CHAPTER 12

SUMMARY REPORTS OF CROSS-SECTORAL PARALLEL SESSIONS

12.1 INTRODUCTION

During the ABDC-10 conference, a total of 27 parallel sessions were held over the first three days, the majority of which were organized by different inter-governmental and non-governmental organizations. Each session lasted one hour and 45 minutes, except for three "double sessions" which lasted three and a half hours. Each organization arranging a session was asked to produce a short summary report from its session, which was presented to the Plenary Session by a Rapporteur the following morning. This Chapter presents the summary reports of the twelve parallel sessions dedicated to cross-sectoral issues.

For these sessions, FAO invited relevant inter-governmental and non-governmental organizations to organize sessions on a specific issue of cross-sectoral importance. For each one, the programme was developed by the organizers, with guidance from FAO. The structure that FAO suggested for each session was one with 2–3 speakers/panellists, each of whom would present for 15 minutes (providing a brief background on the topic and setting the scene) followed by an open discussion moderated by a facilitator. Presentations from the different sessions are available at www.fao.org/biotech/abdc/parallel/en/.

12.2 REPORTS OF THE PARALLEL SESSIONS

12.2.1 Development of genomic resources: Current status and future prospects

Organizer:
Consultative Group on International Agricultural Research

Facilitator:
Rajeev Varshney, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India

Panel Members:
Roberto Tuberosa, University of Bologna, Italy
Jasper Rees, University of Western Cape, South Africa
Jerry Taylor, University of Missouri, United States

Rapporteur:
Michael Baum, International Center for Agricultural Research in the Dry Areas (ICARDA), Syria

Approximately 50 people attended this session, in which the three Panel Members provided background information on the availability of genomics resources in cereals, legumes, trees and animals. It was clear that access to low-cost, next generation sequencing technology will be, or is already, available for many cereal, legume, tree and animal species. To properly utilize this technology, major investments will be required in bioinformatics and data management. For the main cereal crops (wheat, rice, maize and barley), there is good availability of genomic resources and genomic platforms to identify genes/quantitative trait loci (QTLs) for target traits. New strategies such as association mapping have increasingly been deployed. Comparative genomics will play an increasing role for identifying and validating candidate genes following the availability of the sequences of important species such as rice, maize and sorghum, and many more species given the rapid increase in sequencing technology.

In legumes, due to coordinated efforts at national and international levels, a significant amount of genomic resources such as molecular markers, genetic maps, physical maps, genome sequence, and trait-linked markers have been developed in several important species. Tree breeding is challenging given the long breeding cycle, heterozygous germplasm and self-incompatibility. Currently, genetic maps for some fruit tree species such as apple are available and contain the location of various types of molecular markers and QTLs for important traits. Published genome sequences are available for grape and in an advanced stage for apple and peach. For cattle/animal breeding, high-throughput genotyping using the latest advances in genome sequencing is available and genome re-sequencing, *de novo* assembly, and mutation discovery are almost routine.

During the discussion, it was made apparent that developing countries should strongly consider investing in strategic partnerships with advanced research institutes to be in the

best position to take advantage of the latest technologies. If the technology exists for a species, gaining access to it and using it in research and breeding is feasible, either with investments in-house, or through partnerships or out-sourcing. It was also clear that there is a strong requirement for investment in capacity building – training and retaining human resources, especially in the area of informatics and data analysis/management. The correlation of genomic and sequencing data with phenotypic information is very challenging, but critical for the effective use of modern genomic tools. Data analysis, data management and data accessibility are most important when the "tsunamis" of genotyping data as well as phenotypic data become available. Finally, modern genomic information needs to be complemented with proper phenotyping, and this information needs to be converted into useful information (e.g. breeding values) so that breeders in developing countries can use this in their breeding programmes.

12.2.2 Genomic applications: Molecular breeding for developing countries

Organizer:
Consultative Group on International Agricultural Research

Facilitator:
Jean-Marcel Ribaut, Generation Challenge Program, Mexico

Panel Members:
Roberto Tuberosa, University of Bologna, Italy
Dave Hoisington, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India
Carmen de Vicente, Generation Challenge Program, Mexico

Rapporteur:
Nicolas Roux, Bioversity International, France

Approximately 60 people attended the session, which started with the Facilitator reminding the participants that "molecular breeding" is perhaps not the most appropriate terminology since it sounds technology-driven and appears in conflict with conventional breeding. Therefore, it was suggested to use "modern breeding" to describe the use of genomic tools in breeding. Three presentations were given to provide background information and stimulate discussion. The first (by Roberto Tuberosa) laid out the overall strategies and options for applying molecular technologies in breeding. The second (by Dave Hoisington, Jean-Marcel Ribaut and Segenet Kelemu – presented by Dave Hoisington) discussed opportunities for providing molecular technology to research and breeding programmes via technology platforms and regional genotyping/biotechnology laboratories located in developing countries. The third (by Carmen de Vicente) presented studies on the potential impacts of molecular-based breeding and examples for capacity building and communities of practice toward the use of genomics in breeding.

From the presentations, it was clear that there are several opportunities for scientists in developing countries to access large-scale marker services, and therefore there is less need now to consider major investments in in-house technology. The need is now to build the capacity of scientists/breeders in developing countries to better understand how best to apply genomics in their programmes, including data interpretation and management.

The session was then opened to the participants for comments and discussion. A first point raised regarded the potential for intellectual property rights (IPR) to affect the ability to use molecular markers in breeding. In general, molecular markers are not patented, although some cases are known. In addition, while some institutes, even in the public sector, seek IPR on genomic technology, many of these do this to keep the technology in the public domain and make such technology freely available especially to developing countries. There was also a feeling that with the advent of large-scale genomics, less IP protection is being sought on the technology itself; however, the critical knowledge (e.g. about the linkage between a trait and a marker) is often not disclosed.

A few participants presented cases where national governments are supporting the establishment of national biotechnology laboratories, especially where the breeders/researchers are convinced of the potential impact of the technology. Some of these facilities are interested in providing services on a regional basis as capacity grows and needs increase.

While genomic resources are perhaps more advanced in animals than in plants (as presented in the previous session, described in Section 12.2.1), there was a comment that there is a limited ability within the animal breeding community of many developing countries to actually promote the use of modern technology as compared with the plant community. Unfortunately, the session lacked sufficient expertise in the animal sector to properly evaluate if this was a correct observation; however, there is a general lack of ability of breeders in all species to effectively use genomics.

Finally, enhancing the capacity of researchers and breeders in developing countries to understand when and how to use genomics in their programmes is a clear need. A "tsunami" of genomic data and information is coming. Therefore, effective data management and analysis systems will be critical and could become a major impediment for scientists in developing countries to use genomics optimally. Efforts should be initiated to ensure that the power of genomics is not lost as an option to improve global food and nutritional security.

12.2.3 Conservation and sustainable use of genetic resources for food and agriculture

Organizer:
Consultative Group on International Agricultural Research

Facilitator:
Dave Hoisington, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), India

Panel Members:
Tom Payne, International Maize and Wheat Improvement Center (CIMMYT), Mexico
William Roca, International Center for Tropical Agriculture (CIAT), Colombia
Arthur da Silva Mariante, Brazilian Agricultural Research Corporation (EMBRAPA), Brazil
Jean-Marcel Ribaut, Generation Challenge Programme, Mexico

Rapporteur:
Kay Simmons, United States Department of Agriculture, United States

This session, with around 45 participants, was started by the Facilitator noting that 2010 is the Year of Biodiversity and that safeguarding biodiversity is a recurring theme in the Conference, but that it was even more important to better understand and use biodiversity. The first presenter (Tom Payne) noted that many plant genetic resources are conserved and now biotechnology is helping to determine if a crop's gene pool is adequately conserved and how to better access that information. The second presenter (William Roca), on clonally propagated genetic resources, reported that biotechnology is revealing new information on potato species diversity and strengthening efforts to conserve farmer (native) genebanks. The third presenter (Arthur da Silva Mariante) noted that animal genetic resources are under-conserved and diversity is being lost due to the cross-breeding nature of animals. Thus, more conservation of animal semen and *in situ* conservation of breed animals are needed. The fourth presenter (Jean-Marcel Ribaut) described molecular methods to identify valuable subsets of genetic resources, to develop new diverse genetic resources using wide-hybridization and genomics, and to improve the use of genetic resources in crop improvement.

From the presentations it was clear that biotechnology is revealing even more value in conserving genetic resources and providing new tools to use biodiversity. The need now is to build the capacity of scientists/breeders in developing countries to better conserve their unique biodiversity and better access all available genetic resources. Participants, especially from Mexico, reported significant progress in developing a new genebank and *in situ* conservation. Several recognized that national priorities need to be determined and valuable resources used to conserve unique biodiversity and that genetic resources are in danger of being lost. It was also mentioned that the strategy for conservation and management of those resources might be quite different depending on the purpose. The conservation of species that are in danger of extinction is not the same as the species that have strong potential for large distribution on a regular basis.

Participants noted the need to conserve valuable genetic resources beyond plants including fish, animals, breeds, microbes and insects. A few participants suggested that a "Genetic Treaty" for genetic resources such as fish and other animals is needed, to enhance the use and benefit-sharing similar to plant genetic resources. Participants also recognized the need to pay attention to the management of "novel" genetic stocks (e.g. new genetic material produced from wide-hybridization, TILLING [targeting induced local lesions in genomes] etc.). The modality on how best to conserve and distribute these novel genetic resources requires further investigation. Finally, the need for the more advanced genebanks to share methods and technology to better preserve genetic resources in developing country genebanks was noted, and the importance of conserving unique biodiversity in all countries recognized.

12.2.4 Prioritizing the role of the farmer

Organizer:
FAO, with support from the International Federation of Agricultural Producers (IFAP)

Facilitator:
Karin Nichterlein, FAO Office of Knowledge Exchange, Research and Extension, Italy

Panel Members:
Herman Kumera, World Forum of Fisher Peoples, Sri Lanka
Miguel Altieri, University of California, United States
Isidoro Angcog, Asian Farmers Association for Sustainable Rural Development (AFA), the Philippines

Rapporteur:
Harinder Makkar, University of Hohenheim, Germany

About 44 people attended the session in which three presentations were made, focusing on the role of small producers (fishers and farmers) in R&D programmes to develop appropriate technologies. The group identified the following gaps:
1. R&D is not sufficiently addressing small farmers' needs; lack of public investment in R&D
2. Lack of:

- opportunities for farmers to participate in R&D priority-setting;
- national level consultative mechanism for farmers' participation in R&D work;
- information in local languages at the rural level, enabling informed decision-making by farmers;
- involvement of young people in identifying R&D programmes;
- recognition of farmers' knowledge and needs by researchers and policy-makers;
- skills with researchers to effective communicate with the farmers.

The group decided that the following steps should be taken to address these gaps:

- formulate national policies to address needs of small farmers and enable their active participation in R&D programmes.

- national governments should develop policies to oversee and monitor corporate R&D agendas involving farmers.
- farmers should be empowered with knowledge and information enabling them to prioritize their needs and to communicate them to decision-makers.
- mechanisms should be established to allow farmers participation in R&D priority-setting;
- R&D agendas should be driven by farmers' needs, and they should be involved from the very beginning - from planning and designing the R&D work to its execution.
- for developing R&D programmes, traditional knowledge and culture should be taken into consideration. The role of women in addressing this issue should be recognized.
- national R&D agencies and ministries should be proactive in approaching farmers to identify their needs and problems and develop R&D programmes to address them.
- international organizations should make the inclusion of small farmers' needs mandatory in programmes for providing financial and technical support.
- farmers' role in the form of farmer-to-farmer extension should be recognized as a promising strategy for wider dissemination and adoption of technologies. Researchers and extension workers would then play the role of only the facilitators.

12.2.5 Ensuring equitable access to technology, including gender issues

Organizer:
Oxfam International

Facilitator:
Gigi Manicad, Oxfam International, the Netherlands

Panel Members:
Luz Amparo Fonseca, Confederación Colombiana del Algodón (Conalgodon), Colombia
Patricia Zambrano, International Food Policy Research Institute (IFPRI), United States
Wilhelmina (Ditdit) Pelegrina, Southeast Asia Regional Initiatives for Community Empowerment (SEARICE), the Philippines
Andew Mushita, Community Technology Development Trust, Zimbabwe

Rapporteur:
Alvaro Toledo, FAO Commission on Genetic Resources for Food and Agriculture, Italy

In many farming communities worldwide, quite simply, no seeds mean no food. To examine the factors for the equitable generation and access of technologies with focus on women, the participants considered the following factors:

- role of international and national agriculture research systems in facilitating the steady and constant supply of genetic materials (parent breeding lines) so that farming communities can select and develop their own seeds under their specific conditions, which are constantly changing;
- complementary role of the formal seed systems for the supply of finished varieties, which farmers can test and select from;

- cooperation with research institutes for the use of biotechnologies (e.g. genomics, molecular assisted breeding) for the characterization and breeding of crops;
- market support to enable farmers to produce and sell their seeds and crops;
- capacity building approaches to help farmers organize, manage their seeds and production systems and engage in corresponding plant genetic resources policy development and governance;
- engaging women in the management of plant genetic resources.

This double session looked at the stresses and resilience of farmer seeds systems through three regional case studies: introduction of Bt cotton in Colombia (by Luz Amparo Fonseca and Patricia Zambrano); up-scaling and mainstreaming of participatory plant breeding of rice in Asia (by Ditdit Pelegrina); and ensuring farmers access and control of technology in Africa (by Andrew Mushita).

To ensure equitable access to technology, including women, the participants identified and recommended the following:

1. The role of women

There is an imbalance which needs to be corrected. On the one hand, it is important to recognize the significant role of women in household food security and biodiversity management. On the other hand, we need to understand and address the current marginalization of women by research and innovation systems; where women generally receive less information and are unable to participate in agenda setting. Moreover, women need access to institutional services such as credit, education and extension services.

2. Visions of farmers and technologies

We take a broader view of farmers and their multiple livelihoods. These include farmers, livestock producers, pastoralists, forest dwellers and fisher folks. Farmers are men, women, youth and community elders. Farmers too are researchers – they observe, experiment, and develop and adapt technologies. They are not just consumers, or end-users, of technologies.

For farmers, technologies should be easy to use, adopt and adapt in continuously-evolving farming systems and environments. Therefore, the technology needs to be continuously managed, owned, controlled and reproduced by small-scale farmers.

3. Farmers need to validate the technologies

These cannot be imposed top-down. For validation, accessibility of information is key. Information should be accurate and timely; gender-sensitive and relevant to farmers; complete, i.e. not only advertising but informing how to manage an innovation; and make the innovation visible.

4. Shared knowledge generation

- multi-stakeholder involvement (farmers, researchers, extensionists…);
- challenge the linear model of innovation (from vertical R&D to local hubs of innovation);
- increase the capacity for mutual learning and for the cogeneration of innovation;
- address empowerment of indigenous capacities for innovation.

5. Enabling Environments

Markets:

- affordable price of seeds/technology;
- assure market access, where appropriate;
- create opportunities for farmers-researchers to develop their products and add value to them.

Policies:

- access to credit by small-scale farmers;
- regulatory systems that enhance exchange of seeds and other practices:
  - non-restrictive intellectual property rights for small-scale farmers;
  - broaden scope of seed registration beyond yield;
  - seed and marketing laws that recognize farmers varieties;
  - crop insurance policies that cover farmers' varieties.

Institutions:

- ensure a rich multi-stakeholder environment.
- build solid institutions (credit, market, research).
- enable the generation and access to a diversity of technologies, crop varieties.
- strengthen farmers' organizations to access credit, demand research agenda.

12.2.6 Empowering public participation in informed decision-making

Organizer:
International Union for Conservation of Nature (IUCN)

Facilitator:
Keith Wheeler, IUCN Commission on Education and Communication, United States

Panel Members:
John Francis, National Geographic Society, United States
Sarah Stokes Alexander, The Keystone Center, United States
Joseph Russo, ZedX Inc., United States
Marcos Algara-Siller, Universidad Autónoma de San Luis Potosí, Mexico

Rapporteur:
John Francis, National Geographic Society, United States

Around 22 people participated in this double session which explored communication strategies that exercise a bottom-up, demand-driven approach to implementing biotechnology in agriculture. Four presentations were given in the first part of the session followed by a directed discussion with an audience of up to 22 people that continued into the second part. Keith Wheeler opened with the context of IUCN/CEC interest and activities including a brief mention of CEPA (communication, education and public awareness) methods and the challenge of effectively empowering stakeholders. John Francis talked about social networks and a broader conceptualization of the discussion about biotechnology solutions, arguing that everyone on the planet is an actor in agricultural production. This included a call for attention to communication at a grassroots level, including a greater range of participants and the use of emergent technologies to improve fund-raising and information exchange.

Sarah Stokes Alexander discussed how to enable dialogues among people with disparate outlooks and objectives, including recognizing where people are in their interests and capacity, encouraging listening and story telling, identifying common ground, and recognizing shared principles with a commitment to flexibility in solutions. Joseph Russo presented a web-based tool designed by ZedX for accumulating data and presenting it through user selected filters combined with real-time geographical information systems (GIS) information of value across a range of participants from local to international, grower to policy-maker. This includes the potential for real-time input of data from cell phones in the field with predictive, tailored information of value in the field, in the markets, in parliaments, and across a diverse web of actors. Marcos Algara-Siller provided an example of this tool in action with a detailed description of the Scope program, supported by the Mexican Secretaria de Agricultura and others where pest management data, such as the distribution of locusts, is mapped and provides real-time data to affected areas.

Following these presentations, questions posed to the audience included: How can we bridge the divides between research, policy, farmers, and the public?; How do we engage at all levels?; What tools and methods exist for groups to engage more with stakeholders?; What kinds of communication strategies are needed?; What are the relevant gaps and obstacles?

Salient conclusions included:

- For full engagement, especially including farmers in developing countries, researchers and policy-makers must hear and respond to the demands and needs at the local level.
- Solutions do not come as "one size fits all" and one must be aware of differing capacities and circumstances that lead to understanding and effective implementation with sensitivity about carefully selected and trusted messengers.
- Regional centres/approaches might better serve to streamline communication tailored to the audience.
- Starting early in schools with an understanding of agricultural systems and science can increase the likelihood of creating and adopting effective solutions.
- Use of new communications technologies should be embraced as soon as possible in those regions where practical.
- FAO and other international bodies need to financially invest in communications as key to engaging and empowering stakeholders and improving biotechnology implementation.
- FAO should play a role in supporting a global effort to enhance communications about biotechnologies through better coordination with communication and knowledge management specialists at regional and national levels.

12.2.7 Public-private partnerships

Organizer:
FAO, with support from the International Federation of Agricultural Producers (IFAP)

Facilitator:
Michael Baum, International Center for Agricultural Research in the Dry Areas (ICARDA), Syria

Panel members:
Francisco Aragão, Brazilian Agricultural Research Cooperation (EMBRAPA), Brazil
Jacob Mignouna, African Agricultural Technology Foundation (AATF), Kenya
Denis Murphy, University of Glamorgan, United Kingdom

Rapporteur:
Charles Spillane, National University of Ireland, Ireland

This session discussed cross-cutting issues, gaps and needs for successful agricultural public-private partnerships (PPPs) for smallholder farmers and highlighted successful PPPs, key constraints and needs. Case studies were presented on (1) development of herbicide tolerant soybean and virus resistant beans (BASF and EMBRAPA, Brazil); (2) development of water efficient maize for Africa (AATF); and (3) a wide range of agricultural biotechnology PPPs in the Malaysian oil palm sector. Other examples highlighted were agricultural biotechnology PPPs

for biofertilizer inoculants (Mexico), banana micropropagation (Kenya and Uganda), eucalyptus genetic improvement (Brazil), improved maize for African soils (Pioneer Hi-Bred, African national agricultural research systems) and vaccine development for domestic animals (Mexico).

PPPs can provide a mechanism to access and deploy biotechnologies for meeting the 21st century challenges and needs facing smallholder farmers. The private sector comprises many entities, ranging from small and medium sized enterprises (SMEs) and multinationals, to retailers, farmer cooperatives, and producer groups. Agricultural biotechnology innovations (and patents) arise from both the public and private sector. For innovations to reach and benefit smallholder farmers, it is important to identify needs, priority problems and engage target beneficiaries (e.g. farmers groups) for effective PPPs. The relative roles of public and private sectors in PPPs should ensure that the public sector does not undergo mission drift and begin competing with the private sector. Strengthening interfaces between public and private sector R&D can facilitate mutual understanding and more effective PPP management. Institutional capacity of partners to ensure stewardship of proprietary technologies can limit access, where technology providers fear reputational risk.

A key issue is whether regulatory systems for biosafety, intellectual property and seed systems are enabling agricultural biotechnology PPPs for smallholder farmers. High regulatory costs (for testing, production or marketing) can act as barriers to innovation, investment and smallholder farmer access to agricultural biotechnologies. Regulatory systems which are too strict, complicated, non-functioning or uncertain can all act as barriers to effective PPPs. Opportunities may exist for regional-level approaches to rationalize and harmonize regulatory procedures/frameworks to facilitate PPPs.

12.2.8 Biosafety in the broader context of biosecurity

Organizer:
FAO Nutrition and Consumer Protection Division, Italy

Facilitators:
Ruth Frampton, Critique Limited, New Zealand and Masami Takeuchi, FAO Nutrition and Consumer Protection Division, Italy

Panel Members:
Ruth Frampton, Critique Limited, New Zealand
Sridhar Dharmapuri, FAO Nutrition and Consumer Protection Division, Italy
Bertrand Dagallier, Organisation for Economic Co-operation and Development (OECD), France
Sol Ortiz García, Consejo Nacional de Ciencia y Tecnología (CONACYT), Mexico
Marilia Nutti, Brazilian Agricultural Research Cooperation (EMBRAPA), Brazil

Rapporteur:
Sridhar Dharmapuri, FAO Nutrition and Consumer Protection Division, Italy

Some weeks before the session took place, the organizers contributed a short Issue paper[1], focusing on the key topics to be discussed during the session, which was attended by 40

[1] Available at www.fao.org/fileadmin/user_upload/abdc/documents/biosecurity.pdf

people. “Biosafety in the broader context of biosecurity” generally refers to the safe use of new biotechnologies through management of biological risks associated with food and agriculture. The term “biosecurity” has been used by FAO to describe a strategic and integrated approach that encompasses the policy and regulatory frameworks for analyzing and managing relevant risks to human, animal and plant life and health, and associated risks to the environment. The value of the approach was recognized in the session.

In response to the introductory presentation, some participants suggested that the term “biosecurity” could be improved upon, given that currently “biosecurity” means different things in specific country contexts. FAO case studies indicated how this integrated approach may be used to rationalize decision-making around risk analysis. The benefit of identifying coordination mechanisms, yet using the existing institutional arrangements in the countries and the regions was highlighted. It was stressed that the approach should not add another layer to existing national structures.

One of the presentations highlighted that various biotechnologies being used in developed countries have potential to provide useful tools, such as pest/disease diagnosis and traceability tools in the implementation of risk management. At the same time, development and the use of some of the tools would require food and/or environmental safety assessments.

Examples of international efforts on biosafety were introduced by the OECD: one on environmental safety and one on food safety. Multilateral initiatives led by Mexico and Brazil to develop consensus documents were presented. OECD consensus documents are voluntary and risk-oriented guidance documents and are used by many countries and many sectors. The relationship, similarities and differences between OECD consensus documents and Codex texts were also discussed.

The various uses of the capacity building needs assessment tool in identifying gaps, avoiding inconsistencies and prioritizing actions were presented. It was particularly useful for cross-cutting capacity building since cost-effectiveness and usefulness of focused interventions were demonstrated through two case studies. Issues around biotechnology are cross-cutting and often require a multidisciplinary integrated approach.

12.2.9 Intellectual property rights in agricultural biotechnology

Organizer:
World Intellectual Property Organization (WIPO)

Facilitator:
Anja von der Ropp, WIPO, Switzerland

Panel Members:
Jorge Cabrera Medaglia, National Biodiversity Institute (INBio), Costa Rica
Raimundo Ubieta Gomez, Centre for Genetic Engineering and Biotechnology, Cuba
Decio Ripandelli, International Centre for Genetic Engineering and Biotechnology (ICGEB), Italy

Rapporteur:
Peter Gardiner, CGIAR Independent Science and Partnership Council, Italy

National and international agencies and organizations invest in the production of biotechnologies for the improvement of agriculture with high expectations as to accessibility of research results and products. Property rights establish ownership and influence access to, and the distribution and use of, the products and processes of biotechnological applications.

It remains to be established what kind of intellectual property (IP) legislation optimizes innovation and the dissemination of products. The current regulatory framework is complex. Several international instruments are relevant, such as TRIPS (the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights), UPOV (International Union for the Protection of New Varieties of Plants), CBD (Convention on Biological Diversity), ITPGRFA (International Treaty on Plant Genetic Resources for Food and Agriculture) and a WIPO instrument under discussion. The flexibility within international instruments may build opportunities for national options to deal with different sorts of IP. Several countries have formulated IP protection systems based on their social and commercial needs. They include: "Common knowledge" varieties in national lists under Mexican seed law; the Brazilian Agricultural Research Cooperation (EMBRAPA) benefited from the existence of a comprehensive national IP policy since 1996 in negotiations with international providers of IP; and Cuba's IP law to protect national investments in biotechnology in the health and food security sectors. Equally important might be a pragmatic treatment of technology transfer using best practices and sound contracts.

New public-private partnerships are appearing that combine public sector research with private sector resources and development expertise, e.g. EMBRAPA-BASF. Similarly, there are initiatives to overcome difficulties in developing countries to access protected technologies, e.g. the African Agricultural Technology Foundation (AATF). There are also increasing opportunities for collaboration and augmentation of capacities by joining global (e.g. ICGEB) or regional networks.

There is a development away from seeing technology transfer from research institutions as simply a means of generating revenue, to ensuring product development that is of benefit

to society and dissemination of these products. IP management has to support strategic biotechnology goals at the institutional level. IP capacity needs to be improved to enhance the producers of biotechnology and not just treat developing countries as recipients.

Practical tools are needed to obtain information updates on IP and biotechnologies, and intelligent search engines to scan agricultural innovations (such as the patent landscape developed by CAMBIA with WIPO support).

12.2.10 Policy coherence in biotechnology at the national and regional levels: The experience of COMESA, ASEAN and CARICOM regions

Organizer:
United Nations Conference on Trade and Development (UNCTAD)

Facilitator:
Thomas Dubois, International Institute of Tropical Agriculture (IITA), United Kingdom

Panel Members:
Walter Alhassan, Forum for Agricultural Research in Africa, Ghana
Banpot Napompeth, Kasetsart University, Thailand
Wendy Hollingsworth, Policy NetWorks International Inc, Barbados

Rapporteur:
Gregory Jaffe, Center for Science in the Public Interest, United States

This session presented the experiences of the COMESA (Common Market for Eastern and Southern Africa), ASEAN (Association of Southeast Asian Nations) and CARICOM (Caribbean Community and Common Market) in developing regional and national biotechnology policies in agriculture.

The first presentation was given by Walter Alhassan, on behalf of Charles Mugoya and Michael Waithaka from the Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA) in Uganda. He discussed the regional activities that have been conducted by COMESA to harmonize biosafety policies related to genetically modified organisms (GMOs). COMESA has drafted guidelines and policies for handling commercial plantings of GMOs, trade in GM products, and emergency food aid with GM content. The regional work has also involved a biosafety roadmap to help national government establish biosafety frameworks, a communications strategy, and an analysis of the economic impacts on trade if the region grows GMOs.

The second presenter, Banpot Napompeth, provided the participants with a discussion of the current status of biotechnology development and biosafety regulation in the ten ASEAN countries. He explained that the countries ranged from having functional biosafety systems with commercial GMOs to countries with only an outline of their biosafety system and no research into GMOs. He also reported no regional activities in this area.

The final presenter, Wendy Hollingsworth, discussed the process that CARICOM has used to draft a regional biotechnology policy and strategy. She described a bottom-up approach involving stakeholder meetings in six representative countries and an effort to fit the regional policy within the content of other regional priorities, such as the regional agricultural policy. She ended with her thoughts on implementation considerations after the document is adopted by CARICOM.

The discussion focused on three general questions. First, the audience was asked about the general advantages or benefits to regional guidelines. The major points that were raised in the discussion were:

- efficiency (reducing costs and sharing resources);
- allow for regional trade;
- harmonization of technical requirements, regulatory procedures, and legislation;
- the fact that regional risk assessments could lead to approval in multiple countries;
- building and sharing capacity;
- incentive for product development, investment, market access.

The participants then discussed the hurdles to establishing regional guidelines. The points raised included:

- the fact that different countries are at different stages of development;
- countries want to maintain autonomy in the decision process;
- potential conflict with pre-existing laws and regulations;
- cooperation needed by different ministries;
- lack of a GMO product to test the system; the need for political commitment;
- the establishment of a regional secretariat to carry out the policy/guidelines (regional infrastructure).

Finally, the participants addressed which priorities that need tackling at the regional level. The interventions focused on:

- capacity building - human resources and also infrastructure;
- financial sustainability of the regional guidelines;
- an effective regional body;
- education of national decision-makers;
- quantitative (cost-benefit) analysis related to the value of the regional guidelines.

12.2.11 Utilization of plants for non-food uses: Challenges and perspectives

Organizer:
United Nations Industrial Development Organization (UNIDO)

Facilitator:
George Tzotzos, UNIDO, Austria

Panel Members:
Ivan Ingelbrecht, Ghent University, Belgium
Luis Herrera Estrella, Centro de Investigación y de Estudios Avanzados del Instituto Politécnico Nacional (Cinvestav), Mexico
Jonathan Gressel, Weizmann Institute of Science, Israel
Antonio Paes de Carvalho, Federal University of Rio de Janeiro, Brazil

Rapporteur:
Dulce de Oliveira, Ghent University, Belgium

There were 45 participants for this session. Ivan Ingelbrecht and Luis Herrera Estrella provided a general overview of non-food uses for plants, the former discussing the perspectives of the bioeconomy to address global challenges such as population growth and environmental degradation both in the OECD countries and sub-Saharan Africa, while the latter discussed the present and future applications of transgenic plants for non-food/feed uses. He highlighted added-value applications such as production of molecules of pharmaceutical and industrial uses, biodegradable polymers, biofuels, specialty oils, and also environmental sanitation applications such as bioremediation.

Jonathan Gressel and Antonio Paes de Carvalho are entrepreneurs in the field and presented two cases studies. The former presented the case study of genetic engineering marine microalgae for meeting global needs for feed and energy. He concluded that marine microalgae are excellent fishmeal substitutes; do not compete for land and water; can sequester industrial carbon dioxide; are efficient fertilizers; have high productivity; and can generate multiple products. However, to be used, microalgae need domestication for reliability, productivity and composition and this can be achieved via gene engineering. The latter presented the case study of the development of a biodiversity-related bioenterprise in Brazil. He discussed the different steps to adding pharma value to biodiversity from the regulatory background to market and return of benefits. He expressed the opinion that biodiversity-related biotechnology projects are an excellent mechanism to operate the transfer of technologies to farmers and to local biotechnology enterprises, and that biotechnology companies arising as spin-offs of academia in developing countries should be regarded as prime targets for high-tech biotechnology transfer to these countries. In this way, research, technological development and appropriate innovation would actually reach developing countries. He concluded that small biotechnology enterprises in developing countries share similar problems of growth with small farmers and should be treated accordingly by international organizations that purport to make biotechnology a tool to help the poor.

During discussion, the panelists and participants identified the following constraints for the adoption of "white" biotechnology:

- Current policies are not conducive for adding economic value to biodiversity and concomitant bio-business development.
- State funding and private venture capital are currently inadequate for bio-business development.
- There is considerable lack of awareness of the opportunities opened up by biotechnology for industrial applications.

The general conclusions from the discussion were:

- Non-food biotechnology applications are amenable for socio-economic development particularly in rural areas, provided they do not compete with food production.
- Increasing crop production is only part of the solution to reduce poverty. There is need to move away from subsistence farming to systems that make agriculture a vehicle for generating higher standards of living and thus better health.
- Biotechnology offers new opportunities to add value to genetic resources, and therefore inability to access genetic resources constitutes opportunity loss.

Recommendations to overcome the constraints identified and other concerns were:

- Industrial applications of biotechnology should not compete with food production.
- Non-edible products should preferably be produced in non-food crops. Food crops for the production of industrial products should only be used provided they do not compromise human and environmental safety. Adequate safety assessment on a case-by-case basis is a necessary pre-condition.
- Policies that promote the establishment of appropriate infrastructures for the adoption of new technologies through North-South and South-South partnerships should receive more attention by policy-makers and international donors.
- Initiatives for generating awareness about the opportunities offered by new technologies and the management of intellectual property assets should become a priority in capacity building programmes.

Although not explicitly referred to in this session, a recent initiative of UNIDO addresses the constraints and recommendations raised during the discussion. The International Industrial Biotechnology Network (IIBN) is dedicated to assisting countries in accessing and developing biotechnologies for sustainable industrial development. The goals of IIBN will be achieved by developing demand-driven projects; offering institutional capacity building through specialized training in research and areas deemed critical for product development and technology adoption; and raising awareness of governments and industry of the opportunities and challenges posed by the emergence of bio-based industries.

12.2.12 Enhancing human capacities: Training and education

Organizer:
International Centre for Genetic Engineering and Biotechnology (ICGEB)

Facilitator:
Roger Beachy, National Institute of Food and Agriculture, United States

Panel Members:
Godelieve Gheysen, Ghent University, Belgium
Idah Sithole-Niang, University of Zimbabwe, Zimbabwe
Jorge Allende, Universidad de Chile, Chile
Sudhir Sopory, ICGEB, India

Rapporteur:
Decio Ripandelli, ICGEB, Italy

This double session, attended by close to 70 participants, aimed to address some of the most urgent needs for building capacities in agricultural biotechnologies in developing countries, taking stock from past experience and looking into a new perspective determined by a number of scientific, socio-economic and cultural changes that have deeply affected the scientific environment.

Roger Beachy opened the session by providing the audience with some of the issues that in his opinion needed to be addressed, such as the need to educate more young scientists using, wherever feasible, the best tools available. He also emphasized that in the case of the developing world, it is essential that scientists apply the knowledge they acquire to solve the problems affecting their countries and that in the case of agriculture there must be a direct relationship between discovery and its relevant application in the field. Presentations by the Panel Members then followed.

Godelieve Gheysen provided a description of the training activities implemented by the Institute of Plant Biotechnology for Developing Countries (IPBO), and in particular the e-biosafety training which was developed in conjunction with the UN Industrial Development Organization (UNIDO). This programme is proving to be very successful, although it now needs some revision to maintain its attractiveness and overcome some challenges faced in the first years of operation.

Idah Sithole-Niang presented the MSc course in biotechnology developed in the last 20 years in her University, as well as the biosafety training activities implemented in collaboration with other regional and international entities, and in particular those developed in partnership with the Program for Biosafety Systems (PBS), with the mission of empowering countries for science-based biosafety.

Jorge Allende introduced the training programmes of his University. He then elaborated on some aspects relevant to the three major changes that, in his opinion, are influencing training of biotechnologists in the second decade of the 21st century –namely, a drastic

paradigm shift in the science of biology; an important geopolitical change among developing countries; and the increased need for interaction between science and society.

Sudhir Sopory described the training activities being undertaken by the ICGEB, as well as some of the forefront research being implemented in the ICGEB laboratories, upon which the same training activities are based. He then proposed some models to enable training programmes to tackle changes relating to the new generations of agricultural biologists and for mid-career scientists respectively.

The lively discussion that followed provided a wide spectrum of considerations and suggestions for future enhancement of capacity building activities. The following were considered as most relevant for future action by national governments, the FAO and other international and regional organizations:

- In parallel with the Biosafety Clearing House established by the Convention on Biological Diversity (CBD) Secretariat, FAO should establish a coordination mechanism that would allow all institutions providing educational training and capacity building in agricultural biotechnology to share their experiences and, possibly, define synergies for future actions (e.g. sharing success stories of governmental programmes aimed at stimulating the enrolment of young students in scientific faculties);
- In order to respond to society needs, universities and other training institutions should develop educational curricula that would allow future biotechnologists to be conversant on issues that are not directly related to their science, such as entrepreneurship, technology transfer, intellectual property rights etc., keeping in mind, however, the need to maintain different specialization, as a scientist needs to remain a scientist. The use of e-learning methodologies would also prove an asset in this respect.
- Enhance South-South cooperation initiatives such as those implemented by some of the "strongest" developing countries, or by the ICGEB, in collaboration with the Academy of Sciences for the Developing World (TWAS) and the UN Educational, Scientific and Cultural Organization (UNESCO), and other potential partners such as FAO, the CGIAR, as well as regional centres such as the Inter-American Institute for Cooperation on Agriculture (IICA), to ensure that collaboration among more proficient countries and scientifically lagging countries will eventually benefit the building of capacities in the latter.