotechnologies in developing countries
- ABDC-10/6.1 Current status and options for biotechnologies in fisheries and aquaculture in developing countries
- ABDC-10/6.2 Synthesis: Current status and options for biotechnologies in fisheries and aquaculture in developing countries
- ABDC-10/7.1 Current status and options for biotechnologies in food processing and in food safety in developing countries
- ABDC-10/7.2 Synthesis: Current status and options for biotechnologies in food processing and in food safety in developing countries
- ABDC-10/8.1 Policy options for agricultural biotechnologies in developing countries
- ABDC-10/8.2 Synthesis: Policy options for agricultural biotechnologies in developing countries
- ABDC-10/9 Agricultural biotechnologies for food security and sustainable development: Options for developing countries and Priorities for Action by the international community
- ABDC-10/10 Background Document to the FAO e-mail conference on "Learning from the past: Successes and failures with agricultural biotechnologies in developing countries over the last 20 years".

Non-FAO Documents

- ABDC-10/Swaminathan Biotechnology and shaping the future of food security
- ABDC-10/IFAD Investing in agricultural research and agricultural biotechnologies

ABDC-10/AARINENA	AARINENA issue paper for the West Asia and North Africa region (WANA)
ABDC-10/APAARI	APAARI Issue Paper: Harnessing biotechnologies for food security in the Asia-Pacific region
ABDC-10/ECA	Issue paper for the regional session for Europe and Central Asia
ABDC-10/FARA	Forum for Agricultural Research in Africa issue (FARA) issue paper
ABDC-10/IICAREDBIO	Background document for the Latin America and the Caribbean session
ABDC-10/Biosecurity	Issue paper for the session on "Biosafety in the broader context of biosecurity"

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